

A MANUAL
OF
MATERIA MEDICA
AND
PHARMACOLOGY

COMPRISING THE
ORGANIC DRUGS WHICH ARE OR HAVE BEEN
RECOGNIZED BY THE UNITED STATES PHARMACOPŒIA
AND NATIONAL FORMULARY

TOGETHER WITH
IMPORTANT ALLIED SPECIES
ESPECIALLY DESIGNED FOR STUDENTS OF PHARMACY AND MEDICINE, AS WELL
AS FOR DRUGGISTS, PHARMACISTS, AND PHYSICIANS

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ABBREVIATIONS USED THROUGHOUT THIS WORK.

The degree sign (°) associated with numerals indicates *feet*, except when followed by the capital letters C. and F., then it represents *degrees* (temperature); the prime sign (') attached to figures is used for *inches*, but when following vowels or consonants denotes the *accented syllable*.

āā., of each.	Mt., Mount., Mountain.	Kg., Kilogramme.
Abs., abs., Absence.	Nat., nat., Naturalized.	Kl., Kilolitre.
Adj., adj., Adjective.	N. F., National Formu-	Km., Kilometre.
Alc., alc., Alcohol.	lary.	Q. S., q. s., Sufficient
Ar., Arabic.	N. O., Natural Order.	quantity.
Br., British.	OE., Old English.	Sp. gr., sp. gr., Specific
Br. P., British Pharmacopœia.	P. c., p. c., Per cent(um).	gravity.
Cod., Codex, French Pharmacopœia.	P. G., German Pharmacopœia.	T. S., Test Solution.
Contr., contr., Contraction.	P. I., International Protocol.	V. S., Volumetric Solution.
Cult., cult., Cultivated.	Peruv., Peruvian.	L., Litre.
Dif., dif., Difference.	Per., Pers., Persian.	lb., Pound.
Dil., dil., Dilute(d).	Portg., Pg., Portuguese.	M., Metre.
Dist., dist., Distilled, Distinction.	Prep(s), Preparation(s).	ML, Millilitre.
Eng., English.	Pres., pres., Presence of.	Mm., Millimetre.
Fr., French.	P.p., pp., Past participle.	m., min., Minim.
Fr., fr., From.	Skr., Skt., Sanskrit.	ss., Half.
Ger., German.	Sp., Spanish.	$\frac{N}{10}$, Decinormal.
Ger. P, Ger. Phar., German Pharmacopœia.	Syn., Synonym.	ʒ, Dram., Drachm (solid, fluid).
Gr., Greek.	Unoff., Unofficial.	ʒ, Ounce, (solid, fluid).
Heb., Hebrew.	U. S. P., United States Pharmacopœia.	℥, Scruple.
Hind., Hindoo.	C., Centigrade.	O, Pint.
Ind., ind., Indicating.	cc., Cubic centimetre.	+, plus.
Lim., lim., Limit.	Cm., Centimetre.	−, minus.
Lit., lit., Literally.	F., Fahrenheit.	×, multiplication.
	Gm., Gramme.	=, equals.
	Gr., gr., Grain.	□, square.

THE GREEK ALPHABET.

Α α a Alpha.	Ι ι i Iota.	Ρ ρ r Rho.
Β β b Beta.	Κ κ k Kappa.	Σ σ ς s Sigma.
Γ γ g Gamma.	Λ λ l Lambda.	Τ τ t Tau.
Δ δ d Delta.	Μ μ m Mu.	Υ υ u Upsilon.
Ε ε e short . . . Epsilon.	Ν ν n Nu.	Φ φ ph Phi.
Ζ ζ z Zeta.	Ξ ξ x Xi.	Χ χ ch Chi.
Η η e long . . . Eta.	Ο ο o short . . . Omicron.	Ψ ψ ps Psi.
Θ θ ϑ th Theta.	Π π p Pi.	Ω ω o long . . . Omëga.

MATERIA MEDICA AND PHARMACOLOGY.

DISEASE seems to have been man's natural inheritance, while curative methods and remedies are largely his adaptation and creation. From early biblical times the ills "that flesh is heir to" were recognized as a deadly menace to the human family, and whether the vain appeal was made, then or since, to either (for each in turn enjoyed a period of favor) fetichism, sorcery, religious incantations, faith, Christian science, astrology, magic-art, enchantment, witchcraft, spells, charms, hydropathy, venesection, or drugs, the same inherent hope and purpose ever has prevailed—to relieve and palliate physical suffering. Human thought, happily, is no longer so speculative and superstitious, consequently universal intelligence has allowed medical appliances and treatment to be shaped into a systematic and veritable science.

MATERIA MEDICA (L. medical material) is a treatise upon the materials, agents, or appliances used in medicine—including their name, source (origin), habitat, family (natural order—organic), physical characteristics, methods by which obtained, tests for purity and adulterations, constituents (composition), forms of administration (preparations), physiological action (properties), uses (therapeutics—therapy), normal and lethal doses, antagonists, incompatibilities, synergists (organic and inorganic), and other important features.

PHARMACOLOGY (Gr. *φάρμακον*, a drug, medicine, + *λόγος*, discourse) is a similar but more modern term, implying the sum of scientific knowledge of drugs, which is taken to include their art of preparation—pharmacy, and all that is known of their action—pharmacodynamics, at present usually being restricted to this latter meaning. The subject in its entirety is so broad and comprehensive as to justify subdivisions—some receiving distinctive names.

1. *Pharmacy* (Gr. *φαρμακεία*, the use of drugs): comprising the art of preparing drugs in suitable forms for dispensing, administering, or applying, and includes an acquaintance with much of materia medica, practical and theoretical chemistry, and many manipulations peculiar to itself.

2. *Pharmacognosy* (Gr. *φάρμακον*, a drug, + *γνώσις*, knowledge): comprising the study of physical and chemical characters of drugs—the knowledge of selecting, recognizing, and identifying true and false specimens by such characteristics.

3. *Pharmacodynamics* (Gr. *φάρμακον*, a drug, + *δύναμις*, power): comprising the knowledge of physiological action—power or strength

of remedial agents on living organisms of man or lower animals during health.

4. *Toxicology* (Gr. τοξικόν, poison, + λόγος, discourse): comprising the effect, nature, and detection of drugs when given in poisonous doses—the treatment and antidotes for same.

5. *Therapeutics* (Gr. θεραπεύειν, to cure): comprising the intelligent application or use of agents to cure disease—how they act on living organisms during sickness: (a) *rational*, when based upon known laws of the remedies and diseases, as gained through pathology, physiology, and pharmacodynamics, thereby giving the only scientific treatment; (b) *empirical*, when based solely upon clinical observation and experience—the employment of a remedy in any pronounced disease, from its valuable service in previous similar cases; (c) *general*, where other than drugs or medicines are used for curative purposes: (1) Hygienic agents—cleanliness, pure air, ventilation, proper food and clothing, rest, etc.; (2) mechanical agents (semi-surgical)—bleeding, leeches, cups, scarifications, issues, setons, frictions, massage, osteopathy, chiropractic, aspiration, acupuncture, gastric lavage, stomach-pump, sprays, syringes, catheters, bed-pans, urinals, hot-water bags, trusses, pessaries, suspensories, bandages, rubber stockings, jackets, thermometers, etc.; (3) physical agents—*Heat*: solar, artificial (dry or moist vapor), baths—tepid, 29–35° C. (85–95° F.), warm, 35–38° C. (95–100° F.), hot, 38–41° C. (100–106° F.), Turkish, 35–71° C. (95–160° F.), hip or sitz, hot wet-pack; *Cold*: plunge or shower bath, 4–15° C. (40–60° F.), cold wet-pack, rubbing wet-pack, 4–21° C. (40–70° F.), sponging, ice-bag, compresses, douches; *Light*: although at times contraindicated, acts usually as a stimulant or tonic to the blood—correcting imperfect nutrition and imparting strength to organs; *Darkness*: on the other hand, acts as a sedative or tranquillizing agent; *Air*: pure, impure, compressed, hot, 93–149–204° C. (200–300–400° F.); *Electricity*: continuous (galvanic) and induced (faradic) currents, static (frictional) by electric bath, spark, Leyden-jar shock, brush.

Upon the general subject of materia medica, and each of these subdivisions, there are very many published works, but only pharmacy has what may be termed a standard code for reference.

The *Pharmacopœia*, U. S. P. (Gr. φάρμακον, a drug, + ποιῆν, to make), is such a standard for us, and other countries each have, in a measure, their own. It is issued by The Board of Trustees of the United States Pharmacopœial Convention, and describes the most important and reliable vegetable, animal and mineral drugs along with their preparations, doses and specific tests for identity and purity—the list being changed, more or less, in conformity with scientific progress, at each decennial edition. It has been adopted by Congress as a standard in the enforcement of the Pure Food and Drugs Act (1906), which controls the sale of drugs and chemicals throughout our country.

The *National Formulary*, N. F. is issued by the American Pharmaceutical Association, and treats of many drugs and preparations

scarcely secondary to those of the Pharmacopœia (in which formerly some were accepted), and although slightly less authoritative, it has received also official recognition by Congress as a standard in the enforcement of the Pure Food and Drugs Act.

The *Dispensatories*, several in number, are reference-works—in fact, *materia medicas* of the most liberal form, treating not only of the five departments as previously defined, but exhaustively of all other phases of the various sciences bearing upon each drug, official, semi-official, or non-official. Owing to their scope and reliability, they are regarded by the medical and pharmaceutic professions with scarcely less favor and authority than the Pharmacopœia and National Formulary.

FORMS IN WHICH MEDICINES MAY BE USED.

In early times the crude drugs usually were administered, but some being insoluble, nauseous, irritating, bulky, and ill-suited for either internal or external application, led to the adoption of other forms, such as decoctions, infusions, juices, powders, pills, ointments, etc. At the present day elegant pharmacy has placed us in possession of additional and still more acceptable forms and shapes, the most important here being enumerated.

I. OFFICIAL, U.S.P. (liquids, semi-solids, solids).

1. *Acetum*, *Aceta* (vinegars).—10 p. c. Macerate drug, 10 Gm., 7 days with diluted acetic acid q.s. 100 cc., agitating frequently, filter: *Scillæ*.

2. *Aqua*, *Aquæ Aromaticæ* (aromatic waters).—Distilled water impregnated, often saturated, with a volatile substance, by (*a*) *distillation*—distilling mixture of drug, or volatile oil, with water, obtaining clear solution saturated with aromatic principle of plant, free from empyreumatic odors: *Aurantii Florum*, *Rosæ Fortior*; (*b*) *solution*—shaking occasionally during 12 hours, in capacious bottle, volatile oil .2 cc. with distilled water q.s. 100 cc., filtering; or may incorporate volatile substance with purified talc 1.5 Gm., or sufficient purified siliceous earth, or pulped filter paper, then add water to bottle, agitate: *Anisi*, *Menthæ Viridis*; (*c*) *aëration*—passing gas into water: *Ammoniaë*, *Ammoniaë Fortior*.

3. *Ceratum*, *Cerata* (cerates, L. *cera*, wax).—Unctuous-like ointments made firmer by the addition of wax; soften but do not melt at body-temperature; liquefy only above 40° C. (104° F.): *Cantharidis*, *Resinæ*.

4. *Collodium*, *Collodia* (collodions).—Collodion impregnated with medicinal substances for protection and medical effect: *Flexile*.

5. *Decoctum*, *Decocta* (decoctions, L. *decoquere*, to boil down).—5 p. c. aqueous solutions of vegetable drugs made by boiling the substance (5 Gm.) 15 minutes in a closely-covered vessel, allowing to cool therein, expressing, straining expressed liquid, adding through strainer

water q. s. 100 cc.; the strength of decoctions of energetic or powerful drugs should be specially directed by the physician.

6. *Elixir, Elixira* (elixirs, Ar. *el-ik'sir*, the philosopher's stone).—Sweet, aromatic, hydro-alcoholic, medicated liquids; alcoholic strength 20–25 p. c.: Aromaticum, Glycyrrhizæ.

7. *Emplastrum, Emplastra* (plasters, Gr. *εμπλάσσειν*, to daub on).—Substances fused in such proportions as to adhere at body-temperature; some are spread, others are not: Adhæsivum, Sinapis.

8. *Emulum, Emulsa* (emulsions, L. *emulgere*, to milk out).—Aqueous, milky-like mixtures of oils, fats, or resins in a minutely subdivided state, suspended by mucilaginous materials; coagulated by acids, metallic salts, or spirituous liquids in large quantities: Asafœtidæ, Olei Terebinthinæ.

9. *Extractum, Extracta* (extracts, L. *ex*, out, + *trahere*, to draw).—Solid, semi-solid or powdered, made by evaporating medicinal solutions, or expressed juices of organic drugs, until representing 4–5 times the strength of the crude substances; these may be aqueous, alcoholic, hydro-alcoholic, acetous: Belladonnæ, Stramonii.

10. *Fluidextractum, Fluidextracta* (fluidextracts).—Solutions of organic drugs evaporated until 1 cc. represents the activity of 1 Gm. of crude drug: Belladonnæ Foliorum, Zingiberis.

11. *Glyceritum, Glycerita* (glycerites, Gr. *γλυκός*, sweet).—Solutions of a drug in glycerin for external use: Acidi Tannici, Phenolis.

12. *Infusum, Infusa* (infusions, L. *infundere*, a watering).—5 p. c. aqueous solutions of vegetable drugs made by adding to the substance (5 Gm.), in a closely-covered vessel, boiling water (100 cc.), allowing to stand half an hour, straining with pressure, passing through strainer water q. s. 100 cc.; if activity of infusion (drug) is affected by heat, cold water only should be used; the strength of infusions of energetic or powerful drugs should be specially directed by the physician: Digitalis.

13. *Linimentum, Linimenta* (liniments, L. *linere*, to smear).—Medicinal liquids, containing usually a fixed or volatile oil, for external use by rubbing or by simple application: Calcis, Saponis Mollis.

14. *Liquors, Liquores* (liquors, L. *liquor, liquere*, fluid, liquid).—Mostly aqueous solutions of non-volatile chemical substances: Acidi Arsenosi, Zinci Chloridi.

15. *Magma, Magmæ* (L. fr. Gr. *μάγμα, μάσσειν*, to squeeze, knead).—A thin paste or mixture—a precipitate (hydroxide, etc.) tenaciously retaining liquid (water, alcohol) often removed only by forcible expression; usually white unless fluid contains iron, organic matter, etc.: Magnesiae.

16. *Massa, Massæ* (masses, Gr. *μάσσειν*, to knead).—Pill-masses preserved in bulk to be used from when required: Ferri Carbonatis, Hydrargyri.

17. *Mel, Mella, Mellita* (honey, Gr. *μέλι*, honey).—Medicines mixed with honey instead of syrup: Rosæ.

18. *Mistura*, *Misturæ* (mixtures, L. *miscere*, to mix).—Liquids of insoluble medicines suspended in water by some viscid substance, or solutions of one or more active liquids: *Cretæ*, *Glycyrrhizæ Composita*.

19. *Mucilago*, *Mucilagines* (mucilages, L. *mucere*, to be moldy, slimy).—Saturated aqueous adhesive liquids of gum or starch: *Acaciæ*, *Tragacanthæ*.

20. *Oleatum*, *Cleatæ* (oleates, L. *olea*, Gr. *ἐλαία*, olive tree, oil).—Solutions of medicines (alkaloids or metallic salts) in oleic acid: *Hydrargyri*.

21. *Oleoresina*, *Oleoresinæ* (oleoresins, L. *oleum*, oil, + *resina*, resin).—Natural solutions of resin in volatile oils, extracted by ether, acetone, or alcohol: *Aspidii*, *Capsici*.

22. *Oleum*, *Olea* (oils, L. *oleum*, Gr. *ἐλαιον*, oil).—Liquid active constituents, obtained by (a) *distillation*: *Anisi*, *Terebinthinæ*; (b) *expression*: *Aurantii*, *Tiglii*.

23. *Pilula*, *Pilulæ* (pills, L. *pilula*, a little ball, dim. of *pila*, a ball. Eng. abbr., *pil.*, pl. *pill*).—Globular or ovoid masses of medicinal material, 1–7.5 grs., held together by an adhesive substance: *Aloes*, *Phosphori*; these may be plain or coated with gelatin, sucrose, cocoa, tolu, silver-foil (to preserve and mask odor and taste), or salol, *Enteric Pills*, Gr. *ἐντερον*, intestine (to allow passage through the stomach intact, thereby not becoming dissolved until the duodenum or intestinal tract is reached. *Concentric Pills* are made of concentric layers of different ingredients to become dissolved and active at various points of the intestinal tract).

24. *Pulvis*, *Pulveres* (powders, L. *pulverare*, to powder).—Finely powdered drug or drugs, with or without a diluent, as lactose: *Cretæ Compositus*, *Rhei Compositus*.

25. *Resina*, *Resinæ* (resins, L.; Gr. *ρητίνη*, resin (of the pine)).—Resinous powders obtained by exhausting the vegetable drug with alcohol, and precipitating the tincture by adding water; they contain all the principles soluble in alcohol and insoluble in water: *Ipomœæ*, *Podophylli*.

26. *Spiritus*, *Spiritus* (spirit, spirits, L. *spirare*, to breathe, exhale).—Alcoholic or hydro-alcoholic solutions of volatile medicinal substances (chiefly volatile oils): *Æthylis Nitritus*, *Vini Vitis*. Also called, when 10 p. c. (England, 10–20 p. c.), *Essences* (*Essentiæ*).

27. *Suppositorium*, *Suppositoria* (suppositories, L. *supponere*, to place underneath).—Solids of suitable form, cone-shaped, pencil-shaped, globular, oviform, weighing 10–60 gr. (.6–4 Gm.), containing medicines, which melt when inserted into the rectum, nares, urethra, or vagina, the vehicles being oil of theobroma, glycerinated gelatin, sodium stearate: *Glycerini*.

28. *Syrupus*, *Syrupi* (syrups, Ar. *shurab*, a drink, beverage).—Concentrated solutions of sucrose, the menstruum being an aqueous solution of either medicinal or flavoring agents (simple syrup menstruum—distilled water): *Acidi Citrici*, *Zingiberis*. *Cordial* (*Cordiale*)—a one-fourth weaker medicated syrup.

29. *Tinctura, Tincturæ* (tinctures, L. *tingere*, to dye).—Alcoholic or hydro-alcoholic solutions of non-volatile (except iodine) drug-constituents: *Aconiti, Zingiberis. Tincturæ Medicamentorum (Herbarum) Recentium, Tinctures of Fresh Drugs*, N. F., 50 p. c.; macerate fresh drug, cut, bruised or crushed, 50 Gm., for 14 days, in a stoppered container with alcohol 75 cc., agitating frequently, drain on filter, through which add alcohol q. s. 100 cc. *Tincturæ Ætheræ, Ethereal Tinctures*, N. F., 10 p. c. (drug), + ether 1 volume, alcohol 2.

30. *Trituratio, Triturationes* (triturations, L. *triturare*, triturated).—Fine powders of medicinal substances 10 Gm., triturated intimately with lactose 90 Gm., added gradually and mixed thoroughly.

31. *Trochiscus, Trochisci* (troches, Gr. τροχίσκος, a pill, troche).—Solid, round, oval, or flat masses of one or more medicinal agents, with sucrose or extract of glycyrrhiza, or both, caused to adhere by tragacanth mucilage, often flavored: *Acidi Tannici, Ammonii Chloridi*. Also called *Lozenges, Tablets (Tabellæ)*, in England of definite weight and chocolate base. *Toxatabellæ* (*Hydrargyri Chloridi Corrosivi*)—poison, only for external use. *Pastilles (Pastilli-us)*, in England with glyco-gelatin base.

32. *Unguentum, Unguenta* (ointments, L. *ungere*, to smear, anoint).—Soft or solid fatty preparations, for external use, liquefying when rubbed upon the skin, and containing medicine in a basis of benzoated lard, petrolatum, wool fat, prepared suet, expressed oil of almond, wax, spermaceti, paraffin, etc.: *Acidi Borici, Zinci Oxidi. Salve, Paste*—names often applied by laity to healing ointments.

II. SEMI-OFFICIAL, N.F.

1. *Ampulla, Ampullæ* (ampuls, L. *ampulla*, a small narrow-necked vase, flask).—Hermetically sealed glass vessels (tubes with attenuated end or ends) of varying size, containing a sterilized medicinal liquid for hypodermic, intravenous, or inhalation purposes; when for inhalation—contents released by breaking off narrow end, or crushing in handkerchief; pearls, tears, or sealed bulbs (amyl nitrite, ethyl nitrite, ethyl chloride, etc.) are modified ampuls.

2. *Cataplasma, Cataplasmata* (cataplasms, poultices, Gr. καταπλάσσειν, to spread over).—Soft pasty masses to supply moisture and warmth locally in order to break down inflamed tissues; flaxseed meal, slippery elm, hop, bread and milk, kaolin and glycerin, bran, oatmeal, etc., answer well for these, to which either tincture of opium, aconite, arnica, or anodyne alkaloid may be added to lessen pain. The true poultice should be made by bringing the mass moistened with water or milk, to a boil, enclosing it in a cheese-cloth bag, and applying $\frac{1}{2}$ to 1 inch thick over inflamed area; the addition of a little fixed oil or glycerin serves to retain heat and prevent caking, while a covering of oiled silk retains these properties much longer—kaolini (antiphlogistine).

3. *Charta, Chartæ* (papers).—Papers coated or saturated with some medicinal substance, to be used as a plaster or for burning—*potassii nitratis, sinapis*.

4. *Confectio, Confectiones* (confections, boluses, L. *conficere*, to put together).—Pasty masses of drugs triturated while hot (65° C.; 150° F.) with sucrose or honey—*rosæ, sennæ*.

5. *Curatio, -ones, Dressings*.—Ointment-like mixtures of powdered drugs heated with fatty base, stirred until beginning to congeal.

6. *Dentifricium, -a, Dentifrices* (tooth powders).—Finely powdered drugs—astrigent, antiseptic, antacid, non-irritating, non-gritty; often saponaceous, sweetened and flavored.

7. *Dentiliniamentum, -a, Dental Liniments*.—Refrigerant dental counter-irritant and liquid applications.

8. *Fluidglyceratum, -a, Fluid glycerates*.—100 p. c.; glycerin 50 p. c.; drug 100 Gm., glycerin 50 cc., water 150—moisten, macerate, complete percolation with chloroform water, reserve first 50 cc., evaporate second percolate to 60, mix, evaporate to 100 cc.

9. *Gargarisma, Gargarismata* (gargles).—Aqueous medicinal liquids for gargling the throat.

10. *Glycerogelatinum, -a, Glycerogelatins*.—Soft masses, melting at body temperature, containing medicinal material 10 p. c., glycerinated gelatin 10–20–30 p. c., glycerin 15–25–35 p. c., distilled water 35–65 p. c.; melt and apply to affected part with soft brush; substitute for cerates—dermatology.

11. *Inunctum, -a, Inunctions* (L. *inungere*, to anoint—rub into pores of skin).—Medicated ointments containing hydrous wool fat 85–95 p. c.

12. *Lavatio, -ones Ovi, Mouth Washes*.—Soap dissolved in 75 p. c. alcohol, colored and flavored with essential oils to please; antiseptic, purifier.

13. *Lotio, Lotiones* (lotions).—Mostly weak aqueous medicinal solutions or mixtures to be applied locally on linen, lint, or muslin.

14. *Mulla, Mullæ* (mulls).—Hard ointments (suet and lard base) spread on soft muslin or “mull,” similar to plasters.

15. *Nebula, -æ, Sprays*.—Aqueous or oily (light liquid petrolatum) medicinal solutions to be used in atomizer or nebulizer for nares and throat.

16. *Olea Infusa, Infused Oils*.—Vegetable air-dried drug, 10 p. c.; macerate 6 hours in alcohol (10), ammonia water (.2), + sesame oil (100), heat, stir, strain, express, filter.

17. *Oleosacchara, Oil-sugars*.—Triturate the prescribed volatile oil 2 cc. with sucrose 100 Gm.

18. *Oxymel, Oxymella, Oxymellita*.—Honey 50, acetic acid 10, distilled water 10; gargle for sore throat, vehicle for expectorant nauseous medicines.

19. *Pastæ Dermatologicæ, Dermatologic Pastes*.—Ointment-like mixtures of starch, dextrin, sulphur, calcium carbonate, or zinc oxide, etc., made into a smooth paste with glycerin, soft soap, petrolatum, lard or other fats, medicated with antiseptic or astrigent agents—dermatology.

20. *Petroxolinum, -a, Petroxolins*.—Solutions or mixtures of medicinal substances, 3–5–10–20–25–30–50 p. c., in liquid petrolatum—several having an additional small amount of oleic acid or hydrous wool fat.

21. *Sal-ia Effervescentia, Granular Effervescent Salts*.—Dried powdered chemical (chemicals) mixed with sufficient sodium bicarbonate and citric (tartaric) acid and granulated to cause effervescence when dissolved in water.

22. *Solutio, -ones, Solutions*.—Resinous substances, 20–60 p. c., dissolved in chloroform—for external use.

23. *Species, Species*.—The medicinal part of several species of plants mixed, cut, bruised, or reduced to coarse powder, sometimes including a chemical—for external or internal use—tea or poultice.

24. *Spiritus Oleorum Volatilium, Spirits of Volatile Oils*.—Any volatile oil, without formula, 6.5 cc. dissolved in alcohol 93.5 cc.

25. *Stili Medicamentorum, Medicated Pencils*.—Medicated agents made into plastic mass (paste) with starch, dextrin, tragacanth, sucrose, water, rolled into cylinders 5 Mm. ($\frac{1}{5}$ inch) thick, cut into sections 5 Cm. (2 inches) long, dried, wrapped in tin-foil—dermatology.

26. *Tabella, -æ, Tablets: (a) Tablet Triturates*.—Finely powdered drugs triturated with sucrose, lactose, or other soluble diluents, moistened with a volatile liquid (alcohol, water, syrup, etc.) then pressed lightly into molds and dried; *(b) Compressed Tablets*—pure or diluted drugs, dry and granular, with or without excipient, compressed in strong metal dies—these are harder, less friable and more slowly soluble.

III. NON-OFFICIAL.

1. *Abstracts, Abstracta*.—Powders having twice the strength of the vegetable substance, made by exhausting crude drugs, as a rule, with alcohol, recovering same, and incorporating residue with lactose.

2. *Acetic Fluidextracts, Fluidextracta Acetica*.—Solutions of the active constituents of organic drugs made with diluted acetic acid, and of the same strength as the official and semi-official fluidextracts.

3. *Bougies, Pencils*.—Small solid cylinders of gelatin, glyco-gelatin mass (white gelatin 3, glycerin 1), or oil of theobroma, impregnated with medicine, to be inserted into urethra, vagina, rectum, or nares.

4. *Cachets (de pain), Konseals, Wafers*.—Various-sized concave wafers made of unleavened bread (flour and water) or wafer-paper—the cavity formed by moistening the concave edges of two and pressing together containing the drug; when fastened, take by floating in a gulp of water.

5. *Capsules, Capsulæ*.—Various-sized, transparent casings (short tubes, usually with one open end fitting over that of another), of gelatin, hard or soft, for administering nauseous or disagreeable liquids or solids.

6. *Cigarettes*.—Have paper wrapper but filler of one or more medicinal substances—cubeb, stramonium, etc.

7. *Collyrium, Collyria, Eye-washes*.—Liquid applications for the eyes, composed usually of some astringent salt dissolved in rose water.

8. *Enemas, Enemata, Clysters*.—Liquids to be injected into the rectum. When large quantity (℥xvj-32; .5-1 L.), it is to act mechanically in emptying the bowel, and warm soapy or mucilaginous water answers the purpose; when small quantity (℥ij-4; 60-120 cc.), it is to act as a medicine or nutrient, and after injection—a towel pressed against the anus tends to aid retention, therefore absorption.

9. *Fomentations, Fomenta*.—Flannels wrung out of hot water and applied with or without medication.

10. *Gauzes, Carbasi*.—Gauze-muslin, free from sizing, saturated with a medicated solution of a definite strength, and then spread horizontally to dry.

11. *Granules*.—Very small sugar-coated pills, $\frac{1}{4}$ - $\frac{1}{2}$ gr.; *Parrules Dosi-metric*), still smaller, and usually contain poisonous alkaloids or chemicals. *Dragée* (dra-zha)—name given in France to the ordinary sugar-coated pill.

12. *Injections, Injectiones*.—Usually aqueous solutions of vegetable drugs or alkaloids to be injected by a syringe into the rectum (enemas), under the skin (hypodermic), or into the urethral, nasal, aural, or vaginal tract. *Hypodermic Injections (Injectiones Hypodermicæ)* may be 1-5-10-33 p. c., and may have added, as a preservative, a small amount of either phenol, cresol, benzoic, hydrochloric, or salicylic acid.

13. *Inhalations, Inhalationes, Vapors, Vapores*.—Volatile liquid vapors breathed at ordinary inhalation, to act locally upon the respiratory mucous membrane.

14. *Insufflations, Insufflationes*.—Fine powders of active medicine, and mostly bland bases, to be blown into nares, larynx, throat, etc.

15. *Scales, Lamellæ*.—Thin scales, disks, or plates of medicinal substances; in England restricted to gelatin and glycerin, to be dropped into the eye, each weighing $\frac{1}{50}$ gr. (.0013 Gm.).

16. *Succus, Succī, Juices*.—Vegetable liquids expressed from fresh plants and preserved with alcohol.

17. *Wines, Vina* (L. *vinum*, wine).—Liquids differing from tinctures in being extracted with white wine, or a mixture of white wine and alcohol (20-25 p. c.)—antimony, ipecac.

THE AVENUES BY AND THROUGH WHICH MEDICINES ENTER THE SYSTEM.

1. *By Stomach: Gastro-intestinal Route*.—This is the most common and convenient method. After medicines are swallowed they enter circulation through the walls of the bloodvessels (which permeate the mucous membrane of the stomach and intestines), portal veins, and lacteals, so that when the intestinal contents reach the ileo-cecal valve they consist of excrementitious matter and food refuse. If the stomach be healthy and empty, crystalloids in solution quickly pass

through the vessel-walls, but colloids (albumin, fats, gelatin, gums, etc.) have to be digested and emulsified before they can be absorbed; the albuminous drugs (proteins) are transformed in the stomach by pepsin and gastric juice into soluble peptones, and there as such these, along with soluble crystalline salts, diffuse readily into the blood, often giving positive effect within an hour; the sugar, starchy, fatty, gummy, gelatinous, resinous, gumresinous and oleoresinous drugs, without suffering much change from the stomach secretions, pass into the duodenum, where the bile, intestinal and pancreatic juices, within 3-4 hours, convert the starches into sugar (which in part may go finally into lactic acid and fat), emulsionize and saponify the fats, oils, etc., separating them into glycerin and fat acids, the latter meeting alkaline bases, forming diffusible soaps; the resins, alone and in combination, within 4-10 hours, become broken up by these same alkaline juices (associated alkaline salts often facilitating), and either are converted into a soluble form for systemic ingestion, or simply are eliminated from the liver whose secretion (bile) they have stimulated, thereby being allowed to pass into the lower intestine to stimulate intestinal gland secretion, or to act somewhere along the tract as a local irritant or stimulant, thereby aiding peristalsis. All drugs taken from the intestinal canal have to pass through the liver before reaching general circulation, and in this passage they may become medicinally very much changed, modified, or even destroyed; again, some drugs may be excreted into the intestine along with the bile, and never reach further circulation, hence these disadvantages, along with that of required palatable form, preclude sometimes the adoption of this avenue.

2. *By Skin:*

1. *Hypodermic (Hypodermatic).*—This consists in injecting medicinal solutions (Mv-15; .3-1 cc.) into subcutaneous areolar tissue with a syringe (needle)—a method always more or less painful. Quick absorption here takes place by the lymphatics and capillary vessels, giving the advantage of full action of the quantity of drug used, without any possible changes from the intestinal secretions or processes; must here employ only clear, neutral (never acid), aqueous solutions of drugs, as otherwise intractable sores, sloughing, etc., might result around the punctures; must also avoid veins, injecting only on the external parts of the legs, thighs, arms, also abdomen, back, and buttocks (4 Cm.; $1\frac{3}{4}$ behind the great trochanter). In the process of *hypodermoclysis* a sterilized trocar is employed, and several pints of saline solution ($\frac{7}{10}$ -1 p. c.) injected, to antagonize, or to wash out and dilute any septic poison (uremia, septicemia), cholera-collapse, diabetic coma, shock, etc.; here insert trocar in subcutaneous tissue of abdomen or thigh, and control rate of flow alone by elevating or lowering the vessel containing the required amount of liquid; dissipate any tumefaction by careful massage; admit no air or foreign matters.

2. *Epidermic (Epidermatic).*—Here medicines are incorporated in wool fat, or other fats, and rubbed with friction directly upon the skin, thus promoting their passage through and between epidermal cells; best to apply where skin is thinnest (axillæ, groins, abdomen, insides of thighs) in the form of ointments, oleates, or oils. This method also is called *inunction*.
3. *Enepidermic (Enepidermatic).*—Here medicines are applied to the skin without friction; chloroformic and oleic acid solutions of the alkaloids (aconitine, atropine, morphine, strychnine) pass by osmosis most easily; solutions in a mixture of chloroform and alcohol nearly as fast; aqueous solutions slower, while pure alcohol causes an outward osmotic flow. In this way medicinal effect is secured through plasters and poultices.
4. *Endermic (Endermatic).*—Here we first produce a blister on the skin by the use of strong ammonia water (saturated cloths) or cantharides (cerate, collodion), then remove with scissors the epidermis, and apply upon the denuded surface (derma) the powdered medicine—morphine, atropine, quinine, strychnine, etc.; at present little employed.
3. *By Rectum.*—This is accomplished by enemas or suppositories, being suited best to disagreeable tasting alkaloids, acid solutions, etc. While absorption is usually twice as slow by this method as by the stomach, yet salts of atropine and morphine in solution enter circulation just as quickly, while those of strychnine more quickly than even by the mouth.
4. *By Lungs: Respiration.*—Vapors of liquids or solids are inhaled with the air, thereby bringing the system quickly under the drugs' influence; this quick action is due to the rapid absorption, owing to the extensive surface (lungs, etc.) to which applied, and to the fact that volatile substances penetrate the tissues most readily. Some vaporize at all ordinary temperatures, others at that of the body, while many have to be heated. Most anesthetics act by this method.
5. *By Arteries: Arterial Transfusion.*—Large quantities of fluid (defibrinated human or lamb's blood— $\frac{3}{4}$ iv–8; 120–240 cc., etc.) may be introduced into circulation, through the radial or posterior tibial, by the transfusion syringe. This is safer than by the veins, owing to the less likelihood of admitting air (causing fatal syncope) or of producing thrombosis, as the injected solution has to traverse the capillaries prior to reaching the right side of the heart, thus avoiding any likely sudden distention.
6. *By Veins: Intravenous Injection.*—This is the most perilous of all methods, being resorted to only in extreme emergencies to save life; thus blood or milk in hemorrhage, epilepsy, uremia, cholera-collapse; saline solutions in cholera-collapse, diabetic coma; diluted ammonia water, ether, brandy or whisky in bites of reptiles, venomous insects, hydrocyanic-acid poisoning, opium-narcosis, chloroform-asphyxia. It is better here to inject into a vein of the leg than of the

arm, so that the drug may be less concentrated when it reaches the heart, thereby avoiding possibly any cardiac depression.

7. *By External Application.*—Many powdered medicines when dusted on abraded surfaces, or applied by insufflation to the nares, fauces, larynx, become absorbed gradually, and affect the system locally and generally; this equally applies to drops and washes when introduced into the eyes and ears, also to atomized vapors, sprays, etc. The method known as *cataphoresis* consists of producing osmosis, through the skin or mucous membrane, from one point to another, of medicines by the galvanic current, the positive pole being medicated and placed over the affected part, the negative slightly remote; this is a mechanical action, and is accomplished by covering the seat of pain with a paper, linen, or gelatinous disk moistened with a solution of the drug, and placing thereon the anode, or may apply direct the sponge electrode saturated with the medicine; this method affects only tissues between the poles, and solutions of aconite, chloroform, cocaine, and morphine yield good results.

THE MEANS BY WHICH MEDICINES ARE TRANSMITTED THROUGH THE SYSTEM.

It was believed for a long time that drugs radiated from the seat of application throughout the system, by the nerves; this is known now to be false, and, instead, we recognize the blood to be the common carrier; thus the blood has to take up the drug in solution before there will be other than a local effect, and when once dissolved in it the periodic rounds of circulation are made regularly with this impregnation, so that the system, as a whole, responds to the medicine's influence. As proof of this, we find that blood taken from any portion of the body, near or far from the point of application, contains the drug; also the blood of persons poisoned when injected into others produces similar poisonous symptoms; if you interrupt the blood-circulation to any part, no poison will be transmitted to that part; as other secretions are nourished by the blood, you would expect them also to have similar medical properties, and such is the case—milk, sweat, urine, etc.; if we inject medicines directly into the blood (a dangerous process), we soon have characteristic action. The blood is enabled to absorb these through the intervention of the veins, lymphatics, and lacteals; while it eliminates them, even to the extent often of irritation, through the excretory organs, kidneys, bowels, skin, etc.

CONDITIONS WHICH MAY MODIFY THE ACTION—HENCE THE DOSE OF DRUGS.

Medicines are not given immediately before or after meals, unless certain conditions urgently demand it; they enter circulation much quicker on an empty stomach and then also produce best local results,

whereas a full stomach not only retards absorption, but renders poisons and irritating chemicals less injurious. The system is most resistant in the morning, when larger quantities of hypnotics, etc., are required than at night. The interval of doses depends upon rate of absorption and elimination of each drug, and usually should be sufficiently brief as to prevent the patient coming from under a continued influence until finally desired. Medicines change or modify directly the action only of those organs and tissues with which they come into immediate contact; this action may be simply local, or again general (systemic), and while all have one primary (direct) action, they may also produce indirectly (reflexly) one or more secondary (remote) effects.

The identical drug does not give rise to like results in every person, nor do different specimens of the same drug, when taken in equal quantities, produce the precise effects upon the one individual; for this there are several causes:

1. *Age*.—While the adult dose is about uniform (being based upon the average weight of 150 pounds; 68 Kg.), and holds good between the ages of twenty to sixty, yet that from infancy to majority is variable and should be computed by the following rules: Dr. Cowling's applies to any age up to and including the twenty-fourth year, and is thus: Divide the age at the next birthday by 24, and that fraction of the adult dose gives the quantity sought—child one year at coming birthday = $\frac{1}{24}$ of adult dose; gentian, gr. 30, hence $\frac{1}{24}$ of 30 = gr. $1\frac{1}{4}$. Dr. Young's applies to any age up to twelve years, and is thus: Divide the age at the coming birthday by that age plus 12—child two years at next birthday = $\frac{2}{2+12} = \frac{2}{14} = \frac{1}{7}$ of adult dose; cinchona, gr. 40, hence $\frac{1}{7}$ of 40 = gr. $5\frac{5}{7}$. Dr. Brunton's applies to metric doses, and is thus: Multiply the adult quantity by the approaching birthday, and that again by 4, then remove the decimal point two places to the left; adult dose of uva ursi is 1 Gm., and for a child five years old at its next birthday = $\frac{1 \times 5 \times 4}{100} = .2$ Gm.

Very old persons are extremely susceptible to strong or even ordinary medication, all doses having usually to be diminished. Children are very acute to opium and many anodynes, yet tolerate larger quantities of purgatives and a few other drugs (castor oil, calomel, rhubarb, cod-liver oil, iron, belladonna, ipecac, pilocarpine, squill, arsenic, chloral hydrate) than the rules would indicate.

2. *Mode of Administration*.—This has much to do with the rate of absorption, hence controls largely the dose. Thus the dose hypodermically is one-half that by the mouth, or one-fourth that by the rectum, and this difference depends upon the rapidity of absorption—the hypodermic being the quickest, the rectum the slowest; on a full stomach, medicines enter circulation much slower than on an empty one.

3. *Form of the Drug.*—This controls largely the rate of absorption, hence, the dosage. Before any substance enters circulation it must be in solution, and the nearer medicines approach the liquid form the quicker will they have effect and the smaller will be the doses required, consequently, it takes less in tincture than in powder or pill form.

4. *Condition of the Drug.*—The same species do not always produce drugs of uniform strength; thus cinchona, opium, nux vomica, rhubarb, senna, etc., are by no means regular, as the total alkaloids of cinchona may range from 2–10 p. c.; opium, 4–24 p. c., etc.; therefore, to have like results varying quantities must be given. This strength-difference is due largely to soil, climate, cultivation, season of year when collected, curing, duration on the market, possible adulterations, etc.

5. *Conditions of the Individual.*—These are not always the same; sex, race, temperament, idiosyncrasy, congenital tolerance, acquired tolerance (mithridatism), climate, occupation, imagination, mental emotion, disease, and habitual use all affect the dosage required in individual cases. Thus, females demand less than males; strong, burly races more than weaker ones; sanguine temperaments cannot tolerate stimulants; nervous temperaments must use purgatives cautiously; bilious temperaments need mercurials, while these are injurious to lymphatic temperaments. Idiosyncrasies vary in people—some vomit at the odor of ipecac or purge by smelling croton oil; others are affected little or greatly by opium, mercury, arsenic, belladonna, cocaine, iodides, etc. Warm climates demand smaller doses of purgatives and larger doses of antiperiodics. Occupation largely controls doses, as those exposed and under hard labor require unlike quantities to those in light pursuits, sedentary habits, indoor surroundings, etc. Imagination has its effect, as in a degree one's frame of mind can will or not will results. Mental emotion, either with or without disease, as a rule, demands larger doses than when free from any undue excitement. Habitual use lessens medicinal power, the dose having to be increased gradually, as with cathartics, opium, arsenic, etc. Disease modifies dose, as in tetanus, peritonitis, cancer, cholera, etc., excessive quantities of morphine are required and well tolerated; in typhoid fever abnormal amount of stimulants may be used, as alcohol, brandy, etc.; in pneumonia excessive doses of tartar emetic may be given without nausea, while during menstruation, lactation, pregnancy, etc., smaller doses should be administered.

6. *Incidental Conditions.*—Besides the preceding, we have some other factors influencing the variability of doses: State of the stomach, empty, full, active, sluggish, etc.—under certain disorders it will not assimilate medicines at all, when administration must be by other channels. Cumulative action of some drugs requires cautious doses; this may arise from slower elimination than absorption—mercury, lead, or the elimination may suddenly be arrested by the drug causing contraction of renal vessels, when the system has become saturated—digitalis, strychnine; or again, the intestinal contents may quickly be changed,

so that from a slow we get rapid absorption; rate of excretion modifies doses—when rapid, small and oft-repeated quantities are more advantageous than larger ones, and as an outgrowth of this we have now the praiseworthy tendency of diminished dosage, as with calomel, etc.; pathological conditions modify the effects of drugs very considerably; thus antipyretics in fever reduce temperature, but have no effect on it in health; bromides lessen convulsions in epilepsy, but depress very slightly the normal brain, etc.

7. *Untoward Effects.*—Many drugs produce other than their accustomed action upon certain individuals, made abnormal through habit or inheritance; such action results not from any drug impurity, but rather from the difference in the drug's primary and secondary effects (often opposite), the organs chiefly affected by the ordinary action of the drug, and the method of drug elimination. Thus an antipyretic, reducing temperature through the skin (this being connected with and controlled by the central nervous system regulating temperature), may produce skin eruptions or excessive perspiration (untoward)—the drug being eliminated by this channel; and as temperature cannot be controlled without, at the same time, controlling the vasomotor system regulating the blood supply, we also may have collapse, heart failure, palpitation, eye and ear symptoms. If drug is eliminated by kidneys we may have albuminuria, etc. (untoward); hypnotics acting on central nervous system may produce perspiration, skin eruptions, vertigo, heart collapse (untoward); astringents may occasion diarrhea, bloody intestinal discharges (untoward); diaphoretics from over-stimulation cause local pain, etc. (untoward). Thus aconite may produce eruption or itching of the skin; antipyrine—cyanotic hands, nose, lips, cold extremities; arsenic—dermatitis, burning of the skin, coryza; caffeine—insomnia, delirium, tremors, palpitation, tinnitus aurium, gastralgia; chloral hydrate—nausea, vomiting, purging, inflamed eyes; digitalis—nausea, indigestion, syncope; potassium iodide—coryza, acne; iron—gastric disturbance, headache, constipation; opium—wakefulness, nausea, vomiting, mental depression; pilocarpus—dim vision, vomiting, collapse, swollen salivary glands and tonsils, hiccough, strangling, salicylic acid—headache, tinnitus aurium, acne, blindness; cinchona—cinchonism, etc. Powerful drugs (tonics, alteratives, etc.), far more than those comparatively inert, tax the inherited and acquired deficiencies, while excessive and continuous strain on inhibitions usually produce affections of inhibitory apparatus as to modify greatly the untoward effects; these so vary in neurotics as often to cause such nerve-strain of eliminative and assimilative organs as to produce toxins, thereby intensifying or diverting drug's action—etiological moment.

8. *Incompatibility.*—This often changes the drug's action, producing harmless or harmful compounds, and may be of three kinds:

1. *Chemical.*—This results from double decomposition, new compounds being formed, and with the prescriber may be intentional or unintentional: from the former we may have lime water with mercuric

or mercurous chloride; zinc sulphate in solution with lead acetate; hydrochloric acid directly to potassium chlorate, etc.; in all these the new-formed product is the one desired medicinally; from the latter (unintentional) we may have glucosides (tannin, etc.) ordered with free acids, or emulsions; alkaloids with alkalies, alkaline salts, iodides or bromides; tannic and gallic acids with iron salts, alkaloids, tartar emetic, albumin, metallic oxides, gelatin; vinegars, acetic syrups, and diluted acid solutions with soluble carbonates; quinine sulphate with potassium acetate; corrosive mercuric chloride with alkalies, alkali carbonates, iodides, bromides, alkaloids, sulphides, reduced iron, silver nitrate, albumin, gelatin, tannin, etc. Any of the following with other substances should also be watched carefully, as they readily cause precipitation and changes: Chlorine solutions, corrosive mercuric chloride, iodine, iodides, lead salts, iron solutions, potassium acetate, bromide, and permanganate, solution of potassium hydroxide, tannic and gallic acids, diluted hydrocyanic acid, mineral acids, quinine sulphate, silver and zinc salts, tincture of guaiac, chlorates, iodates, picrates, nitrates, dichromates. The accompanying table is from Potter's *Materia Medica*, and serves an admirable purpose in this connection; P. stands for precipitate.

	Alkaloidal solutions (generally).	Metallic solutions (generally).	Solutions of lead or silver.	Solutions of calcium salts.	Solutions of magnesium salts.	Solutions of albumin or gelatin.
Alkalies	P.	P.	P.	P.	P.	P.
Tannic acid	P.	P.	P.	P.	P.	
Carbonic acid and carbonates	P.	P.	P.	P.	P.	
Sulphuric acid and sulphates	P.	P.	P.	P.	P.	
Phosphoric acid and phosphates	P.	P.	P.	P.	P.	
Boric acid and borates	P.	P.	P.	P.	P.	
Hydrochloric acid and chlorides	P.	P.	P.	P.	P.	
Hydrobromic acid and bromides	P.	P.	P.	P.	P.	
Hydriodic acid and iodides	P.	P.	P.	P.	P.	
Sulphides	P.	P.	P.	P.	P.	
Arsenical preparations	P.	P.	P.	P.	P.	
Albumin	P.	P.	P.	P.	P.	

Explosions have resulted by mixing fluidextract of uva ursi or geranium with spirit of ethyl nitrite; chromic or nitric acid with glycerin; potassium permanganate with glycerin; silver nitrate with creosote; silver oxide with extract of gentian in pill; potassium chlorate with glycerin and tincture of ferric chloride; calcium chloride triturated with sulphur; oxidizing agents with sulphur, charcoal, iodine, phenol, glycerin, turpentine, etc.; iodine with ammonia; potassium chlorate with catechu. Poisonous compounds result from mixing potassium chlorate with its iodide, forming in the system potassium iodate; potassium chlorate with syrup of iodide of iron, liberating in the system free iodine; diluted hydrocyanic acid or potassium cyanide with calomel, forming corrosive mercuric chloride or mercuric cyanide.

2. *Pharmaceutical*.—This results when substances are mixed and do not produce clear solutions, owing to their different solubility in menstrua—insoluble powders or oil will not mix with water, nor will water with solutions of resins without precipitation—acid quinine solutions with glycyrrhiza solutions precipitate glycyrrhizin—alcoholic solutions with aqueous solution of chloral hydrate separate the latter on top. In all such cases it is better pharmacy to suspend the separated ingredients by the addition of a mucilage or some emulsifying agent. Under this head it is well to remember the following classes:

1. Alcoholic or resinous tinctures and fluidextracts, essential and fixed oils, copaiba, each precipitate with aqueous preparations.
2. Compound infusion of cinchona with compound infusion of gentian, and this latter with infusion of wild cherry.
3. Spirit of ethyl nitrite with strong mucilages, tincture of guaiac, solution of potassium bromide or iodide.
4. Alcoholic liquids, tinctures, and fluidextracts with those made with diluted alcohol; also with strong solutions of acacia.
5. Infusions in general with metallic salts—due to gelatinization and behavior of tannic acid.
6. Antipyrine with alkaloids, tincture of iodine, corrosive mercuric chloride, Lugol's solution, spirit of ethyl nitrite, ferric salts, hydrocyanic, tannic, and nitric acids, phenol, permanganates, salicylates, chloral hydrate, orthoform.
7. Pepsin with alkalies, alcoholic liquids, mineral salts, tannates, heat (100° C.; 212° F.).
8. Salicylic acid with iron compounds, alkali iodides, spirit of ethyl nitrite.

3. *Therapeutical*.—This results where two drugs of opposite medicinal properties are given together—the one neutralizing somewhat the other; astringents with purgatives; aconite or veratrum viride with digitalis; atropine, belladonna, hyoscyamus, or stramonium with caustic alkalies, pilocarpine, physostigmine (eserine), or morphine; acids with alkalies; arsenic with hydrated ferric oxide; phenol or lead salts with magnesium or sodium sulphate; cannabis with strychnine, picrotoxin, or acids; cocaine or gelsemium with morphine; conium with strychnine, picrotoxin, or stimulants; corrosive mercuric chloride with tannin or vegetable astringents; homatropine with physostigmine (eserine); opium and its alkaloids with potassium permanganate, belladonna, hyoscyamus, or stramonium; oxalic acid with calcium carbonate; silver nitrate with sodium chloride; strychnine or picrotoxin with chloral hydrate and potassium bromide; tartar emetic with tannin. Sometimes physiological antagonists are prescribed together purposely, in order to have the action of the one to guard that of the other, as atropine with morphine (hypodermically).

THE CLASSIFICATIONS OF MEDICINES.

There have been many systems brought forward to facilitate the studying of drugs, and it is owing, possibly, to the number that authors observe little uniformity in the arrangement followed. It has been thought wise to outline the five most important, of which the first and fourth alone are by their nature sufficiently comprehensive to include all organic and inorganic drugs without any omissions. The others (three) are but scientific systems applicable only to the organic medicines, and, as such, are recommended mostly by pharmaceutical and chemical investigators.

I. ARRANGEMENT BY ALPHABETIC SEQUENCE.—This is the least scientific but the most popular; in fact, it is not a true system, as no tacit relationship in any particular exists between the associated subjects, save that of initial letter in spelling, which possibly can offer to the student only the trifling advantage of lexical convenience.

II. ARRANGEMENT BY CHEMICAL CONSTITUENTS.—From a very early period organic drugs (vegetable and animal) were known to yield some of their activity to water and spirit, but the precise nature of the active constituents were little sought after until the beginning of the last century. The intelligent development of chemistry has been the means of separating these potentials and assigning their individual nature, to the extent of formulating a system or an arrangement of plants into groups dependent upon their chief constituent furnishing the medicinal properties, as: alkaloid, glucoside, fixed oil, volatile oil, resin, starch, etc. This classification, although best for the chemist in his laboratory investigation, somewhat assists the botanist, since certain genera and even families (natural orders) occasionally have similar constituents: Labiatae (volatile oil), Solanaceae (mydriatic alkaloids), Convolvulaceae (cathartic resin), Rosaceae (volatile oil, tannin), etc. Its great drawbacks consist in the variability of the nature assigned these constituents from time to time through the advance of chemical science: thus, a neutral principle today may be an alkaloid tomorrow; and, again, nearly all drugs have more than one constituent, the most abundant often being the least active, and which should govern its classification is not always easy to decide. To the general student, however, it is of considerable value, as it furnishes a knowledge of the character, name, and number of the possible drug constituents, also impresses the great difference between the crude drug and its active principle, and beyond all—that in every case it is the latter that furnishes the drug's working capacity.

1. *Amylaceous*.—Those containing starch as their chief medicinal principle: inula, lappa, cetraria, etc.

2. *Mucilaginous, Gummy*.—Those having considerable mucilage or gum: acacia, tragacanth, flaxseed, etc.

3. *Saccharine*.—Those containing much sugar, or related substance: manna, glycyrrhiza, triticum, etc.

4. *Acidulous*.—Those containing chiefly an organic acid: lemon, orange, tamarind, rubus, etc.

5. *Oleaginous*.—Those containing: (a) Volatile or essential oil: (1) Terpenes, $C_{10}H_{16}$: turpentine, cubeb, juniper, etc. (2) Oxygenated, $C_{10}H_{18}O$: cinnamon, anise, fennel, etc. (3) Sulphurated, $C_{12}H_{22}S_2$: mustard, asafetida, allium. (4) Nitrogenated, C_7H_6O (HCN): bitter almond, wild cherry, peach, etc. (b) Fixed oils (Compound ethers) which leave a permanent stain: olive, almond, castor oils, etc.

6. *Resinous*.—Those containing much resin: (a) Natural exudations: mastic, guaiac, benzoin. (b) Extracted by alcohol, etc., from resinous drugs: podophyllum, jalap, sumbul, etc.

7. *Gumresinous*.—These contain milky exudations consisting of one or more gums and resins: (a) With volatile oil: ammoniac, asafetida, myrrh, etc. (b) Without volatile oil: gamboge, scammony, etc.

8. *Oleoresinous*.—Those containing a volatile oil holding in solution a resin: turpentine, copaiba, Burgundy pitch, etc.

9. *Balsamic*.—Those containing a liquid, semi-liquid, or solid vegetable product composed of a resin or oleoresin, an odorous principle, and either one or both benzoic and cinnamic acids: Peru, Tolu, storax, etc.

10. *Glucosidal*.—These contain an organic principle converted by mineral acids, alkalies, or ferments into glucose and an allied organic compound; they may be neutral or acid, and sometimes form salts; nearly all are soluble in alcohol: salicin, gentiopiecin, cathartic acid, tannin, etc.

11. *Neutral Principles*.—These, sometimes called bitter principles from their bitterness, are plant-constituents, either neutral or feebly acid, and, when possible, form salts with alkalies; they differ from glucosides in not splitting into glucose, and from alkaloids in not being precipitated by tannin or mercuric-potassium iodide: aloin, elaterin, picrotoxin, santonin, etc.

12. *Alkaloidal*.—These contain alkaloids composed of carbon, hydrogen, and nitrogen alone, if liquid (amines), and additionally oxygen, if solid (amides); sometimes they are called vegetable alkalies, and, in fact, are related to ammonia, as when heated with alkalies ammonia is given off: quinine, morphine, cocaine, atropine, nicotine, coniine, etc.

III. ARRANGEMENT BY MORPHOLOGY AND ANATOMY.—This system is preëminently adapted for those wishing to become perfectly familiar with the general make-up of the various official plant-parts; the inner structural resemblances and differences of each group-member, as well as the relationship that each group itself sustains to its neighbors. In other words, it is most suited to laboratory work where time is afforded to make cross-sections, stainings, tests, dissections of fibro-vascular bundles, medullary sheaths, rays, etc., thereby readily

distinguishing the true and genuine article from that which is false and spurious.

1. *Roots, Radices*: (a) Monocotyledonous: sarsaparilla. (b) Dicotyledonous. (1) Fleshy: stillingia, sumbul, calumba. (2) Woody: glycyrrhiza, paraira, krameria, ipecac, etc.

2. *Rhizomes, Rhizomata*: (a) Cryptogamous: aspidium. (b) Monocotyledonous. (1) Without roots: ginger, calamus, triticum. (2) With roots: veratrum viride, cypripedium, iris. (c) Dicotyledonous. (1) Without roots: sanguinaria, geranium, podophyllum. (2) With roots: valerian, arnica, serpentaria, hydrastis, spigelia, etc.

3. *Tubers and Bulbs, Tubera et Bulbi*: (a) Monocotyledonous tubers: colchicum, salep, indian turnip. (b) Monocotyledonous tunicated bulbs: squill, garlic, etc. (c) Dicotyledonous tubers: jalap, aconite, corydalis.

4. *Twigs and Woods, Stipites et Ligna*: (a) Twigs: dulcamara, scoparius. (b) Woods: quassia, guaiacum, hæmatoxylon, etc.

5. *Barks, Cortices*: (a) Bitter and astringent: cinchona, wild cherry, viburnum. (b) Astringent: white oak, rubus, pomegranate. (c) Bitter, not aromatic; frangula, cascara sagrada, juglans. (d) Acrid or pungent: xanthoxylum, mezereum, euonymus. (e) Mucilaginous: ulmus. (f) Aromatic with oil- or resin-cells: cinnamon, sassafras, cascarilla, etc.

6. *Leaves and Leaflets, Folia et Foliola*: (a) Entire. (1) Aromatic, glandular, coriaceous: rosemary, pilocarpus, eucalyptus. (2) Not aromatic, glandular, or coriaceous: uva ursi, senna, coca. (b) Toothed or crenate. (1) Coriaceous: chimaphila, buchu, eriodyctyon. (2) Not coriaceous: stramonium, hyoscyamus, digitalis, etc.

7. *Herbs, Herbæ*: (a) Cryptogamous: chondrus, cetraria, maiden-hair, etc. (b) Dicotyledonous. (1) Petals distinct: pulsatilla, chelidonium, scoparius. (2) Petals united: eupatorium, lobelia, peppermint (*Labiatae*). (3) Petals absent: cannabis.

8. *Leafy Tops, Cacumina, Summitates*: savine, red cedar, thuja, etc.

9. *Flowers and Petals, Flores et Petala*: (a) Unexpanded: clove, santonica. (b) Expanded. (1) Polypetalous: orange, kousso, rose. (2) Gamopetalous: *Compositæ*, sambucus, lavender, etc.

10. *Fruits, Fructus*: (a) Multiple: juniper, hop, fig. (b) Simple. (1) Drupes: phytolacca, cubeb, black pepper, prune. (2) Berries: lemon, capsicum, colocynth. (3) Achenes: barley, lappa, cannabis. (4) Cremocarps: *Umbelliferae*. (5) Capsules: cassia fistula, cardamom seed, vanilla. (6) Parts of fruit: lemon, tamarind, etc.

11. *Seeds, Semina*: (a) Monocotyledonous (albuminous): sabadilla, colchicum, areca, etc. (b) Dicotyledonous. (1) Exalbuminous: almond, pumpkin, physostigma, mustard. (2) Albuminous: nuxvomica, staphisagria, linseed, nutmeg, stramonium.

12. *Drugs with Cellular Structure*: (a) Not farinaceous: nutgall, ergot, mace, saffron, lupulin, lycopodium. (b) Farinaceous: starch, tapioca, barley, etc.

13. *Drugs without Cellular Structure:* (a) Extracts and inspissated juices, *Extracta et succi inspissati*. (1) Wholly or partially soluble in water or alcohol: guarana, opium, lactucarium, aloë, extract of glycyrrhiza, extract of hæmatoxylon, catechu, gambir, kino. (2) Insoluble in water or alcohol: gutta-percha, elastica, etc. (b) Sugars, *Sacchara*: sucrose, manna, honey. (c) Gums, *Gummata*: acacia, tragacanth, etc. (d) Gumresins, *Gummi resinæ*. (1) With volatile oil: asa-fetida, ammoniac, myrrh. (2) Without volatile oil: gamboge, scammony. (e) Resins, *Resinæ*. (1) Without benzoic or cinnamic acid: elaterium, mastic, rosin, guaiac. (2) With benzoic and cinnamic acids: benzoin, dragon's blood. (f) Balsams and oleoresins, *Balsama et oleoresinæ*. (1) Without benzoic or cinnamic acid: copaiba, turpentine, Burgundy pitch, pine tar. (2) With benzoic or cinnamic acid: Balsam of Peru, Tolu, storax. (g) Volatile oils and camphors, *Olea volatilæ et camphoræ*. (1) Volatile oils—arranged in sequence of families (natural orders), containing a volatile portion, eleoptene, and a less volatile portion, stearoptene, or camphor: terpenes, oxygenated, nitrogenated, sulphurated. (2) Camphors: camphor, thymol, menthol, etc. (h) Fixed oils and waxes, *Olea pinguis et ceræ*. (1) Liquid fats: almond, olive, linseed, cod-liver, croton, castor oils. (2) Solid fats: oil of theobroma, lard, suet. (3) Waxes: spermaceti, wax.

14. *Drugs of Animal Origin:* (a) Animals: cantharides, cochineal, leech. (b) Animal products, tissues, secretions: eggs, isinglass, musk, pepsin, oxgall. (c) Calcareous skeletons and concretions: coral, cuttlefish bone, oyster-shell.

IV. ARRANGEMENT BY THERAPEUTIC EFFECT.—This is possibly the least difficult and most useful to the average physician. In a way it is scientific, but since many medicines possess more than one property with the same or varying dosage, it often becomes more or less confusing as to the group to which such should be assigned; then again this system has become somewhat flexible and lacking in perfect uniformity through the preferences of those giving it prior sanction. Thus all drugs may be placed into a dozen general classes, each with many subdivisions: those acting on protoplasm, muscle, nerves, spinal cord, brain, special senses, reproduction, circulation, digestive system, tissue-changes, excretion, generative system; or with no less equity the same number may be retained, but in substance somewhat modified, thus: drugs acting upon organisms, blood, cardiac mechanism, vessels, skin, urinary system, bodily heat, respiration, digestive apparatus, nervous and muscular systems, organs of generation, metabolism; or again the general classes may be omitted, simply using the names descriptive of the various therapeutic effects, arranged alphabetically, or according to real or fancied importance. From its universal favor and the usage of its terms throughout this work, we give yet another modification which has some advantages.

I. AGENTS PROMOTING CONSTRUCTIVE METABOLISM (METAMORPHOSIS).

1. *Restoratives* (L. *restaurare*, to restore).—These restore or renew strength or vitality: (a) Foods, Aliments—which maintain some vital process, or renew some structural material, while medicines can modify only some vital action. They are derived from the vegetable, animal, and mineral kingdoms, and in Nature are recognized as being either: *oxidizable*—heat-producing and force-forming: carbon compounds, fat, sugar, starch, gum, etc.; *nitrogenous*—flesh-forming: albumin, casein, fibrin, etc.; *unoxidizable* or *incombustible*: metallic salts, water, etc.; (b) Digestive ferments—which are animal and vegetable substances for aiding digestion when the normal alimentary secretions are inefficient: pepsin, pancreatin, papain, diastase, ingluvin, etc.; (c) Digestive acids—which check the production of glands having acid secretions, but increase those having alkaline secretions: diluted hydrochloric, nitric, sulphuric, nitro-hydrochloric, lactic, phosphoric, etc.; (d) Fats and fatty oils—which form the molecular basis of the chyle, are indeed necessary for the digestion of nitrogenous food, and by oxidation become the chief producers of vital force and heat: cod-liver, cottonseed, linseed, olive, sweet almond, theobroma; (e) hematics (Gr. *αἱματικός*, of the blood)—which increase the amount of hematin in the blood, improving its quality by enriching the red corpuscles: salts of iron, manganese, chalybeate waters, etc.; (f) Tonics (Gr. *τονικός*, tone)—which improve the tone of specific tissues, restoring energy and strength to the entire debilitated system, by imperceptibly stimulating vital functions. (1) Mineral: phosphorus, phosphates, phosphites, bismuth, arsenic, etc. (2) Vegetable: (a) Simple Stomachic Bitters, containing a bitter principle: gentian, calumba, quassia, chirata, calendula; (b) Aromatic Bitters, containing a volatile oil, bitter principle, resin, tannin: serpentaria, wild cherry, eupatorium, anthemis, matricaria.

2. *Antiperiodics* (L. *anti*, opposed to, + *periodicus*, periodic, period).—These prevent recurrence of or modify certain periodic febrile diseases by arresting further development in the blood of successive crops of pathogenic organisms causing the disorder: cinchona alkaloids, eucalyptus, salicin, arsenic, etc.

3. *Antipyretics, Febrifuges* (Gr. *ἀντί*, against, + *πυρετός*, fever; L. *febris*, fever, + *fugare*, to put to flight).—These reduce abnormally high body-temperature, either by decreasing heat-production, or increasing heat-loss; the former condition being effected by (1) lessening tissue-change, (2) reducing circulation; the latter by (1) dilating the skin-vessels, thereby increasing radiation, (2) causing perspiration and its evaporation, (3) abstracting body-heat, through cold applications: cinchona alkaloids, acetanilid, antipyrine, acetphenetidin, phenyl salicylate, phenol, creosote, aconite, veratrum viride, cold bath, pack, or sponging, purgation, venesection.

4. *Antiphlogistics* (Gr. *ἀντί*, against, + *φλογιστός*, burning).—These reduce inflammation of serous membranes: mercury, opium, etc.; respiratory tract and organs: aconite, tartar emetic, etc.; and puerperal metritis: veratrum viride, ergot, cold, purgation, etc.

II. AGENTS PROMOTING DESTRUCTIVE METABOLISM (METAMORPHOSIS)—INCREASE WASTE.

5. *Semi-alteratives, Alkalies*.—These, before meals, stimulate acid and check alkaline secretions when placed in contact with the mouths of the gland-ducts producing them; when administered after meals, they may be (1) Direct—which lessen the stomach's acidity. (2) Indirect—which have only a remote effect, being oxidized in the blood, and excreted as carbonates in the urine, thereby lessening its acidity; potassium carbonate and bicarbonate, solution of potassium hydroxide, sodium carbonate and bicarbonate, solution of sodium hydroxide, ammonium, lithium, and magnesium carbonates, magnesium oxide, solution of calcium hydroxide, calcium carbonate, aromatic spirit of ammonia, potassium and sodium acetates, potassium, sodium, and lithium citrates, potassium tartrate and bitartrate, vegetable acids.

6. *Alteratives*.—These alter or change morbid conditions, by furthering metabolism, and modify nutritive processes: iodine, iodides, arsenic, antimony, mercury, sulphur, sulphides, sulphites, phosphorus, sarsaparilla, guaiacum, mezereum, stillingia, colchicum, xanthoxylum, hydrastis, phytolacca, sassafras, cod-liver oil. Alteratives also are called *Resolvents* and *Discutients* (L. *resolvere*, to resolve, disperse; *discutere*, to disperse) from the fact that they promote absorption of inflammatory deposits, either by stimulating the lymphatic glands, or promoting the imbibition of medicinal or nutritive material in the system.

7. *Astringents* (L. *astringere*, to draw close, contract).—These contract muscular fiber by direct irritation (local), and condense other tissues by precipitating the albumin and gelatin (remote). 1. Mineral: salts of silver, copper, lead, zinc, bismuth, and aluminum. 2. Vegetable: tannic and gallic acids, nutgall, white oak, geranium, gambir, catechu, kino, krameria, hæmatoxylon, hamamelis, red rose, uva ursi.

III. AGENTS PROMOTING THE DESTRUCTION OF MICROBES, PARASITES, ETC.

8. *Antizymotics* (Gr. *ἀντί*, against, + *ζυμωτικός*, fermentation).—These arrest fermentation dependent upon organic ferments (enzymes): diastase, pepsin, ptyalin; or upon organized ferments: yeast, bacteria, etc.: (a) *Antiseptics* (Gr. *ἀντί*, against, + *σηπτικός*, rotting)—which prevent or retard septic decomposition, by killing the bacilli producing it, or by arresting their development: corrosive mercuric chloride, hydrogen peroxide, potassium permanganate, sulphurous acid, phenol,

cresol, creosote, lysol, thymol, eucalyptol, menthol, sodium borate, boric acid, chlorine, zinc chloride; (b) *Disinfectants* (L. *dis*, *dī*, in two, apart, from, + *inficere*, *infectus*, infect(ion)—which destroy specific germs communicating disease (mostly microbes), by (1) acting as oxidizants, (2) combining with albumin, (3) chemically combining to form substitution-compounds, (4) arresting molecular changes, (5) altering the reaction of the media containing the germs: heat (110–121° C.; 230–250° F.), lime, chlorinated lime and soda, ferrous sulphate, zinc chloride, potassium permanganate and dichromate, sulphurous and nitrous acids, sulphur dioxide, formaldehyde, air, water, fire; (c) *Deodorants* (L. *de*, from, + *odorare*, *odoran(t)s*, smelling)—which destroy foul odors. These may be volatile (oxidizing and deoxidizing) agents, that act chemically on obnoxious gases: chlorine, sulphur dioxide, hydrogen dioxide, formalin; or non-volatile (chiefly absorbents) agents that act by condensing and decomposing the effluvia: potassium permanganate, charcoal, earth, lime, ferrous sulphate, etc.

9. *Parasiticides*, *Germicides* (Gr. *παρά*, besides, upon, + *σιτέιν*, to feed; L. *parasitus*, parasite, + *cædere*, to kill).—These kill animal and vegetable parasites existing upon the system, being applied usually in the form of lotions, solutions, washes, ointments, and oleates: staphisagria, corrosive mercuric chloride, mercuric nitrate and oxide, ammoniated mercury, sulphur, sulphur iodide, phenol, iodoform, thymol iodide, resorcinol, naphthalene, betanaphthol, creosote, guaiacol.

IV. AGENTS ACTING ON THE NERVOUS SYSTEM (NEUROTICS, NERVINES).

10. *Cerebral Excitants*, *Stimulants*, *Antispasmodics* (L. *stimulare*, *stimulus*, to urge, stimulate, a goad, excitant; Gr. *ἀντί*, against, + *σπασμός*, a spasm).—These increase the functional activity of the brain without causing subsequent depression or suspension of the cerebral functions: valerian, asafetida, sumbul, musk, camphor, guarana, caffeine (theine), alcohol.

11. *Cerebral Depressants*, *Sedatives* (L. *sedare*, *sedatus*, to allay, calm, a pacifier, tranquillizer).—These lower or suspend the higher brain functions after a preliminary stage of excitement: (a) *Narcotics* (Gr. *νάρκη*, numbness, stupor)—which at first excite and stimulate all the body functions, then cause profound sleep, stupor, coma, insensibility, and death by paralyzing the medulla-centers governing respiration and other vital functions: opium, morphine, cannabis, lactucarium, cimicifuga; (b) *Hypnotics*, *Soporifics*, *Somnificants* (Gr. *ὑπνος*, sleep; L. *sopor*, heavy sleep, *somnus*, sleep, + *facere*, to make)—which produce sleep, leaving undisturbed the normal relationship of the mental faculties to the external world; in a broad sense these include narcotics and anesthetics: chloral hydrate, sulphonmethane, sulphone-thylmethane, paraldehyde, chloralformamide, urethane, potassium, sodium, and ammonium bromides; (c) *Anodynes*, *Analgesics* (Gr. *ἀν*,

not, + ὀδύνη, ἄλγος, pain, without pain, cures pain)—which relieve pain by either depressing sensory centers or impairing nerve-fiber conductivity: opium, morphine, belladonna, hyoscyamus, stramonium, coca, cocaine, hop, antipyrine, acetanilid, acetphenetidin; (d) *Anesthetics* (Gr. ἄν, not, + αἰσθητός, sensible, insensible effect produced)—which reduce sensory nerve-functions until nerves cannot receive or conduct sensation; some directly depress the skin's end-organs, others impair the sensory nerve conductivity, others reduce local circulation; these are mostly volatile substances, whose vapor when inhaled sufficiently causes complete unconsciousness, loss of sensation and motion; anodynes only diminish, while anesthetics temporarily destroy skin and mucous membrane sensibility: ether, chloroform, nitrous oxide, ethyl bromide, methylene bichloride.

12. *Motor Excitants (Excito-motors, Spinants)*.—These increase functional activity of the motor apparatus and spinal cord, causing, in large doses, disturbances of motility, increased reflex excitability, and tetanic convulsions, finally paralysis from over-stimulation: nux vomica, strychnine, ignatia, picrotoxin, electricity.

13. *Motor Depressants (Depresso-motors)*.—These lower functional activity of the motor apparatus and spinal cord, in large doses directly paralyzing them: physostigma, conium, gelsemium, potassium, sodium, ammonium, and lithium bromides, amyl nitrite, nitroglycerin, lobelia, alcohol, ether, chloroform.

14. *Mydriatics* (Gr. μυδρίασις, enlarged pupil).—These dilate the pupil; some act locally, others systemically, causing paralysis of the ciliary muscle: atropine, homatropine, hyoscyamine, daturine, duboisine, cocaine.

15. *Myotics* (Gr. μύειν, to close, shut).—These contract the pupil by stimulating the circular muscular fibers of the iris, and by contracting the ciliary muscle so that the eye is accommodated only for near objects: physostigmine, pilocarpine, morphine, anesthetics (at first), muscarine.

V. AGENTS ACTING ON THE RESPIRATORY SYSTEM (RESPIRATION).

16. *Respiratory Stimulants*.—These exalt the functions of the respiratory center in the medulla, affording deeper and quicker breathing: strychnine, atropine, digitalis, apomorphine, duboisine, emetine, opium (small doses).

17. *Respiratory Sedatives (Depressants)*.—These lower the respiratory center's activity, affording shallow and slow respirations: opium, physostigma, gelsemium, aconite, veratrum viride, conium, muscarine, hydrocyanic acid.

18. *Pulmonary Sedatives* (Gr. πλέυμων, πνέυμων, lung; L. *pulmonarius*, pertaining to or affecting the lungs).—These lessen the irritability of the respiratory nerves or center, thereby diminishing cough and dyspnea. Some directly depress the center, others remove irritating

substances from the passages, others lessen local congestion, others lower the excitability of the vagus end-organs and afferent filaments of the lungs and respiratory tract: opium, morphine, codeine, hydrocyanic acid, belladonna.

19. *Sternutatories, Errhines* (L. *sternutare*, to sneeze; Gr. ἐν, in, + ῥιν, the nose).—The former cause sneezing; the latter increase nasal secretion when applied to mucous membrane in powdered form: ipecac, quillaja, ammonia, cubeb, etc.

20. *Ciliary Excitants* (L. *cilium*, an eyelid, hair-like process).—These, when dissolved in the mouth, promote bronchial mucous expectoration through reflex excitation of the bronchial and tracheal cilia: acacia, ammonium and sodium chlorides, potassium chlorate.

21. *Expectorants* (L. *ex*, out of, + *pectus, pectoris*, the breast).—These change the broncho-pulmonary mucous membrane secretion, promoting its expulsion: (a) Nauseating (Sedative)—which, in large doses, cause vomiting, thereby acting mechanically in expelling the mucus, and, in small doses, increase osmosis from the inflamed mucous membrane; they may increase secretion and lower blood-pressure: tartar emetic, ipecac, apomorphine, lobelia, pilocarpus; (b) Stimulating—which stimulate the bronchial mucous membrane that eliminates them, altering the secretion and facilitating expectoration: senega, squill, ammonium carbonate and chloride, benzoin, balsam of Peru, Tolu, pine tar, turpentine, garlic, onion, glycyrrhiza, saccharine substances, ammoniac.

VI. AGENTS ACTING ON THE CIRCULATORY SYSTEM (CIRCULATION).

22. *Cardiac Stimulants (Tonics; L. cardiacus; Gr. καρδία, heart)*.—These stimulate the cardiac muscle, slowing and strengthening its contractions; excessive quantities may cause sudden death by syncope: digitalis, strophanthus, scoparius, convallaria, cimicifuga, nitroglycerin, nitrites, alcohol, ether, ammonia, heat, galvanism, chloroform.

23. *Cardiac Depressants (Sedatives)*.—These lessen the force and frequency of the heart's action, controlling its over-action and palpitation; especially do they slow the pulse in sthenic fevers due to local inflammation: aconite, veratrum viride, tartar emetic, senega, pilocarpine, hydrocyanic acid, emetine, quinine (full doses), pulsatilla, grindelia, cold.

VII. AGENTS ACTING ON THE DIGESTIVE SYSTEM (DIGESTION).

24. *Sialagogues* (Gr. σίαλον, saliva, + ἄγειν, ἀγωγός, to lead, leading forth).—These promote the secretion and flow of saliva and buccal mucus: (a) Topical—which act through reflex irritation, caused by taking something into the mouth: capsicum, ginger, cubeb, mustard, tobacco, pyrethrum, horse-radish, alkalies; (b) General—which act

through systemic influence on the glands or their secretory nerves during the drug's elimination: pilocarpus, mercurials, antimonials, iodine compounds, physostigma.

25. *Refrigerants* (L. *refrigerare*, to cool).—These allay thirst, giving the sensation of coolness: vegetable and mineral acids (diluted), fruit juices, ice-water, effervescing drinks, diaphoretics.

26. *Dental Anodynes*.—These are used locally in toothache due to caries, thus exposing a nerve filament: aconite, cocaine, opium, morphine, phenol, creosote, oils of clove and peppermint, chloral hydrate.

VIII. AGENTS ACTING ON THE EXCRETORY SYSTEM (EXCRETION).

27. *Carminatives, Aromatics* (L. *carminare*, *carminativus*, to expel wind).—These expel gases from the stomach and intestines by increasing peristalsis, stimulating the circulation, and relaxing the cardiac and pyloric orifices; also act as diffusible stimulants to the body and mind: cardamom seed, capsicum, ginger, peppermint, spearmint, cinnamon, nutmeg, lavender, calamus, orange, anise, caraway, coriander, fennel, pimenta, pepper, mustard, clove, asafetida, and volatile oil of each.

28. *Emetics* (Gr. *ἔμετος*, vomiting).—These cause vomiting: (a) Local—which, by reflex action, irritate the end-organs of the gastric, pharyngeal, or esophageal nerves: zinc and copper sulphates, mercury subsulphate, alum, mustard, tepid water; (b) Systemic (General)—which act by directly stimulating the vomiting-centers through circulation: ipecac, apomorphine, tartar emetic, senega, squill, lobelia, sanguinaria, compound syrup of squill.

29. *Antiemetics*.—These lessen nausea and vomiting: (a) Local—which produce a sedative action on the end-organs of the gastric nerves: ice, phenol; bismuth subnitrate and subcarbonate, cerium oxalate, creosote, small doses of calomel or ipecac, hot water, opium, cocaine; (b) General—which act by reducing the irritability of the vomiting-center in the medulla: opium, bromides, morphine, codeine, chloral hydrate, alcohol, amyl nitrite, food, brandy.

30. *Cathartics, Purgatives* (Gr. *καθαρτικός*, cleansing; L. *purgare*, to cleanse).—These increase or hasten intestinal evacuations: (a) *Aperients, Laxatives* (L. *aperire*, to open; *laxare*, to loose)—which excite moderate peristalsis, giving soft movements without irritation: magnesia, manna, sulphur, tamarind, almond and olive oils, fig, prune, oatmeal; (b) *Simple Purgatives*—which cause active peristalsis and stimulate secretion of the intestinal glands, giving one or more copious, semi-fluid movements accompanied by some irritation and griping: aloë, calomel, castor oil, cascara sagrada, rhubarb, senna, small doses of salines, drastics, cholagogues; (c) *Saline Purgatives*—which stimulate the intestinal glands, increase peristalsis and osmosis, causing watery stools: magnesium sulphate and citrate, potassium sulphate, tartrate and bitartrate, sodium sulphate, phosphate and chloride, potassium and sodium tartrate; (d) *Drastic Purgatives* (Gr. *δράω*,

δραστικός, to act, active).—These often are called simply cathartics, and act more intensely than the preceding, causing violent peristalsis, watery stools, griping, tenesmus, borborygmus, mucous membrane irritation, and exosmosis of serum; large doses become irritant poisons: colocynth, jalap, gamboge, scammony, croton oil; (e) *Hydragogue Purgatives* (Gr. ὕδωρ, water, + ἄγειν, ἀγωγός, to lead, leading forth)—which remove much water from the vessels: croton oil, elaterium, gamboge, potassium bitartrate, large doses of salines and drastics; (f) *Cholagogue Purgatives* (Gr. χολή, bile, + ἄγειν, ἀγωγός, to lead, leading forth)—which stimulate bile flow, causing free purgation of green-colored (bilious) and liquid stools: mercurials, aloë, rhubarb, podophyllin, euonymin, iridin, leptandrin.

31. *Diuretics* (Gr. δια, through, + οὔρειν, to urinate).—These increase renal secretion, either by raising the local or general blood-pressure, thereby increasing renal circulation (blood-supply), or by stimulating the secreting cells or nerves of the kidneys, or by washing out the kidneys with much water taken at night or early morning; (a) Refrigerant—which excite the renal epithelium, producing a hyperemic condition of the kidneys and an increased amount of water in the urine; they depress the heart and general circulation: potassium acetate, citrate and bitartrate, ammonium and sodium acetates, lithium carbonate and citrate, magnesium citrate and sulphate, water, milk, cold applications; (b) Hydragogue—which largely increase the amount of water in the urine, owing to raising arterial pressure, locally or generally: digitalis, strophanthus, spirit of ethyl nitrite, nitrites, squill, cimicifuga, scoparius; (c) Stimulant (blennorrhetics)—which act directly upon the renal tissue, by which they are to a great extent eliminated from the body: buchu, copaiba, cubeb, matico, pareira, uva ursi, savin, juniper, chimaphila, taraxacum, cantharides, turpentine, oil of santal, corn silk, apocynum.

32. *Antilithics, Lithotriptics* (Gr. ἀντί against, + λίθος, stone, + τρίβειν, to rub).—The former prevent the formation of urinary and biliary concretions in the excretory passages; the latter dissolve them when formed: *biliary calculi*: alkaline waters, turpentine, etc.; *vesical calculi*: (1) uric acid or urates: alkaline salts, magnesium citro-borate, etc.; (2) calcium oxalate: acids, carbonated waters, etc.; (3) phosphatic deposits (calculi): ammonium benzoate, nitric acid, etc.

33. *Diaphoretics, Sudorifics* (Gr. δια, through, + φέρειν, to carry; L. *sudor*, sweat, + *facere*, to make).—These increase the action of the skin, causing sweat-secretion; are called sudorifics when the secretion is so profuse as to form beads on the surface: (a) Simple—which enter circulation and stimulate the sudoriferous glands, by which they are eliminated: pilocarpus, ammonium acetate and citrate, sarsaparilla, guaiacum, mezereum, sassafras, senega, serpentaria, salicylates; (b) Nauseating—which relax and dilate the superficial capillaries: ipecac, tartar emetic, opium, Dover's powder, alcohol, ether, spirit of ethyl nitrite, lobelia, tobacco, vapor and Turkish baths, wet-pack, hot drinks;

(c) Refrigerant—which reduce circulation by acting on the sweat-centers in the spine and medulla: potassium citrate, aconite, veratrum viride, tobacco, lobelia, pilocarpus, spirit of ethyl nitrite, opium.

34. *Antihydrotics, Anhydrotics* (Gr. *ἀντί*, against, *ἄν*, not, + *ἰδρώς*, sweat).—These check perspiration by reducing the action of the sweat-glands, or the excitability of the sweat-centers, or the circulation in the skin: belladonna, chloralformamide, muscarine, pilocarpine, strychnine, quinine, etc.

35. *Anthelmintics* (Gr. *ἀντί*, against, + *ἐλμυνθ*, a worm).—These destroy (*Vermicides*, L. *vermis*, worm, + *cædere*, to kill) or expel (*Vermifuges*, L. *vermis*, worm, + *fugare*, to put to flight) intestinal worms. Vermifuges: castor oil, jalap, scammony. Vermicides, for: (a) Thread worms (*Oxyuris vermicularis*): vegetable astringents, alum, iron sulphate, aloe, tannin, lime water, quassia, all by enema; (b) Round worms (*Ascaris lumbricoides*): santonin, spigelia, chenopodium, each in combination with either calomel, castor oil, senna, or compound powder of jalap; (c) Tape worms (*Tænia solium* +) *Tæniifuges*: aspidium, kamala, koussou, pomegranate, pumpkin seed, turpentine.

IX. AGENTS ACTING ON THE REPRODUCTIVE SYSTEM (GENERATION).

36. *Emmenagogues* (Gr. *ἐμμηνοσ*, monthly, + *ἄγειν*, ἀγωγός, to lead, leading forth).—These restore the menstrual function, either by stimulating directly the uterine muscular fiber or indirectly enriching the blood, thus toning up the nervous system: (a) Direct—which act locally on the uterus: ergot, rue, tansy, savin, cantharides, myrrh, guaiacum, apiol, hedeoma, cimicifuga, caulophyllum, pulsatilla, potassium permanganate; (b) Indirect—which act generally on the system: iron, manganese, quinine, strychnine, aloetic purgatives, tonics, hot hip baths, cod-liver oil.

37. *Ecbolics, Oxytocics* (Gr. *ἐκ*, out of, + *βάλλειν*, to throw out; *ὀξύς*, quick, + *τόκος*, birth).—These stimulate the muscular fibers of the gravid uterus to contraction, thus causing premature birth or abortion: ergot, cottonroot bark, savin, hydrastis, potassium permanganate, oils of rue, tansy, and pennyroyal.

38. *Aphrodisiacs* (Gr. Ἀφροδίτη, Venus, Greek goddess of love, venereal).—These stimulate sexual appetite and power by acting reflexly or directly upon the cerebral or spinal genital center: damiana, phosphorus, cantharides, tonics, ergot, meat diet, strychnine, cannabis, alcohol.

39. *Anaphrodisiacs* (Gr. *ἄν*, not, + Ἀφροδίτη).—These lessen sexual functions and appetite, by diminishing excitability of the nerves of the genital organs, also by depressing the genital centers in the brain and spine, and by decreasing local circulation: bromides, camphor, opium, tobacco, purgation, venesection, cold baths, ice, vegetable diet, cocaine, belladonna.

40. *Galactagogues* (Gr. γάλα, milk, + ἄγω, ἄγωγός, to lead, leading forth).—These increase lacteal secretion: pilocarpus, ricinus (leaves locally), thea (internally with alcohol, beer, porter), etc.

X. AGENTS ACTING ON THE CUTANEOUS SYSTEM (SKIN).

41. *Irritants, Counter-irritants*.—These when applied to the skin cause vascular excitement; are called counter-irritants when used to produce reflex influence on remote parts: (a) *Rubefacients* (L. *rubere*, to be red, + *facere*, to make)—which produce temporary redness and skin congestion; if left on too long, may cause exudation between the cuticle and true skin (vesicants), or may destroy the tissue, forming a slough (escharotics), or may cause muscular atrophy: mustard, capsicum, mezereum, iodine, menthol, ammonia, arnica, volatile oils (turpentine, cajuput, etc.), hot water, friction; (b) *Vesicants, Epispastics, Blisters* (L. *vesica*, a blister; Gr. ἐπί, upon, + σπᾶν, to draw)—which produce much inflammation of the skin and effusion of serum between the epidermis and derma: cantharides, mezereum, iodine, rhus toxicodendron, glacial acetic acid, volatile oil of mustard, steam, boiling water, ammonia vapor; (c) *Pustulants* (L. *pustulare*, to blister)—which cause pustules, and affect isolated parts of the skin, as orifices of sudoriferous glands: croton oil, tartar emetic, silver nitrate; (d) *Escharotics, Caustics* (Gr. ἐσχάρα, a scab, scar)—which destroy tissue when applied, by abstracting its water, or by combining with the albumin of the skin, or by corrosive deoxidation of the tissues, thus causing a slough: mineral acids, phenol, chromic acid, lime, potassium and sodium hydroxides, dried alum, silver nitrate, zinc chloride, copper sulphate, corrosive mercuric chloride, mercuric oxide and nitrate, bromine, high heat, electric cautery, boiling water, arsenic trioxide.

42. *Styptics, Hemostatics* (L. *stypticus*, contracting; Gr. αἷμι, blood, + ἰστάναι, στατικός, to stop, stopping).—These arrest hemorrhage; the former being used locally, the latter internally. Some act mechanically, by closing the mouths of the bleeding vessels with a blood-clot; others contract the vessels, thus checking the blood-flow: (1) acids, alum, collodion, ferric chloride and sulphate, silver nitrate, matico, tannin, lead acetate, zinc sulphate, vegetable astringents, cold (locally), electric cautery; (2) ergot, gallic acid, matico, lead acetate, diluted sulphuric acid, hamamelis, oil of turpentine, heat (locally).

43. *Emollients* (L. *emollire*, to soften).—These soften and relax the tissues when applied locally, diminish the tension and pressure on the nerves, dilate the vessels, and protect inflamed surfaces: poultices, fatty oils, lard, spermaceti, glycerin, petroleum, starch, soap liniment, oil of theobroma.

44. *Demulcents* (L. *demulcere*, to soothe).—These, usually mucilaginous or oleaginous, are intended for soothing parts to which applied, being restricted generally to mucous membranes (internally), and emollients to the skin (externally): acacia, cetraria, starch, flaxseed,

glycyrrhiza, gelatin, honey, althea, egg-white, tragacanth, olive and other bland oils.

45. *Protectives*.—These are mechanical coverings to protect various injured parts from air, water, friction, etc.: collodion, plasters, etc.

V. ARRANGEMENT BY NATURAL AFFINITIES (BOTANICAL).—This system is the one adopted throughout this work. It is of all others the most scientific by which plants may be studied, and, as the official portions of vegetable drugs are but parts of the whole, it seems only natural that the parental source should furnish the basis of classification for these medicinal parts. Everyone knows that there are greater similarities and dissimilarities between some plants than between others, and that this likewise applies to animals. Scientists, taking advantage of this fact, have for several centuries been trying to form groups of plants, each to contain only those possessing, in common, certain marks of resemblance, and so naming the same, when possible, to typify the strongest characteristic. Early botanists were content with one point of agreement, but they differed even as to what plant-organ, above all others, should be accepted to furnish this point, hence the basis of a system. Cæsalpinus (1519–1603) selected the fruit, the globular furnishing one class, the flat another, etc. Tournefort (1656–1708) took the flower, restricting himself to the modification and arrangement of the corolla, the cup-shaped being one class, the bell-shaped another, etc. Linnæus (1707–1778) went a step further, and founded classes and orders upon the position, number, and relative lengths of the stamens and pistils, giving us the Linnæan, artificial, or sexual system of plants. This worked very well until cultivation, climatic differences, etc., changed the number of stamens and pistils. So far, no one had taken into consideration the plant's entirety. It is to John Ray (1628–1705), often called the "father of English natural history," that we owe the conception of a broader and more natural system; but it was Jussieu (1748–1836) who, embodying the grand features of both Ray and Tournefort, laid the permanent foundation of the true natural system which, somewhat modified, has come down to us. The very foundation of this system necessitates the faithful consideration of the similarities in form, structure, growth, habits, functions, thereby involving the idea of "affinity in essential organs." These understood, we may arrange the entire vegetable kingdom into allied groups of a scaling grade, dependent upon their whole make-up, thus placing each family (natural order), genus, and species next to those it most resembles in all respects.

Families or Natural Orders.—Of these there are about 280; they are the broader groups, and each comprises plants resembling one another in some strong particular, which applies to them generally as a class; this characteristic usually is taken from one of the reproductive organs (flowers, fruit, seed), and is so striking as to be noticeable by the inexperienced: Leguminosæ (fruit in legumes), Umbelliferæ (flowers

in umbels), Compositæ (flowers compound), Labiatae (corolla 2-lipped), Cupuliferæ (fruit in cupule), Guttiferæ (juice exudes in drops), Coniferæ (fruit in cones), Cruciferæ (petals arranged like a Maltese cross), etc.

Genus, Genera.—Of these there are about 10,000; they are more restricted groups, and go to compose the families or natural orders. This name corresponds to the family, surname, or last name of persons, Brown, Jones, Smith; it is a noun, and, like the family (ordinal) name, begins with a capital. Genera also are grouped according to some certain but more restricted characteristic taken from the reproductive organs; hence a genus is a collection of species resembling one another in the structure and general characters of the organs of reproduction, or in reproductive processes, methods of fructification, pollination, etc. Plants of the same genus are expected to be on the same numerical plan, and to have flowers, constituents, and medicinal properties somewhat similar.

Species, Species.—Of these there are about 200,000; they are the most restricted permanent groups and make up the various genera. This name corresponds to the baptismal or first name of persons, James, John, William; it is usually an adjective agreeing in case and gender with generic name, and, as such, should begin with a small letter. These are grouped according to some certain but still more restricted characteristics taken usually from the vegetative organs (root, stem, leaves), as color, proportion, shape, surface, duration, division, etc.; hence, species is a succession of individuals which reproduces and perpetuates itself. The last two names, generic and specific, when taken together, constitute the plant's name—*i. e.*, botanical source or origin—and consequently every plant (and animal) thus always is designated.

There are two scientific methods (with their many modifications) of arranging each family (natural order), genus, and species toward its nearest neighbor. Thus we may follow Jussieu's sequence, beginning with the cellular, flowerless, or lowest plant-life (Algæ), advancing to those of vascular structure, with apologetic, imperfect, or incomplete floral parts, always having each to follow in the ascending scale, finally reaching those producing as then understood the most perfect, complete, and typical flowers (Ranunculaceæ). De Candolle (1778–1841) greatly innovated this system, but chiefly in reversing the arrangement, placing the most highly organized plants, or flower producers, first in order, and each lower one in a descending succession. This would seem the most unnatural, as the order of development in Nature surely suggests evolution from forms more simple to those more complex, and not the converse. In spite of this, however, it was universally accepted up to the latter part of the last century, being strongly indorsed and followed by many of the world's greatest botanists, including Bentley, Trimen, Hanbury, Gray, Balfour, Bentham, Hooker, etc.; and is enunciated best by Bentham and Hooker in their *Genera Plantarum*.

The other plan, being the most rational, has continued always to have supporters, and during the past three decades has been studied systematically and thoroughly, especially in Germany, with more than ordinary zeal and results. Such scholars as Eichler, Engler, Prantl, Gilg, Thomé, Potonié, Richter, Flückiger, Köhler, Strasburger, Schenck, Schimper, etc., have instituted many changes, and, although beginning with the most primitive plant-life and ending with those bearing most complex flowers (Compositæ), have succeeded in evolving the system in a form much more consistent and in harmony with modern scientific thought and general plant-nature. As such, it is enunciated best by Engler and Prantl in their *Die Natürlichen Pflanzenfamilien*, and by Engler in his *Syllabus der Pflanzenfamilien*, and as this is the sequence that necessarily must come into future favor, it has been thought wise, in the main, to adhere to it in this work, giving thereto the following synopsis:

SUB-KINGDOM I. **THALLOPHYT(ES)-A.**

CLASS 1. **ALGÆ.**

1. *Gelidiaceæ*.—Distinguished by being parenchymatous or cartilaginous plants, growing in fresh or salt water, or moist places, red, purple, violet, occasionally green or black—chlorophyll being masked by phycoerythrine (red); composed of many species. *Gelidium*.

CLASS 2. **FUNGI.**

2. *Hypocreaceæ*.—Distinguished by rarely containing chlorophyll, saprophytes, parasites, either soft, fibrous, gelatinous, fleshy, leathery, horny, mycelium inconspicuous, often producing a dense homogeneous tissue; composed of 200 species. *Claviceps*.

SUB-KINGDOM II. **PTERIDOPHYT(ES)-A.**

CLASS 3. **FILICINÆ.**

3. *Polypodiaceæ*.—Distinguished by leaves being fronds, large, spores one kind, in cases (sporangia) on under surface or margin, circinate in veneration, stems usually prostrate, subterranean; composed of 70 genera, 3000 species. *Dryopteris*.

CLASS 4. **LYCOPODINÆ.**

4. *Lycopodiaceæ*.—Distinguished by yellow spores, low, usually moss-like evergreens, stems much branched, elongated, sporangia 1-3-celled, solitary in the axils of leaves, or on their upper surface; composed of 125 species. *Lycopodium*.

SUB-KINGDOM III. **SPERMATOPHYT(ES)-A.**

CLASS 5. **GYMNOSPERMÆ.**

5. *Pinaceæ (Coniferae)*.—Distinguished as resinous, evergreen trees, shrubs, flowers unisexual, no perianth, staminate—catkins, pistillate—

scaly aments, becoming cones, sepals naked (2), leaves needle-shaped; composed of 25 genera, 240 species. *Pinus*, *Juniperus*.

CLASS 6. **ANGIOSPERMÆ.**

SUB-CLASS 1. **Monocotyledones.**

6. *Graminaceæ*.—Distinguished by glumaceous flowers, paleæ 2 in each, stamens hypogynous, stems hollow, jointed, leaves 2-ranked; composed of 3500 species. *Zea*, *Saccharum*, *Hordeum*.

Liliaceæ. { 7. *Melanthaceæ*.—Distinguished by ovary superior, capsules mostly septicidal, with rootstocks, rarely bulbs, perianth 6, stamens 6, seeds appendaged, leaves grass-like, polygamous or diœcious; composed of 36 genera, 140 species. *Veratrum*.
8. *Liliaceæ*.—Distinguished by regular, symmetrical flowers, 6's, perianth non-glumaceous, petaloid, hypogynous, ovary 3-celled, anther 2-celled; composed of 125 genera, 1300 species. *Colchicum*, *Aloe*, *Urginea*.

9. *Smilacææ*.—Distinguished by being mostly vines, woody, herbaceous, often prickly stems, leaves net-veined, flowers green, diœcious, perianth 6, stamens 6, fruit globose berry, 1-6-seeded; composed of 3 genera, 200 species. *Smilax*.

10. *Zingiberaceæ*.—Distinguished by creeping rhizomes, calyx and corolla distinct, each 3, leaves stalked, sheathing, ovary inferior, stamens 6; composed of 30 genera, 280 species. *Zingiber*, *Elettaria*.

11. *Orchidaceæ*.—Distinguished by the 1-2 sessile anthers united to pistil, flowers irregular, reptile-shaped, perfect, perianth 6 in 2 rows, petaloid; composed of 410 genera, 5000 species. *Vanilla*.

SUB-CLASS 2. **Dicotyledones.**

SERIES I. **Choripetalæ.**

12. *Piperaceæ*.—Distinguished by jointed stems, ovary syncarpic, 1-celled, stigma sessile, 2, 3, 4, fruit fleshy, 1-celled, 1-seeded; composed of 8 genera, 1060 species. *Piper* (*Cubeba*).

13. *Salicaceæ*.—Distinguished by diœcious flowers, both kinds in catkins, no perianth or only cup-like calyx, stamens 1-30, fruit capsule; composed of 2 genera, 200 species. *Salix*, *Populus*.

14. *Fagaceæ* (*Cupuliferæ*).—Distinguished by small flowers, monoœcious, staminate—aments, pistillate subtended by involucre (united bracts) becoming a bur (cup), petals none, stamens 4-20, perianth 4-8-lobed; composed of 5 genera, 375 species. *Quercus*.

15. *Ulmaceæ*.—Distinguished by fugacious stipules, small flowers, monoœcious, diœcious, perfect or polygamous, perianth 3-9-parted, or sepals, petals none, stamens 3-9, ovary 1-celled, superior, samara, drupe or nut; composed of 13 genera, 140 species. *Ulmus*.

16. *Moraceæ*.—Distinguished by having milky juice, small flowers, monoœcious, diœcious, calyx 4-5-parted, petals none, stamens 4-5, ovary 1-celled, superior, fruit various; composed of 55 genera, 925 species. *Cannabis*.

17. *Santalaceæ*.—Distinguished by calyx 4-5 valvate-lobed, green or petaloid, stamens perigynous, sheathing disk, ovules suspended by funiculus; composed of 26 genera, 250 species. *Santalum*.

18. *Aristolochiaceæ*.—Distinguished by colored, irregular calyx, epigynous stamens, fruit capsule, many-seeded, leaves cordate; composed of 5 genera, 200 species. *Aristolochia*.

19. *Polygonaceæ*.—Distinguished by stems having many swollen joints, ochreate stipules above each, flowers perfect, calyx colored or greenish, ovary superior, 1-celled; composed of 30 genera, 800 species. *Rheum*.

20. *Chenopodiaceæ*.—Distinguished by succulency and flowers being ebracteate, minute, greenish, perfect or unisexual, ovary superior, 1-celled, fruit 1-seeded utricle; composed of 75 genera, 559 species. *Chenopodium*.

21. *Myristicaceæ*.—Distinguished by leaves alternate, dotted, leathery, flowers diœcious, regular, calyx 3-4-cleft, filaments 3-12, united, ovary 1-celled, ovule 1, fruit succulent; composed of 5 genera, 100 species. *Myristica*.

22. *Ranunculaceæ*.—Distinguished by flowers being most complete, organs all distinct, no adhesions nor cohesion, often yellow; composed of 35 genera, 1050 species. *Hydrastis*, *Cimicifuga*, *Aconitum*.

23. *Berberidaceæ*.—Distinguished by the few stamens being in 2-3 whorls and anthers opening by two hinged valves (Podophyllum—longitudinal); composed of 20 genera, 105 species. *Podophyllum*.

24. *Menispermaceæ*.—Distinguished by flowers being diœcious, petals shorter than sepals, solitary seed moon- or kidney-shaped, woody climbers; composed of 55 genera, 150 species. *Jateorhiza*.

25. *Lauraceæ*.—Distinguished by polygamous flowers, calyx inferior, petaloid, anthers opened by 2-4 uplifted valves, ovary 1-celled, fruit drupe or berry; composed of 40 genera, 900 species. *Cinnamomum*, *Sassafras*.

26. *Papaveraceæ*.—Distinguished by the 2-3 fugacious sepals and minute embryo near the base of fleshy albumin; composed of 26 genera, 200 species. *Papaver*.

27. *Cruciferae*.—Distinguished by pungent or acrid juice, cruciform flowers, tetradynamous stamens, and fruit a silique or silicle; composed of 185 genera, 1500 species. *Brassica*.

28. *Hamamelidaceæ*.—Distinguished by ovary being inferior, ovule solitary, pendent from cell apex, fruit capsule, 2-celled; composed of 15 genera, 35 species. *Liquidambar*.

29. *Rosaceæ*.—Distinguished by prickles, warts on woody surface, flowers regular, stamens inserted on calyx tube, perigynous; composed of 65 genera, 1200 species. *Rosa*.

30. *Drupaceæ*.—Distinguished by bark exuding gum, bark and seeds containing hydrocyanic acid, calyx 5-lobed, free from ovary, petals (5), stamens (many) inserted on calyx, ovary 1-celled, 2-ovuled, drupe; composed of 6 genera, 110 species. *Prunus*, *Amygdalus*.

Rosaceæ.

- Leguminosæ. { 31. *Mimosaceæ*.—Distinguished by ovary several-ovuled, fruit legumes, leaves 2-3-pinnate, flowers small, regular, calyx 3-6-lobed, corolla 3-6, stamens distinct or monadelphous, ovary 1-celled; composed of 30 genera, 1350 species. *Acacia*.
32. *Casalpiniaceæ*.—Distinguished by legumes, upper petal enclosed by lateral ones in the bud, leaves compound, stipulate, flowers perfect, monœcious, diœcious, polygamous, 5's; composed of 90 genera, 1000 species. *Copaiba*, *Cassia* (*Cathartocarpus*).
33. *Krameriaceæ*.—Distinguished by fruit spiny indehiscent, leaves simple, exstipulate, sepals 4-5, petals 5, smaller than sepals, stamens monadelphous, ovary 1-2-celled, ovules 2, fruit 1-seeded; composed of 1 genus, 15 species. *Krameria*.
34. *Papilionaceæ* (*Leguminosæ*).—Distinguished by legumes or loments, upper petal enclosing lateral ones in the bud, leaves compound, stipulate, calyx 4-5-toothed, petals somewhat united (banner, wings, keel), stamens usually 10, pistil 1, superior; composed of 310 genera, 5000 species. *Toluiifera*, *Astragalus*, *Glycyrrhiza*, *Pterocarpus*, *Vouacapoua*, *Physostigma*.
35. *Linaceæ*.—Distinguished by flowers being regular, showy, stamens monadelphous at base, sepals imbricate, ovary 3-5-celled; composed of 4 genera, 150 species. *Linum*.
36. *Erythroxylaceæ*.—Distinguished from *Linaceæ* by the shrubby or arboreous habit, and by the drupaceous fruit, calyx 5-lobed, petals 5, stamens 10, hypogynous, ovary superior; composed of 3 genera, 60 species. *Erythroxylon*.
37. *Rutaceæ*.—Distinguished by leaves being exstipulate, dotted, petals imbricated, ovary sessile, surrounded at base by fleshy, glandular disk, or elevated on gynophore; composed of 110 genera, 880 species. *Barosma*, *Pilocarpus*, *Citrus*.
38. *Simarubaceæ*.—Distinguished from *Rutaceæ* by leaves being exstipulate, without glands or dots, disk conspicuous, ovary stalked; composed of 30 genera, 112 species. *Picrasma*, *Quassia*.
39. *Burseraceæ*.—Distinguished by secreting a resinous or gum-resinous juice, leaves compound, dotted, disk and stamens perigynous, ovary superior; composed of 26 genera, 150 species. *Commiphora*.
40. *Polygalaceæ*.—Distinguished by flowers being irregular, papilionaceous, stamens monadelphous, sepals 5, of which 2 inner are wing-like, petaloid; composed of 10 genera, 150 species. *Polygala*.
41. *Euphorbiaceæ*.—Distinguished by milky, acrid juice, flowers unisexual, apetalous, fruit tricoccous, 3-6-seeded capsule, radical superior; composed of 210 genera, 4000 species. *Croton*, *Ricinus*.
42. *Anacardiaceæ*.—Distinguished by milky, acrid, resinous juice, petals and stamens perigynous, disk hypogynous or wanting; composed of 50 genera, 400 species. *Rhus*.
43. *Rhamnaceæ*.—Distinguished by its spiny habit, perigynous stamens, concave petals, non-caducous, valvate sepals, fruit not a berry; composed of 45 genera, 575 species. *Rhamnus*.

44. *Malvaceæ*.—Distinguished by stamens monadelphous, anthers 1-celled, leaves often downy, palmate-divided; flowers showy, purple, yellow, white; composed of 40 genera, 800 species. *Althæa*, *Gossypium*.

45. *Sterculiaceæ*.—Distinguished by flowers being regular or irregular, petals sometimes absent, filaments usually monadelphous, anthers 2-celled; composed of 49 genera, 730 species. *Theobroma*.

46. *Theaceæ* (*Ternstræmiaceæ*).—Distinguished by sepals distinct, endosperm little or none, leaves alternate, flowers, large solitary, sepals 5, petals 5, hypogynous, ovary 2-several-celled, fruit 2-3-celled, woody capsule; composed of 16 genera, 160 species. *Thea*.

47. *Guttiferaæ*.—Distinguished by yielding a resinous juice, stamens distinct, monadelphous or polyadelphous, flowers unisexual or polygamous, leaves coriaceous; composed of 24 genera, 340 species. *Garcinia*.

48. *Flacourtiaceæ*.—Distinguished by being chiefly tropical shrubs and trees with alternate dentate leaves, often transparent dots, axillary clusters of small diœcious flowers, straight embryo, edible fruit, economic products; composed of 79 genera, 300 species. *Taraktogenos*.

49. *Lythraceæ* (*Punicaceæ*).—Distinguished by calyx lobes being valvate, petals wrinkled, leaves exstipulate, stamens perigynous, inserted below the petals; composed of 21 genera, 350 species. *Punica*.

50. *Myrtaceæ*.—Distinguished by numerous stamens, leaves exstipulate, opposite, dotted, with marginal vein, ovary inferior; composed of 76 genera, 2700 species. *Eugenia*, *Melaleuca* (*Cajuputi*), *Eucalyptus*.

51. *Umbelliferaæ*.—Distinguished by the 2-celled ovary forming a cremocarp, with vittæ (oil-tubes), flowers in umbels, stems hollow, ovary inferior, crowned with fleshy disk; composed of 170 genera, 1600 species. *Coriandrum*, *Carum*, *Pimpinella*, *Feniculum*, *Ferula*.

SERIES II. Gamopetalæ.

52. *Ericaceæ*.—Distinguished by hypogynous corolla and stamens, anthers 2-celled, dehiscing by pores or slits, ovary 2-5-celled, leaves exstipulate, fruit capsule or berry; composed of 55 genera, 1050 species. *Gaultheria*, *Arctostaphylos*.

53. *Styraceæ*.—Distinguished by flowers of 5-10 stamens attached to 5-lobed corolla, anthers 2-celled, calyx coherent with ovary, superior or part inferior, fruit drupe; composed of 7 genera, 75 species. *Styrax*.

54. *Oleaceæ*.—Distinguished by 2 stamens, ovary superior, 2-celled, each with 2 ovules, corolla regular, 4-8-cleft, fruit capsule, berry, or drupe, seed albuminous, oily; composed of 21 genera, 500 species. *Fraxinus*, *Olea*.

55. *Loganiaceæ*.—Distinguished by opposite, entire, stipulate leaves, stamens epipetalous, styles divided as ovary cells number, fruit capsule, drupe, seeds winged; composed of 30 genera, 400 species. *Strychnos*.

56. *Gentianaceæ*.—Distinguished by being smooth herbs, leaves entire, glabrous, sessile, calyx and corolla persistent, ovary superior, fruit 2-celled capsule; composed of 65 genera, 600 species. *Gentiana*.

57. *Apocynaceæ*.—Distinguished by milky juice, from Asclepiadaceæ by stamens being free from style and stigma, anthers contain granular pollen, stigma hour-glass-shaped; composed of 130 genera, 1050 species. *Strophanthus*.

58. *Convolvulaceæ*.—Distinguished by milky juice, from Solanaceæ and Scrophulariaceæ by twining, trailing habit, alternate leaves, large solitary seeds, crumpled embryo, corolla 5's, plaited; composed of 40 genera, 900 species. *Exogonium*, *Ipomæa*.

59. *Hydrophyllaceæ*.—Distinguished by watery, insipid juice, flowers scorpioid, 5's, stamens borne on corolla base, styles 2, fruit capsule; composed of 17 genera, 160 species. *Eriodictyon*.

60. *Labiataæ*.—Distinguished by square stems, corolla bilabiate, stamens 4, didynamous, ovary 4-lobed, leaves aromatic, stigma bifid, fruit achenes; composed of 160 genera, 3000 species. *Rosmarinus*, *Lavandula*, *Thymus*, *Mentha*.

61. *Solanaceæ*.—Distinguished by colorless juice, flowers with plicate border, isomerous, ovules many, fruit capsule or berry, ovary superior; composed of 70 genera, 1600 species. *Capsicum*, *Atropa*, *Hyoscyamus*, *Datura*.

62. *Scrophulariaceæ*.—Distinguished by 2-celled ovary, numerous seeds, fleshy albumin, calyx 5-lobed, corolla irregular, 2-lipped, stamens 4, didynamous, ovary sessile, 2-celled, fruit capsule or berry; composed of 165 genera, 2500 species. *Digitalis*.

63. *Rubiaceæ*.—Distinguished by regular, epigynous corolla, valvate lobes, salver, rotate, or funnel-shaped, stamens on corolla-tube, epipetalous, ovary crowned with an epigynous disk, fruit capsule or fleshy nuts; composed of 355 genera, 5500 species. *Cinchona*, *Ourouparia*, *Coffea*, *Cephaelis*.

64. *Valerianaceæ*.—Distinguished by corolla being epigynous, anthers free, seed exalbuminous, leaves exstipulate, ovary inferior, 3-celled, 2 empty; composed of 9 genera, 275 species. *Valeriana*.

65. *Cucurbitaceæ*.—Distinguished by stems being succulent, prostrate or climbing, with tendrils, flowers unisexual, leaves and stem scabrous, fruit pulpy; composed of 90 genera, 650 species. *Ecballium*, *Citrullus*, *Cucurbita*.

66. *Campanulaceæ*.—Distinguished by endosperm present, fleshy, usually milky juice, flowers perfect, calyx 5-lobed, gamopetalous, stamens 5, ovary 2-5-celled, fruit capsule or berry, seeds many; composed of 60 genera, 1500 species. *Lobelia*.

67. *Compositæ*.—Distinguished by compound flowers, watery or resinous (rarely milky) sap, calyx-tube adnate to ovary, corolla 5-lobed, stamens 5, borne on corolla, anthers syngenesious, ovary 5-celled, ovule 1, fruit achene; composed of 760 genera, 10,000 species. *Artemisia*.

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses.
Gelidiaceae: 1. Agar. 2. Agar.	<i>Gelidium cornutum</i> .	Dried mucilaginous substance.	Pacific Atlantic Oceans.	Glucose, mineral salts, water.	.....	Demulcent, nutrient, aperient.	Culture media, constipation.	Grains. 60-240 (4-15 Gm.).
Hypnaceae: 1. Ergota. 2. Ergot.	<i>Claviceps purpurea</i> .	The dried sclerotium.	Russia, Spain.	Ergotoxine, paralyzant, tyramine, histamine, ergotamine, fixed oil, sclerotium.	Fluidextract.	Emmenagogue, abortifacient, hemostatic, antispasmodic, antiparasitic, poisonous.	In labor, dysmenorrhea, postpartum hemorrhage, hemorrhoids.	15-60 (1-4 Gm.).
Polypodiaceae: 1. Aspidium. 2. Aspidium.	<i>Dryopteris Filix-mas</i> .	The rhizome and stipes.	N. America, N. Asia, Europe.	Filicic acid, filicin, fixed oil, filitannic acid, vol. oil, resin.	Oleoresin.	Tonic.	Tape-worms.	30-120 (2-8 Gm.).
Lycopodiaceae: 1. Lycopodium. 2. Lycopodium.	<i>Lycopodium clavatum</i> .	The spores.	Europe, Asia, N. America.	Fixed oil, cane-sugar (sucrose), volatile base (methylamine).	.....	Diuretic, antispasmodic, rheumatism, epilepsy, pulmonary, renal disorders.	Externally: erysipelas, eczema, herpes, ulcers, chafing, to prevent pills and postpartum adhering.	Externally.
Pinaceae (Coniferae): 1. Oleum Terebinthinae. 2. Oil of Turpentine. 3. Resin. 4. Rosin.	<i>Pinus palustris</i> +	Volatile oil. Resin.	N. America.	Pinene, $C_{10}H_{16}$. Abietic, pinic and sylicic acids.	<i>Oil</i> : Recti. oil, terpene, turpentine, resin, volatile base, etc. <i>Rosin</i> : ros. cer., pine canth. cer., pine tar.	Stimulant, antelmintic, expectorant, antispasmodic, diuretic, rubefacient.	Bronchitis, catarrh, cystitis, erysipelas, hemorrhages, erysipelas, pneumonia, rheumatism, renal colic, sprains.	Mixing. 5-30 (3-2 cc.).
1. Oleum Pini Pumilionis. 2. Oil of Dwarf Pine Needles.	<i>Pinus montana</i> .	Volatile oil.	C. Europe.	Pinene, phellandrene, sylvestrene.	.....	Antirheumatic, expectorant, stimulant, diuretic.	Rheumatism, bronchitis, laryngitis.	1-5 (0.6-3 cc.).
1. Oleum Juniperi. 2. Oil of Juniper.	<i>Juniperus communis</i> .	Volatile oil.	N. America.	Pinene, $C_{10}H_{16}$, cadinene, $C_{15}H_{24}$.	.....	Stimulant, diuretic, anodyne, emmenagogue.	Renal dropsy, vesical catarrh, rheumatism, swellings.	5-15 (3-1 cc.).
1. Oleum Cadinum. 2. Oil of Cade.	<i>Juniperus Oxycedrus</i> .	Volatile oil.	S. Europe.	Phenols, cadinene, $C_{15}H_{24}$.	.....	.....	Psoriasis, pityriasis rubra, eczema.	3-5 (2-3 cc.).
Gramineae: 1. Anylum. 2. Starch.	<i>Zea Mays</i> .	The granules from the grain.	.....	$(C_6H_{10}O_5)_n$	Glycerite, diluent in extracts, glucosum, etc.	Nutritive, demulcent.	Allays itching, urticaria, erysipelas, inflamed rectum, protective.	Grains. 30-120 (2-8 Gm.).
1. Saccharum. 2. Sacrose.	<i>Saccharum officinarum</i> .	The juice evaporated and crystallized.	S. Asia.	$C_{12}H_{22}O_{11}$.	Syrup, many troches and medicated syrups, pills, powders, etc.	Demulcent, lenitive, laxative, ulcerations.	Vehicle, corrigent, preservative, antiseptic, expectant, coughs, ascites, ulcers, wounds, eye troubles.	Ad libitum.

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1. Maltum 2. Malt	Hordeum vulgare.	The partially germinated grain dried.	W. Asia, China.	Diatase, peptase, hor- denine, dextrose, sugar, starch.	Extract.	Nutritive, laxa- tive, demulcent.	Dyspepsia, phthisis, wasting diseases, emulsifying agent.	Ad libitum.
<i>Melastomaceae</i> 1. Veratrum Viride. 2. Veratrum Viride.	Veratrum viride.	The dried rhiz- ome and roots.	N. America.	Protopetrine, jervine, rubijervine, pseudo- jervine, cevadine, resin —veratroidine.	Tincture.	Sedative, emetic, diaphoretic, erethine.	Arterial excitement, spinal spasms, pneu- monia, heart troubles, convulsions, tetanus, chorea, mania.	1-4 (.06-26 Gm.).
1. Colchicum Cornus. 2. Colchicum Corn. 1. Colchicum Semen. 2. Colchicum Seed.	Colchicum autumnale.	The dried corn. The dried seed.	C. and S. Europe, N. Africa.	Colchicine, colchicine, colchicresin, starch, sugar, fixed oil.	Extract. Fluidextr., tincture.	Alterative, cathar- tic, emetic, sedative, diaphoretic, di- aphoretic.	Gout, rheumatism, skin diseases, purpura, uric- temia, neuralgia.	2-8 (.06-13- 15 Gm.).
<i>Liliaceae</i> 1. Aloe. 2. Aloe.	Aloe: Perryi, vera, ferox.	The inspis- sated juice.	E. Africa, So- cotra, W. Indies, Cu- raçao, Cape of Good Hope.	Aloin, resin, emodin, volatile oil.	Pills, extr. colic. co., tr. benz. co.	Cathartic, drastic, emmenagogue, vermifuge.	Costiveness, jaundice, hemorrhoids, amenor- rhea, ascariides.	1-10 (.03-6 Gm.).
1. Scilla. 2. Squill.	Urginea maritima.	The inner bulb scale.	Mediterra- nean Basin.	Scillitin, sinistrin, sugar, Ca oxalate.	Vinegar, syrup, fluidextr., comp. syrup, tincture.	Expectorant, car- diac stimulant, diuretic, emetic, cathartic, irri- tant.	Croup, coughs, bron- chitis, asthma, drop- sies, whooping-cough.	1-5-10 (.06-3-6 Gm.).
<i>Smilacaceae</i> 1. Sarsaparilla. 2. Sarsaparilla.	Smilax: medica, officinalis, ornata.	The dried root.	Trop. Amer- ica, Mexico.	Sarsasaponin, parillin, smilasaponin, volatile oil, resin, starch, Ca oxalate.	Fluidextr., comp. syr., comp. fluid- extr.	Alterative, diure- tic, diaphoretic, tonic.	Blood purifier in scrof- fulous diseases, syphilis, abscesses, ulcers.	30-120 (2-8 Gm.).
<i>Zingiberaceae</i> 1. Zingiber. 2. Ginger.	Zingiber officinale.	The dried rhizome.	India, Africa, Hindustan.	Volatile oil, gingerol, resin, starch, mucil- lage.	Fluidextr., syrup, tinct., ac. sulph. at., pulv. rhei comp.	Carminative, stim- ulant, stercorant, rheumatism, tooth- ache, headache, colic.	Dyspepsia, diarrhea, cholera, bronchitis, rheumatism, tooth- ache, headache, colic.	5-20 (3-13 Gm.).
1. Cardamomi Semen. 2. Cardamom Seed.	Elettaria Carda- momum.	The dried seed.	Malabar, India.	Volatile oil, fixed oil, starch, salts.	Tinct. tinct. co., ext. colicyn. co., tr. gent. co., tr. rhei.	Carminative, stim- ulant, aromatic, condiment.	As adjuvant or correc- tive to cordials, tonics, purgatives, flavoring.	5-15 (3-1 Gm.).
<i>Orchidaceae</i> 1. Vanilla. 2. Vanilla.	Vanilla planifolia.	Methylpro- tocatechuate aldehyde.	E. Mexico.	CaH ₄ O ₈.	.....	Carminative, stimulant, aphro- disiac, irritant.	Hysteria, flavoring agent.	1-1 (.01-.03 Gm.).
<i>Piperaceae</i> 1. Cubeba. 2. Cubeb.	Piper Cubeba.	The dried nearly full- grown un- ripe fruit.	Java, Suma- tra, Borneo, W. Indies.	Volatile oil, resin, eu- bebin, cubebic acid, fixed oil.	.....	Diuretic, stimu- lant, carmina- tive, irritant.	Gonorrhea, cystitis, bronchitis, catarrh, vesical irritability.	15-60 (1-4 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

RECAPITULATION TABLE No. 2—U. S. P. DRUGS AND PREPARATIONS.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Dose.
<i>Salicaceae</i> : 1. <i>Salicinum</i> . 2. <i>Salicin</i> .	<i>Salix</i> and <i>Populus</i> species.	A glucoside.	Europe, N. America.	$\text{C}_{12}\text{H}_{18}\text{O}_7$.	.....	Bitter, tonic, antiperiodic, antiseptic, antineuritic, anifertment.	Rheumatism, intermittents, coryza, neuralgia, diabetes, eczema, cancer, relieves pain.	Grains. 10-30 (6-2 Gm.).
<i>Fagaceae (Cupuliferae)</i> : 1. <i>Gallæ</i> . 2. <i>Nutgall</i> .	<i>Quercus infectoria</i> , + allied species.	The gall from young twigs.	Mediterranean Basin.	Tannin, gallic acid, mucilage, fat, resin, starch.	Oint., <i>Tannin</i> , glycerite, troch. acid.	Astringent, tonic.	Diarrhea, gleet, relaxed membranes, sore mouth, antidote to alkaloidal poisoning.	5-30 (3-2 Gm.).
<i>Ulmaceae</i> : 1. <i>Ulinus</i> . 2. <i>Ein</i> .	<i>Ulmus fulva</i> .	The dried inner bark.	N. America.	Mucilage, starch, tannin, bitter principle.	.....	Demulcent, emollient, nutritive.	Diarrhea, urinary affections, bronchitis, boils, fissures, strictures.	120-240 (8-15 Gm.).
<i>Moraceae</i> : 1. <i>Cannabis</i> . 2. <i>Cannabis</i> .	<i>Cannabis sativa</i> .	The dried pistillate flowering tops.	Asia, N. India, United States.	Cannabinol, Cannabin, choline, vol. oil.	Extract, fluidext.	Anodyne, nervine, sudorific, narcotic, aphrodisiac.	Neuralgia, gout, tetanus, chorea, hysteria, epilepsy, delirium tremens.	1-5 (0.5-3 Gm.).
<i>Santalaceae</i> : 1. <i>Oleum Santali</i> . 2. <i>Oil of Santal</i> .	<i>Santalum album</i> .	The volatile oil.	S. India, E. Indian Islands.	Santalol— $\text{C}_{15}\text{H}_{18}\text{O}$, santalal, $\text{C}_{15}\text{H}_{18}\text{O}$.	.....	Astringent, stimulant, diuretic.	Bronchitis, gonorrhea, cystitis, pyelitis, diarrhoea.	Minims. 5-20 (3-1.3 cc.).
<i>Aristolochiaceae</i> : 1. <i>Serpentaria</i> . 2. <i>Serpentaria</i> .	<i>Aristolochia</i> : <i>Serpentaria</i> , reticulata.	The dried rhizome and roots.	United States.	Volatile oil, aristolochine, resin, tannin, starch.	Tinct. cinch. co.	Stimulant, tonic, diaphoretic, antiperiodic.	Pneumonia, intermittents, dyspepsia, diphtheria.	Grains. 5-30 (3-2 Gm.).
<i>Polygonaceae</i> : 1. <i>Rheum</i> . 2. <i>Rhubarb</i> .	<i>Rheum</i> : officinale, palmatum, + varieties.	The dried rhizome and roots.	W. and C. China.	Resin, cathartic acid, vol. oil, chrysophanic acid, emodin, aloemodin, rheinolic acid, rhein, starch, mucotannic acid, Ca oxalate.	Extract., fluidext., syrup, pulv. comp. tinct., ar. tr., ar. syr.	Aperient, purgative, astringent, stomachic, tonic.	Diarrhea, hemorrhoids, chronic dysentery, thread-worms, bilious fever.	5-30 (3-2 Gm.).
<i>Chenopodiaceae</i> : 1. <i>Oleum Chenopodii</i> . 2. <i>Oil of Chenopodium</i> .	<i>Chenopodium ambrosioides</i> , var. antihelminticum.	The volatile oil.	W. Indies, C. and S. America.	Pinene, + $\text{C}_{10}\text{H}_{16}\text{O}$.	.....	Anthelmintic, vermifuge, roundworms.	Worms, intermittents, hysteria, chorea, nervousness, tetania.	Minims. 2-10 (13-6 cc.).
<i>Myristicaceae</i> : 1. <i>Myristica</i> . 2. <i>Myristica</i> .	<i>Myristica fragrans</i> .	The dried ripe seed (kernel) without seed-coat.	Moluccas (Spice Islands), India.	Volatile oil, fixed oil, starch, proteins.	Tr. lav. co., tr. rhod. ar., <i>Oil</i> : Sp. ammon. ar.	Stimulant, stomachic, condiment, flavoring, narcotic.	Flatulence, diarrhoea, nausea, colic, dyspepsia, carminative.	Grains. 5-20 (3-1.3 Gm.).
<i>Ranunculaceae</i> : 1. <i>Hydrastis</i> . 2. <i>Hydrastis</i> .	<i>Hydrastis canadensis</i> .	The dried rhizome and roots.	N. America.	Hydrastine, berberine, canadine, resin.	Fluidextract.	Alterative, tonic, aperient, antiperiodic, nervine.	Dyspepsia, costiveness, malaria, jaundice, catarrh, gonorrhea.	5-30 (3-2 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

1. <i>Cinchifuga</i> . 2. <i>Cinchifuga</i> .	<i>Cinchifuga</i> rose- mosa.	The dried rhizome and roots.	United States, Canada.	Cinchifugin, resins, vol. oil, fat, tannin.	Fluidextract.	Alternative, em- menagogue, sed- ative.	Bronchitis, rheumatism, amenorrhea, chorea, dyspepsia.	5-30 (3-2 Gm.).
1. <i>Aconitum</i> . 2. <i>Aconite</i> .	<i>Aconitum</i> Napel- lus.	The dried tuberous root.	Europe, Asia, N. America.	Aconitine, aconine, picroaconitine, pseudo- aconitine, resin, aco- nitic acid.	Tincture.	Sedative, anodyne, antipyretic, poi- son.	Stenic fevers, pericar- ditis, rheumatism, neu- ralgia, pneumonia.	1-2 (.06-13 Gm.).
<i>Berberidaceæ</i> : 3. <i>Podophyllum</i> . 2. <i>Podophyllum</i> .	<i>Podophyllum</i> peltatum.	The dried rhizome and roots.	N. America.	Resin (podophyllin— podophyllotoxin), starch, fixed oil.	Resin.	Cathartic, tonic, alterative.	Constipation, torpid liver, diarrhea, fevers, jaundice.	5-15 (3-1 Gm.).
<i>Menispermaceæ</i> : 1. <i>Calumba</i> . 2. <i>Calumba</i> .	<i>Jateorhiza palmata</i> (<i>calumba</i>).	The dried root.	E. Africa.	Calumbin, berberine, calumbic acid, resin, starch.	Tincture.	Tonic, stomachic, stimulant.	Dyspepsia, debility, re- mittent fevers, diar- rhea, phthisis.	5-30 (3-2 Gm.).
<i>Lauraceæ</i> : 1. <i>Cinnamomum</i> . 2. <i>Cinnamon</i> .	<i>Cinnamomum</i> Loureirii.	The dried bark.	Cochin China, Annam.	Volatile oil, tannin, sugar, mannite, starch.	Tr. card. co., tr. gambir. co., tr. rhei- lav. co., tr. rhei- ar., <i>Oil</i> : aqua spi- rit, inf. dig. mist. cret., syr. rhei., ar. sulph. ac.	Germicide, anti- spasmodic, cur- minative, stimu- lant, astringent, aromatic.	Parvuriot, flavoring, diarrhea, flatulence, nausea, menorrhagia.	5-30 (3-2 Gm.).
1. <i>Camphora</i> . 2. <i>Camphor</i> .	<i>Cinnamomum</i> Camphora.	The dextro- rotatory ketone.	China, Japan, Formosa.	$C_{15}H_{16}O$.	Aq. lin. spt. lin. alcohol, inf. spt., tr. opii camph.	Antispasmodic, stimulant, aro- matic, vine, diaphoretic, resolvent, anti- septic.	Hysteria, nervousness, diarrhea, colic, rheu- matism, tetanus, asthma, cough, ulcers, scabies.	1-5 (.06-3 Gm.).
1. <i>Oleum Sassafra</i> s. 2. <i>Oil of Sassafra</i> s.	<i>Sassafras vari-</i> folium.	The volatile oil.	N. America.	Safrol, pinene, eugenol, <i>d</i> -camphor.	Syr. sars. co.	Alterative, dia- phoretic, stimu- lant.	Skin diseases, rheuma- tism, syphilis.	Minims. 1-3 (.00-3 cc.).
<i>Papaveraceæ</i> : 1. <i>Opium</i> . 2. <i>Opium</i> .	<i>Papaver somnif-</i> erum, + var. al- bum.	The air-dried milky exu- dation.	W. Asia.	Morphine, narcotine, codaine, narcine, meconic acid, ethyl- morphine, apomor- phine, cotarine, etc.	Tg. tr. opii camph. pulv. ip. et opii, opium gran., opium pulv.	Narcotic, sedative, anodyne.	Diarrhea, peritonitis, cholera morbus coughs, rheumatism, etc.	1-2 (.06-13 Gm.).
<i>Cruciferae</i> : 1. <i>Sinapis Nigra</i> . 2. <i>Black Mustard</i> .	<i>Brassica nigra</i> , juncea.	The dried ripe seeds.	Asia, S. Europe.	Fixed oil, sinigrin, sin- apine sulphocyanide, n_2 , rosolin.	Emplast., vol. oil.	Stimulant, emetic, tonic, diuretic, expectorant, con- diment.	Dyspepsia, delirium tremens, dropsy, poi- son, rheumatism, gout, colic, headache, etc.	15-60 (1-4 Gm.).
<i>Hamanitidaceæ</i> : 1. <i>Stryax</i> . 2. <i>Stryax</i> .	<i>Liquidambar</i> : orientalis, <i>Strya-</i> ciflua.	The balsam.	Asia Minor, United States.	Styrol, styracin, phenyl- propyl cinnamate, cin- nam. benzo. acids, storsin, vanillin.	Tinct. benzoini comp.	Stimulant, expecto- rant, diuretic, antiseptic.	Bronchitis, catarrhs, gleet, phthisis, asthma, amenorrhea.	10-30 (6-2 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

RECAPITULATION TABLE No. 3—U. S. P. DRUGS AND PREPARATIONS.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Dose.
<i>Rosaceæ</i> : 1. Rosa. 2. Rose.	Rosa gallica.	The dried petals.	W. Asia.	Volatile oil, mucilage, tannin, quercitrin, sugar.	Fluidextract, aq. aq. fort., ung.	Tonic, mild astringent, carminative.	Hemorrhages, aphthae, ulcers, inflamed eyes, favoring, perturfery.	Grains, 15-60 (1-4 Gm.).
<i>Drupaceæ</i> : 1. Prunus Virginiana. 2. Wild Cherry.	Prunus serotina.	The stem bark.	N. America.	Amygdalin, emulsin, bit. prin., tannin, resin, gallic acid.	Syrup.	Sedative, pectoral, tonic, astringent.	Consumption, cough, scrofula, dyspepsia, debility, intermittents.	30-60 (2-4 Gm.).
1. Oleum Amygdale Amaræ. 2. Oil of Bitter Almond.	Amygdalus communis, var. amara.	The volatile oil.	W. Asia.	Benzaldehyde, hydrocyanic acid.	.....	Demulcent, nutritive, sedative.	Coughs, pulmonary affections, flavoring.	Minims. 4-1 (0.16-0.06 cc.).
1. Oleum Amygdale Expressum. 2. Expressed Oil of Almond.	Amygdalus communis, var. dulcis.	The fixed oil.	W. Asia.	Triglein, tripalmitin, trilinolein.	Ung. aq. rose.	Demulcent, nutritive.	Diabetes, confectionery.	Minims. 5-2 (30-60 cc.).
<i>Mimosaceæ</i> : 1. Acacia. 2. Acacia.	Acacia Senegal, +.	The dried gummy exudation.	E. and W. Africa.	Arabic acid, combined with Ca, Mg, K, sugar.	Mucil., emuls., pulv., creta co., pills, troches.	Demulcent, emollient, nutritive.	Coughs, gastritis, dysentery, hemorrhages, typhoid, emulsiher, expectant.	Grains, ad lib.
<i>Cesalpiniaceæ</i> : 1. Copaliba. 2. Copaliba.	Copaliba: One or more species.	The oleoresin.	Brazil.	Volatile oil, resin, bitter principle, copalvic acid.	.....	Diuretic, stimulant, expectorant, laxative.	Urinary affections, cystitis, bronchitis, hemorrhoids, dropsy, gonorrhea.	Minims. 10-60 (6-4 cc.).
1. Senna. 2. Senna.	Cassia: Senna, angustifolia.	The dried leaflets.	E. and C. Africa, India.	Anthruglucosamin, enodin, chrysophan, acid, isomodrin, stannin, rhamnetin, sennanigrin.	Fluidextract, syr., pulv., glycyrr. co.	Cathartic.	Constipation, hemorrhoids, fissures, fever.	Grains, 5-30 (2-12 Gm.).
<i>Krameriaceæ</i> : 1. Krameria. 2. Krameria.	Krameria: triandra, argentea.	The dried root.	Peru, Bolivia, Brazil.	Kramero-tannic acid, rhamtanic acid, rhamnine.	Tincture.	Astringent, tonic.	Diarrhea, hemorrhage, gleet, sore throat, gums, eyes, nose.	5-30 (3-2 Gm.).
<i>Papilionaceæ</i> : 1. Tolu. 2. Tolu.	Toluidra Balsaminum.	The balsam.	S. America.	Resin, volatile oil, cinna- and benzoe acids, vanillin.	Syrup, tincture, fluid, balsamini comp., pills.	Stimulant, expectorant, vulnerary.	Bronchitis, catarrhs, flavor, perfumery.	5-30 (3-2 Gm.).
1. Balsamum Peruvianum. 2. Balsam of Peru.	Toluidra Pereira.	The balsam.	C. America.	Cinnamene (vol. oil), resin, cinnamic, and benz. acids, vanillin.	.....	Stimulant, expectorant, vulnerary, stomacheic.	Catarrhs, phthisis, gonorrhea, rheumatism, ulcers, eczema, scabies.	Minims. 5-30 (3-2 cc.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

1. <i>Tragacantha</i> . 2. <i>Tragacanth</i> .	<i>Astragalus gum- mifer</i> , +.	The dried gummy exudation.	W. Asia.	Bassorin, calcium, com- pound of a gummy acid starch.	Mucilage.	Demulcent, nutritious, expectorant.	Coughs, protective, ex- pectant to pills and troches.	Grains. 5-30 (3-2 Gm.).
1. <i>Glycyrrhiza</i> . 2. <i>Glycyrrhiza</i> (Licorice Root).	<i>Glycyrrhiza glabra</i> , var. <i>typica</i> , and <i>glandulifera</i> .	The dried rhizome and root.	S. Europe, W. Asia.	Glycyrrhizin, glycyrr- anarin, asparagin, resin, starch, tannin.	Ext., tro. am. cl., fifext. cas. sag. ar., fident., elix., mist., glyc. co., syr. sars. co., pulv. glyc. co., mass. hyd.	Demulcent, expectorant, laxative.	Catarrhs, bowel and urinary affections, coughs, colds.	15-60 (1-4 Gm.).
1. <i>Santalum Rubrum</i> . 2. Red Saunders.	<i>Pterocarpus san- talinus</i> .	The heart- wood.	S. Asia, Madras.	Santalol, santal, ptero- carpin, homoptero- carpin.	.....	Astringent.	Dyeing, for coloring tinctures, ointments, etc.	
1. Kino. 2. Kino.	<i>Pterocarpus Mar- supium</i> .	The dried juice.	E. Indies.	Kino-tannic acid, kino- red, pyrocatechin, kinoal., gum.	Tincture.	Astringent, tonic, hemostatic.	Diarrhea, menorrhagia, leucorrhoea, ulcers, sore throat.	5-20 (3-1.3 Gm.).
1. <i>Chrysarobinum</i> . 2. <i>Chrysarobin</i> .	<i>Vouacarpoua</i> <i>Araoba</i> .	A mixture of neutral principles.	Brazil.	$C_{20}H_{32}O_7$.	Ointment.	Irritant—exter- nally.	Parasites, ringworm, psoriasis, eczema, hemorrhoids.	.008 Gm.). ‡
1. <i>Physostigmine</i> <i>Salicylas</i> . 2. <i>Physostigmine</i> <i>Salicylate</i> .	<i>Physostigma ven- enosum</i> .	The alkali- loidal salt from seed.	W. Africa.	$C_{16}H_{24}O_4Na_2C_2H_5O_4$.	.....	Sedative, myotic, poisonous, emetic, purg., diaphoretic.	Tetanus, paralysis, chorea, gastralg., con- vuls., strychn. and arrop. poisoning.	‡ 1/100-1/50 (.005- .001 Gm.).
<i>Linaceae</i> : 1. <i>Linum</i> . 2. Linseed (Flaxseed).	<i>Linum usitatissi- mum</i> .	The dried ripe seed.	Levant, S. Europe (United States).	Fixed oil, mucilage, proteins, amygdalin, resin.	Oil: Soft soap, lin. s. s., lin. s. s. co.	Demulcent, emol- lient, diuretic.	Internal inflammations, catarrh, dysentery.	60-120 (4-8 Gm.).
1. <i>Oleum Lini</i> . 2. Linseed Oil.	.....	The fixed oil.	.....	Linolein, glycerides of palmitin, myristin, and olein.	Lin. cal., liq. cresol. co.	Demulcent, laxa- tive.	Piles, erysipelas.	Minims 240-960 (15-60 cc.).
<i>Erythroxylaceae</i> : 1. Cocaine. 2. Cocaine.	<i>Erythroxylon</i> <i>Coca</i> .	The alkaloid from leaves.	S. America (Peru, Bo- livia).	LEAVES: Cocaine, hygrine, benzoyl- ecgonine, cinnamyl- cocaine, truxilline, tannin.	Cocaine hydro- chloride.	Stimulant, tonic, diaphoretic, nar- cotic, anesthetic.	Wasting diseases, con- valesc., stomatitis, bronchi., surgery.	Grains. 1/2-2 (.008-13 Gm.).
<i>Rutaceae</i> : 2. <i>Buchu</i> . 2. <i>Buchu</i> .	<i>Barosma: betulina</i> , <i>crenulata</i> , <i>serra- tfolia</i> .	The dried leaves.	S. Africa.	Volatile oil, barosmin, diosphenol, resin.	Fluidextract.	Diuretic, stimu- lant, tonic, dia- phoretic.	Urinary troubles, blad- der catarrh, etc., feeble digestion.	15-30 (1-2 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

RECAPITULATION TABLE No. 4—U. S. P. DRUGS AND PREPARATIONS.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Dose.
Rutaceae: 1. <i>Pilocarpine Hydrochloridum</i> . 2. <i>Pilocarpine Hydrochloride</i> .	<i>Pilocarpus</i> : <i>Jaborandi</i> , <i>microphyllus</i> .	The alkaloidal salts from the leaves.	S. America (Brazil).	$\text{CuH}_{10}\text{O}_2\text{N}_2\text{HCl}$ $\text{CuH}_{10}\text{O}_2\text{N}_2\text{HNO}_3$	.....	Diaphoretic, sialagogue, myotic, emetic, cardiac depressant.	Dropsy, rheumatism, pleurisy, coryza, Bright's disease, eye affections.	Grains. $\frac{1}{4}$ – $\frac{1}{2}$ (.008–.03 Gm.).
1. <i>Pilocarpine Nitras</i> . 2. <i>Pilocarpine Nitrate</i> .	<i>Citrus Aurantium</i> (var. <i>amara</i>).	The dried fruit of unripe fruit.	N. India.	Volatile oil (naringin, hesperidin, tannin, resins. <i>Oil</i> : limonene, geraniol, anthranilate.	Tinct., tr. cinch. co., tr. gent. co. (<i>Oil aur. flo.</i>); aqua, syr.	Stimulant, tonic, carminative, stomachic, flavor.	Indigestion, flatulence, corrigent to purgatives.	15–30 (1–2 Gm.). oil. m–5 (06–3 cc.).
1. <i>Aurantii Amari Cortex</i> . 2. <i>Bitter Orange Peel</i> .	<i>Citrus Aurantium</i> , var. <i>sinensis</i> .	The fresh flowers.		Volatile oil, bitter principle, hesperidin.	Syr., tinct., <i>Oil</i> sp. auranth. comp., ammoniac. at., liq. mag. cit.	Stimulant, stomachic, flavor.	Indigestion.	Grains. 30–40 (2–4 Gm.).
1. <i>Aurantii Dulcis Cortex</i> . 2. <i>Sweet Orange Peel</i> . 1. <i>Limonia Cortex</i> . 2. <i>Lemon Peel</i> .	<i>Citrus medica</i> , var. <i>Limonium</i> .	The outer rind of yellow, ripe fruit.	N. India.	Picrosmin (quassin), resin, alkaloid, mucilage.	.....	Tonic, febrifuge, antihelmintic, bitter.	Dyspepsia, diarrhea, constipation, loss of appetite.	15–60 (1–4 Gm.).
Samarubaceae: 1. <i>Quassia</i> . 2. <i>Quassia</i> .	<i>Picrosma excelsa</i> , <i>Quassia amara</i> .	The wood.	W. Indies, Surinam.	Volatile oil, resin, gum, bitter principle.	Tincture.	Stimulant, tonic, expectorant, mucousagogue, urinary.	Dyspepsia, amenorrhea, menstrual irregularities, dysuria, ulcers, disinfecant.	5–30 (3–2 Gm.).
Burseraceae: 1. <i>Myrrh</i> . 2. <i>Myrrh</i> .	<i>Commiphora</i> Myrrh, or other species.	The gum-resin.	E. Africa.	Senegin, polygalic acid, fixed oil, vol. oil, resin, pectin, malates.	Fluidextract, syrup, squill comp.	Expectorant, diuretic, diaphoretic.	Bronchitis, croup, asthma, renal dropsy, rheumatism, pneumonia, amenorrhea.	5–30 (3–2 Gm.).
Polygalaceae: 1. <i>Senega</i> . 2. <i>Senega</i> .	<i>Polygala Senega</i> .	The dried root.	United States.	Glycerides of stearic, lauric, myristic, lauric, oleic, formic, acetic, tiglinic, valeric acids, crotonol, croton-resin, crotonolic acid.	.....	Powerful purgative, irritant, rubefacient.	Mania, constipation, dysuria, dropsy, emery paralysis, rheumatism, swellings, pneumonia, ovaritis, pleurisy.	Minims. $\frac{1}{2}$ –2 (.02–.15 cc.).
Euphorbiaceae: 1. <i>Oleum Tiglli</i> . 2. <i>Croton Oil</i> .	<i>Croton Tiglium</i> .	The fixed oil expressed from seeds.	India, Philippine Islands.	Tricinolein, palmitin, ricinoleic acid.	.....	Purgative, demulcent.	Constipation, colic, diarrhea, enteritis, worms, fevers, calculi, amenorrhea, cystitis, gonorrhea.	60–480 (4–30 cc.).
1. <i>Oleum Ricini</i> . 2. <i>Castor Oil</i> .	<i>Ricinus communis</i> .	The fixed oil from seeds.	India, Europe.					

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<i>Anacardiaceae:</i> 1. <i>Rhus Glabra</i> . 2. <i>Rhus Glabra</i> .	<i>Rhus glabra</i> .	The dried ripe fruit.	N. America.	Acid Ca, and K, malates, tannin, fixed oil.	Fluidextract.	Astringent, reifrigrant, diuretic.	Stomach catarrh, tonsillitis, spongy gums, aphthae, ulcers, wounds.	Grains. 30-60 (2-4 Gm.).
<i>Rhamnaceae:</i> 1. <i>Cassia Sadrada</i> . 2. <i>Cassia Sadrada</i> .	<i>Rhamnus Purshiana</i> .	The dried bark.	Western U. States.	Emodin, isomodulin, resin, vol. oil, rhannol, ferment.	Fluidextract, extract, aro. fluid-extract.	Purgative, tonic, febrifuge.	Constipation, dyspepsia, hemorrhoids.	15-60 (1-4 Gm.).
<i>Malvaceae:</i> 1. <i>Althaea</i> . 2. <i>Althaea</i> .	<i>Althaea officinalis</i> .	The dried root.	Europe, W. N. Asia, United States.	Asparagin, mucilage, starch, pectin.	Mas. hydrarg., pil. ferri carb., pil. phosphori.	Demulcent, emollient, protective.	Inflammations: pulmonary, digestive, urinary tracts, skin eruptions, absorbent.	30-60 (2-4 Gm.).
1. <i>Gossypium Purificatum</i> . 2. Purified Cotton.	..... <i>Gossypium herbaceum</i> , +	The hairs of the seed. The refined fixed oil.	C. Asia, Africa, S. America.	Cellulose, fixed oil, inorganics.	Pyroxilin, colloidion, flex. colloidion.	Protective.	Dressing to burns, surgical wounds, etc.	Minims. 120-480 (8-30 cc.).
<i>Sterculiaceae:</i> 1. <i>Oleum Theobroma</i> . 2. Oil of <i>Theobroma</i> .	<i>Theobroma Cacao</i> . <i>Thea sinensis</i> .	The fat from roasted seeds. The gum resin.	S. America.	Olein, palmitin, linolein, linoleic acid.	Soft soap, lins. s. soap, camph.	Demulcent, nutrient.	For olive, almond oil, liniments.	Grains. 30-60 (2-4 Gm.).
<i>Guttiferae:</i> 1. <i>Camboja</i> . 2. <i>Gamboge</i> .	<i>Garcinia Hanburyi</i> .	The gum resin.	Camboja, Annam, Siam.	Stearin, palmitin, lauric glycerides, formic acetic, butyric, linoleic acids.	.....	Demulcent, emollient, nutrit.	Abraded surfaces, base for suppositories, ointments.	Grains. 30-60 (2-4 Gm.).
<i>Flacourtiaceae:</i> 1. <i>Oleum Chaulmoogra</i> . 2. <i>Chaulmoogra Oil</i> .	<i>Taraktogenos Kurzii</i> , + <i>Punica Granatum</i> .	The fixed oil. The dried bark of stem and root.	S. Asia, India, Siam. S. W. Asia, India.	Gum, resin, (cambojic acid), vol. oil. Chaulmoogric and hydrocarpic acids, palmitin, linolein.	Pil. hydrarg. chlor. mit. co. Ethyl Chaulmoograte.	Drastic, hydragogue cathartic. Alterative, germicide, antiseptic, blood-purifier.	Liver and kidney diseases, veruitage, dropsy. Leprosy, sores, wounds, sprains, bruises.	1-5 (0.3-3 Gm.). Minims. 5-30 (.3-2 cc.).
<i>Lythraceae:</i> 1. <i>Granatum</i> . 2. <i>Pomegranate</i> .	<i>Punica Granatum</i> .	The dried bark of stem and root.	S. W. Asia, India.	Punico-tannic acid, pelletterine, maninite, gum, pectin.	Fluidextract, pelletterine tannate.	Anthelmintic, febrifuge, astringent.	Tape- and lumbricoid worms.	Grains. 30-120 (2-8 Gm.).
<i>Myrtaceae:</i> 1. <i>Caryophyllus</i> . 2. <i>Clove</i> .	<i>Caryophyllus aromaticus</i> .	The dried flower-buds.	Molucca (Clove) Islands.	Volatile oil, tannin, gum, resin, caryophyllin, vanillin, eugenol.	Tinct. lavender. comp. tinct. rhei ar., Oil, eugenol.	Stimulant, stomachic, antispasmodic, rubefacient.	Nausea, colic, condition, rheumatism, neuralgia, toothache.	5-10 (3-6 Gm.).
1. <i>Oleum Cajuputi</i> . 2. Oil of <i>Cajuput</i> .	<i>Melaleuca Leucadendron</i> .	The volatile oil.	E. India Islands.	Cineol, terpineol, <i>l-pinen</i> , <i>valer.</i> , benz. aldehydes.	.....	Carmenative, stimulant, diaphoretic, rubefacient.	Rheumatism, stomach, bowel troubles, colic, toothache, bronchitis, dysmenorrhea.	Minims. 2-10 (13-6 cc.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

RECAPITULATION TABLE No. 5—U.S.P. DRUGS AND PREPARATIONS.

Family (Nat. order). 1. Latin official name 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses.
<i>Myrtaceae</i> : 1. <i>Eucalyptus</i> . 2. <i>Eucalyptus</i> .	<i>Eucalyptus globulus</i> .	The dried, stem-shaped leaf.	Australia.	Volatile oil, tannin, carylic alcohol, eucalyptic acid, 3 resins.	Fluidextract, oil, eucalyptol.	Antiperiodic, stimulant, astringent, antiseptic, diaphoretic.	Intermittents, malaria, urinary, pulmonary troubles, bronchitis, hemorrhages, gleet, ulcers.	Grains. 15-60 (1-4 Gm.).
<i>Umbelliferae</i> : 1. <i>Oleum Coriandri</i> . 2. Oil of Coriander.	<i>Coriandrum sativum</i> .	The volatile oil from dried ripe fruit.	C. Asia, S. Europe.	<i>Oil</i> : <i>d</i> -pinene, geraniol, linalool.	.....	Aromatic, carminative, stimulant, stomachic.	Indigestion, flatulence, flavoring, rheumatism.	Minims. 2-5 (13-.3 cc.).
1. <i>Carum</i> . 2. Caraway.	<i>Carum Carvi</i> (Carui).	The dried ripe fruit.	C. and W. Asia.	Volatile oil, fixed oil, resin, sugar, gum, tannin.	Tr. card. co., <i>Oil</i> .	Stimulant, carminative, diuretic, stomachic.	Colic, flatulence, flavoring, toothache.	Grains. 10-30 (6-2 Gm.).
1. <i>Oleum Anisi</i> . 2. Oil of Anise.	<i>Pimpinella Anisum</i> , <i>Illicium verum</i> .	The volatile oil from dried ripe fruits.	W. Asia, S. E. Europe.	<i>Anethol</i> , <i>d</i> -pinene, <i>d</i> -phellandrene, safrol.	<i>Oil</i> : <i>Al</i> , <i>spt.</i> , <i>spt. aurant.</i> co., <i>syr. sars.</i> co., <i>fl. ext.</i> cas. <i>sag.</i> ar., <i>tr. opi</i> camph.	Stimulant, carminative, stomachic, aromatic.	Colic, flatulence, bronchitis, catarrhs, flavoring.	Minims. 2-5 (13-.3 cc.).
1. <i>Oleum Foeniculi</i> . 2. Oil of Fennel.	<i>Foeniculum vulgare</i> .	The volatile oil from dried ripe fruit.	S. Europe, W. Asia.	<i>Anethol</i> , pinene, phellandrene, dipentene.	<i>Oil</i> : <i>Aqua</i> , <i>pulv. glycyrr.</i> co.	Carminative, stimulant, galactagogue.	Nausea, colic, amenorrhea, flatulence; increases secretions.	2-5 (13-.3 cc.).
1. <i>Asafoetida</i> . 2. <i>Asafoetida</i> .	<i>Ferula Asafoetida</i> , <i>foetida</i> .	The gum-resin.	Persia, Turkistan.	Gum, resin, vol. oil, vanillin, ferulic acid, asaric acid, tannol.	Emulsion, pill, tinct.	Stimulant, antispasmodic, laxative, emmenagogue.	Hysteria, spasms, asthma, catarrhs, chorea, consumption, flatulence.	Grains. 3-10 (2-.6 Gm.).
<i>Ericaceae</i> : 1. <i>Methyl Salicylas</i> . 2. Methyl Salicylate.	<i>Gaultheria procumbens</i> , <i>Betula lenta</i> .	An ester (compd. ether).	N. America.	$\text{CH}_3\text{C}_6\text{H}_4\text{O}_2$.	<i>Emul.</i> ol. morrh., <i>fl. ext.</i> cas. <i>sag.</i> ar., <i>syr. sars.</i> co. flavoring.	Antiseptic, analgesic, carminative, stimulant, flavoring.	Rheumatism, migraine, sciatica, lumbago.	Minims. 1-10 (66-.6 cc.).
1. <i>Uva Ursi</i> . 2. <i>Uva Ursi</i> .	<i>Arctostaphylos Uva-ursi</i> .	The dried leaves (leaf).	Europe, Asia, N. America.	Tannin, gallic acid, arbutin, ericic acid, ursic acid.	Fluidextract.	Astringent, diuretic, tonic, nephritic.	Cystitis, gravel, gleet, menorrhagia, bronchitis, diarrhea.	Grains. 15-60 (1-4 Gm.).
<i>Styracaceae</i> : 1. <i>Benzoinum</i> . 2. Benzoin.	<i>Styrax Benzoin</i> , +.	The balsamic resin.	Sumatra, Java, Borneo, Siam.	Benzoin and cinnamic acids, resin, volatile oil, vanillin.	Benzoinated lard, tinct., tinct. benz. co., benzoic acid.	Stimulant, expectorant, antiseptic, diuretic.	Laryngitis, diarrhea, wounds, coryza, ulcers.	5-30 (3-2 Gm.).
<i>Oleaceae</i> : 1. <i>Nanna</i> . 2. <i>Nanna</i> .	<i>Fraxinus Ornus</i> .	The dried (saccharine) exudation.	Mediterranean Basin.	Mannite, glucose, sucrose, resin, fraxin, mucilage.	Laxative, demulcent, expectorant, cholagogue.	Piles, urinary irritation, to evacuate bowels of children, etc.	60-480 (4-30 Gm.).

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1. <i>Oleum Olivæ.</i> 2. Olive Oil.	<i>Olea europæa.</i>	The fixed oil.	Asia, S. Europe.	Olein, linolein, palmitin, arachin, phytosterin.	Emp. plumb. oleat. ext. colocy. co., pl. aloes, pl. assaf.	Nutrient, laxative, demulcent, pro-tective.	Constipation of infants, gall-stones, bruises, sprains, wounds, ascari- des, lubrication.	Minims. 60-180 (4-30 cc.).
<i>Loganiaceæ:</i> 1. <i>Nux Vomica.</i> 2. <i>Nux Vomica.</i>	<i>Strychnos Nux- vomica.</i>	The dried ripe seed.	India, E. India Islands.	Strychnine, brucine, isostrychnine, isostrychnine, fat.	Extract, tincture, strychnine: nitrate, sulphate.	Spinal nerve- tonic, poisonous.	Atonic dyspep., nervousness, anemia, paralysis, lead palsy, tetanus, chorea, epilepsy.	Grains. ½-5 (.03-.3 Gm.).
<i>Gentianaceæ:</i> 1. <i>Gentiana.</i> 2. <i>Gentian.</i>	<i>Gentiana lutea.</i>	The dried rhizome and roots.	C. and S. Europe.	Gentiopicrotin, genti- in, gentiogenin, genti- anose fixed oil, pectin, resin.	Tinct. gent. comp.	Tonic, bitter.	Increases digestion, amenorrhea, dyspep- sia, intermittents.	5-30 (.3-2 Gm.).
<i>Apocynaceæ:</i> 1. <i>Strophanthus.</i> 2. <i>Strophanthus.</i>	<i>Strophanthus</i> : <i>Kombé, hispidus.</i>	The dried ripe seed.	Africa, Asia.	Strophanthin, choline, trigonelline, strophan- the acid, fixed oil.	Tincture.	Heart stimulant, diuretic.	Bright's disease, heart palpitation, endocar- ditis, asthma, dropsy.	½-1 (.008-.03 Gm.).
<i>Convolvulaceæ:</i> 1. <i>Jalapa.</i> 2. <i>Jalap.</i>	<i>Exogonium Jalapa.</i>	The dried tuberous root.	E. Mexico.	Resin (jalapin and jalapurgin), starch, gum.	Comp. powder, resin, pl. hg. chlor. mit. co.	Hydragogue cathartic, diu- retic.	Constipation, dropsy, fevers, inflammations, head affections.	5-20 (.3-1.3 Gm.).
1. <i>Ipomea.</i> 2. <i>Ipomea.</i>	<i>Ipomea oriza- bensis.</i>	The dried root.	Mexico.	Resin, starch, gum, tan- nin.	Resin. extract. colocyn. co.	Hydragogue cathartic.	Dropsies, cerebral affec- tions.	10-30 (.6-2 Gm.).
<i>Hydrophyllaceæ:</i> 1. <i>Eriodictyon.</i> 2. <i>Eriodictyon.</i>	<i>Eriodictyon cali- fornicum.</i>	The dried leaves (leaf).	California.	Volatile oil, resin, eriodictyol, phenol, triacontane, tannin.	Fluidextract.	Expectorant, bil- ter tonic, stimu- lant.	Bronchitis, asthma, to disguise quinine taste.	30-60 (2-4 Gm.).
<i>Labiata:</i> 1. <i>Oleum Rosmarini.</i> 2. Oil of Rosemary.	<i>Rosmarinus offic- nalis.</i>	The volatile oil.	S. Europe, Med. Basin.	Pinene, camphor, bor- neol, cineol.	Soap liniment, tinct. lavender comp.	Carminative, stim- ulant, diuretic, diaphoretic.	Colic, nervousness, menstrual derange- ments, rheumatism, sprains.	Minims. 1-5 (.06-.3 cc.).
1. <i>Oleum Lavandule.</i> 2. Oil of Lavender.	<i>Lavandula spica.</i>	The volatile oil.	S. Europe.	Terpene, $C_{10}H_{16}$, geraniol, linalool, $C_{10}H_{18}O$.	Spirit, comp. tinct., Fowler's sol., lin. ssp. mol., sp. am. aro., ung. pb. oil.	Stimulant, carmin- ative, nervine, errhine.	Gastralgia, nausea, headache, flatulence, perfumery.	1-5 (.06-.3 cc.).
1. <i>Thymol.</i> 2. <i>Thymol.</i>	<i>Thymus vulgaris.</i>	Phenolin vol- atile oil.	S. Europe.	$C_{10}H_{18}O$.	.....	Stimulant, tonic, emmenagogue, antispasmodic, antiseptic.	Chlorosis, rheumatism, neuralgia, bronchitis, diarrheæ, gleet, vesical catarrh.	Grains. 1-5 (.06-.3 Gm.).
1. <i>Mentha Viridis.</i> 2. Spearmint.	<i>Mentha spicata (viridis).</i>	The dried leaves and tops.	Europe, N. America.	Volatile oil, resin, tan- nin, gum.	Spirit, Oil: water, spirit.	Carminative, stim- ulant, nervine.	Cholera infantum, culi- nary and confectionery purposes, perfume.	30-60 (2-4 Gm.).
1. <i>Mentha Piperita.</i> 2. Peppermint.	<i>Mentha piperita.</i>	The dried leaves and tops.	Asia, Europe, N. America.	Volatile oil, resin, tan- nin, gum.	Spirit, Oil: water, spirit.	Carminative, stim- ulant, nervine, antispasmodic.	Flatulence, colic, nausea, headache, dysmenor- rhea, rheumatism, toothache.	15-60 (1-4 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

RECAPITULATION TABLE No. 6—U.S.P. DRUGS AND PREPARATIONS.

Family (Nat. order). 1. Latin official name. 2. Eng. official name.	Botanic source.	Part official.	Habitat.	Constituents.	Official preparations.	Medicinal properties.	Medicinal uses.	Doses.
Solanaceæ: 1. Capsicum. 2. Capsicum.	Capsicum frutescens.	The dried ripe fruit.	S. and C. America.	Capsaicin, fixed oil, volatile oil, resin, capsaicine.	Oleoresin, plaster, tincture.	Stimulant, spasmolytic, rubefacient.	Dyspepsia, colic, cholera, diphtheria, meningitis, rheumatism, relaxed uvula.	Grains. 1-2 (06-3 Gm.).
1. Belladonna Folia. 2. Belladonna Leaves.	Atropa Belladonna.	The dried leaves and tops.	C. and S. Europe.	Atropine, belladonnine, hyoscyamine, scopalamine, atropamine, atrosin, malic acid, starch, homatropine.	Extract (pil., pow.), plaster, ointment, fluidext., tinct.	Sedative, narcotic, mydriatic, antispasmodic, anodyne.	Rheumatism, neuralgia, sciatica, cancer, meningitis, erysipelas, asthma, coughs, spasms, scarlet fever, abscesses, eczema, phthisis.	$\frac{1}{2}$ -3 (03-2 Gm.).
1. Belladonna Radix. 2. Belladonna Root.	.....	The dried root.	.....	.....	Fluidextract, atropine, atrop. sulph.	.....	.....	$\frac{1}{2}$ -2 (03-13Gm.).
1. Hyoscyamus. 2. Hyoscyamus.	Hyoscyamus niger.	The dried leaves (leaf), with or without tops.	Europe, Asia.	Hyoscyamine, scopalamine (hyoscine), choline, hyoscyperin, KNO ₃ .	Extract, fluidextract, tincture, hyoscyamine hydrobrom., scopalamine hydrobrom.	Anodyne, hypnotic, narcotic, mydriatic, laxative, carminative.	Mania, insomnia, insanity, coughs, colics, paralytic tremors, bladder trouble, constipation, chorea, tetanus.	2-10 (13-6 Gm.).
1. Stramonium. 2. Stramonium.	Datura Stramonium.	The dried leaves and flowering tops.	Asia, nat. universally.	Daturine, vol. oil, mucilage, albumin, KNO ₃ .	Extract (pil., pow.), tincture.	Narcotic, anodyne, antispasmodic, diuretic, mydriatic.	Insanity, epilepsy, asthma, whooping-cough, rheumat., dysmenorr., chorea, sprains, ulcers, hemorrhoids.	1-5 (06-3 Gm.).
Scrophulariaceæ: 1. Digitalis. 2. Digitalis.	Digitalis purpurea.	The dried leaves (leaf).	W. and C. Europe.	Digitalisin, digitofolin, gitalin, digitonin, digitosaponin, enzymes; vol. oil, digitalin.	Infusion, tinct.	Cardiac tonic, vasomotor stimulant, sedative, narcotic, diuretic, emetic.	Feeble heart, renal dropsy, anasarca, edema, delirium, moribund, orrhaag., epilep., enlarged glands.	1-2 (06-13Gm.).
Rubiaceæ: 1. Cinchona. 2. Cinchona.	Cinchona: succirubra; Ledgeriana, Calceya.	The bark.	S. America, Java, India, Ceylon.	Quinine, quinidine, cinchonine, cinchonidine, quinine, cinchonine, cinchonidine, cinchononic acids, cinchona-red, vol. oil, resin.	Fluidext., tinct., tinct. cinch. co., alkaloids and salts	Tonic, antiperiodic, antispasmodic, antipyretic, febrifuge, astringent.	Dyspepsia, convalescence, gastritis, asthma, bronchitis, intermitten., typhoid pneumonia, neuralgia, erysipelas.	15-60 (1-4 Gm.).

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM

1. Gambir. 2. Gambir.	Ourouparia Gambir.	Dried aqueous extract of leaves, twigs.	E. India Islands.	Tannic acid, catechin. $C_{50}H_{10}O_{25}N_4H_2O$.	Tinct. co.	Astringent, tonic.	Diarrhea, leucorrh- pitis, gonorrhitis, relaxed uvula, dysent.	5-30 (3-2 Gm.).
1. Caffeina. 2. Caffeine. 3. Tinct. 4. Tea.	Coffea arabica. Thea sinensis.	Feeble basic alkaloid (alkaloid) from seeds (1), leaves (2).	Trop. Africa. S. E. Asia.	Emetine, cepha line, psychotrine, emetrol- idine (kryptamine), theanine, theacum- bic acid, resin.	Citrat. caffeine, caf. sod. benz.	Tonic, stimulant, nervine, anti- emetic, diuretic.	Nervous headache, diarrhea, phthisis, dropsy, gout, insomnia, fevers.	Caffeine 1-5 (0.6-3 Gm.).
1. Ipecacuanha. 2. Ipecac.	Cephaelis: Ipecacuanha, acuminata.	The dried rhizome and roots.	Brazil, Bolivia, Columbia.	Vol. oil, valeric, formic, acetic, malic acids, chaitine, tannin, resin.	Fluidext., syr., pulv. ip. et opi.	Emetic, expecto- rant, diaphoretic, nervine, hemostatic.	Catarh, croup, asthma, croup, dysentery, vom. of preg., cholera, ophthalmia.	1-20 (0.1-1.3 Gm.).
Valerianaceae: 1. Valeriana. 2. Valerian.	Valeriana officinalis.	Dried rhi- zome and roots.	Europe, N. Asia.	$C_{30}H_{50}O_8$.	Tincture, am. tinc- ture.	Stimulant, ano- dyne, nervine, antispasmodic, vermifuge.	Hysteria, nervous coughs, diabetes, delir- ium tre., typhoid, dys- menorrhea, epilepsy.	15-60 (1-4 Gm.).
Cucurbitaceae: 1. Elaterium. 2. Elaterin.	Elballium Ela- terium.	A substance from juice of fruit.	W. Asia, N. Africa, S. Europe.	Colocynthin, colocyn- thin, pectin, gum.	.....	Hydragogue cathartic.	Dropsy, brain and lung congestion, uremia.	$\frac{1}{2}$ - $\frac{1}{4}$ (.003-.006 Gm.).
1. Colocynthis. 2. Colocynth.	Citrullus Colocyn- this.	Dried pulp of unripe fully grown fruit.	Asia, Africa, S. Europe.	Fixed oil, resin, starch, proteins.	Extract, comp. extr., pil. hg. chlor. mit. co.	Cathartic, drastic, diuretic, emetic.	Evacuant, dropsy, apo- plexy, paralysis.	2-10 (.13-.6 Gm.).
1. Pepo. 2. Pepo.	Cucurbita Pepo.	The dried ripe seed.	Tropical Asia, Amer- ica.	Lobeline, inflatin, lobel- acrin, lobic acid, res- in, vol. oil.	.....	Tonifuge, vermi- fuge.	Tape and lumbricoid worms.	480-960 (30-60 Gm.).
Campanulaceae: 1. Lobelia. 2. Lobelia.	Lobelia inflata.	The dried leaves and tops.	N. America.	$C_{13}H_{15}O_5$.	Tincture.	Expectorant, emetic, nervine, purg., narcotic.	Spasmod. asth., catarh, bronch. spasms, whooping-cough.	1-20 (0.6-1.3 Gm.).
Compositae: 1. Santoninum. 2. Santonin.	Artemisia pauci- flora.	The inner anhydride of Santoni- nic acid from flowers.	N. Turkestan.	.....	.....	Anthelmintic, stimulant, em- menagogue.	Round and thread worms, incontinence of urine; eye affections.	$\frac{1}{4}$ - $\frac{1}{2}$ (.016-.26 Gm.).

PART I.

ORGANIC DRUGS FROM THE VEGETABLE KINGDOM.

SUB-KINGDOM I. **THALLOPHYTES**-A.

CELLULAR cryptogams, composed of one or many cells, with no differentiation of root, stem, or leaves, the thallus being without true woody fibers and vessels.

CLASS I. **ALGÆ.**

1. **GELIDIACEÆ. Red Seaweed Family.**

Ge-li-di-a'se-e. L. *Gelidium* + aceæ, fr. L. *gelus*, *gelidus*, cold, frozen—*i. e.*, plants boiled down to a jelly—hardened by cooling. Composed of many marine algæ, red, purple, violet, few green or black—chlorophyll being masked by red pigment, phycoerythrine, which forms a carbohydrate differing from starch. Thallus has great variety of forms and structure, usually with apical growth and distinction of stem and root; fronds cartilaginous, terete or compressed, much branched; cystocarps immersed in frond and contain spores attached to axile placenta; universal; demulcent, nutritious, alterative, aperient.

Genus: 1. **Gelidium.**

AGAR. AGAR, *U.S.P.*

Gelidium corneum (Hudson) Lamouroux, and other species, also closely related algæ.	{ The dried extracted mucilaginous substance, with not more than 1 p. c. foreign organic matter, yielding not more than 1 p. c. acid- insoluble ash and 16 p. c. moisture.
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Habitat. Japan, China, Malaysia, Ceylon; Atlantic Ocean, United States.

Syn. Agar-agar, Jelly Plant, Corsican (Worm) Moss, Crow-silk, Japanese (Chinese, Bengal, Ceylon) Isinglass, Vegetable Gelatin, Gelosine; Fr. Mousse de Chine; Ger. Wurmmoss, Wurm tang.

Ge-lid'i-um. L. see etymology, above of Gelidiaceæ.

Cor'ne-um. L. fr. *corneus*, hard, horny—*i. e.*, the tough fronds.

A'gar-A'gar—*i. e.*, fr. Malay *agar-agar*, Eastern name of Ceylon Moss or Bengal Isinglass.

PLANT.—Very similar to *Chondrus crispus* and *Gigartina mamillosa*, *Irish Moss*, but in reproduction the carpogonium gives rise to one or

GELIUMACEÆ

more elongated branched ooblastima filaments which fuse with one or more auxiliary cells, the sporangia being produced from the ooblastima filaments—not directly from the auxiliary cell (cells). AGAR occurs usually in bundles, 30–60 Cm. (1–2°) long, consisting of thin, translucent, membranous, agglutinated pieces, 4–10 Mm. ($\frac{1}{6}$ – $\frac{2}{5}$ ′) broad, yellowish-brownish-white, tough (damp), brittle (dry), insoluble in water, slowly soluble in hot water; solution in hot water (1 in 100)—stiff jelly upon cooling; odor slight; taste mucilaginous. POWDER, pale buff—in chloral hydrate T. S., fragments transparent, granular, striated, angular, occasionally frustules of diatoms. *Tests*: 1.—With iodine T. S., some fragments—bluish-black, with some areas—bright red. 2.—Aqueous-solution (1 in 100), made by boiling, upon cooling, +

tannic acid T. S.—no precipitate (abs. of gelatin), + iodine T. S.—not blue (abs. of starch). *Impurities*: Shells, incrusting Bryozoa, spicules, sand, gelatin, starch. *Solvent*: hot water. Dose, ʒj–2 (4–8 Gm.).

Commercial. — Seaweeds, collected by hand and rakes, May–August, are spread upon beach to dry and bleach in the sun, then pounded by hand, or passed through a concrete mortar-and-pestle battery (to remove adhering shells, frustules, spicules, sand, etc.), then alternately washed and sun-dried for several days until thoroughly bleached and cleansed—a process sometimes hastened by bleaching chemicals. It is now boiled, 3–5 hours, with water (1 in 50) in an iron kettle (to extract the gelose in soluble form), filtered

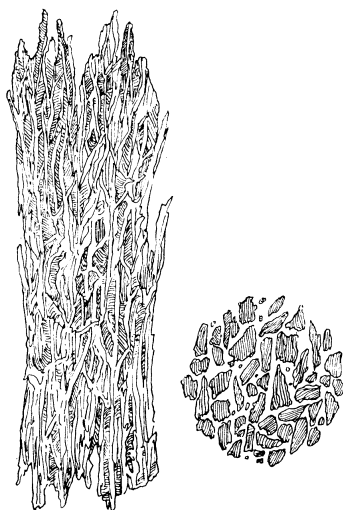


FIG. 1.—Agar; portion of sheet; granules.

through (1) coarse cloths and (2) squeezed through linen bags in a press (to separate from insoluble matter), and the filtered jelly poured into wooden trays, 2° long, 1° wide, 3′ deep, to cool and solidify into hard jelly (Japanese “tokoroten”), which is cut by sharp knives into blocks, 1° long, 2′ square, and pressed through coarse wire grating that divides them into bundles of slender straws. In this condition the “tokoroten” is subjected to low temperature,—5° —15° C. (23–5° F.), until sticks are frozen solid (to allow water to crystallize out), and then melted (to permit substances soluble in cold water to drain off in solution), thereby leaving pure gelose. Repeated freezing, thawing, and drying in the sun (open air) yields a pure agar insoluble in cold water. Sticks, before thoroughly dry, may be put through a forcing machine

that flattens each fine strip into a transparent sheet, which, after drying in the sun, are tied into bundles, $\frac{1}{2}$ –3 pounds; it is also prepared in sheets, 8–12' long, 1–1 $\frac{1}{2}$ ' wide, and in rectangular blocks, 8' long, 1' square. Our importation, 1920, was 240 tons, valued at \$500,000, which suggests our using *G. cartilagin'eum* and *G. aman'sii*, California coast, that yield a dry gelatin 28–30 p. c., of which a 2 p. c. solution makes a hard, elastic jelly, the equal of agar, that remains hard at 58° C. (137° F.), and does not begin to liquefy until 76° C. (170° F.).

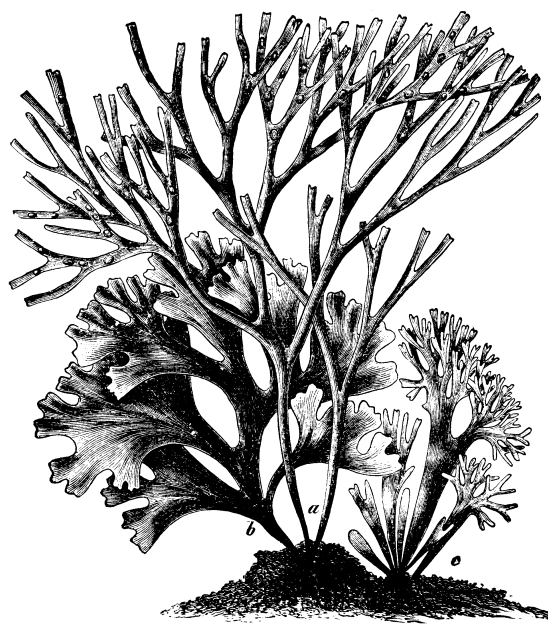


FIG. 2.—*Chondrus crispus*: a, narrow form, with fruit; b, broad form; c, small form.

CONSTITUENTS.—Gelose (*gel*(atin)+*ose*), amorphous gelatin-like carbohydrate 60–70 p. c., moisture 23 p. c., mineral salts, ash 4 p. c.; gelose heated with strong nitric acid yields mucic and oxalic acids; dissolved in acidulated water with heat—does not gelatinize on cooling.

PROPERTIES AND USES.—Demulcent, nutrient, aperient, emulsifier. In the United States chiefly in hospitals and bacteriological laboratories as a base for culture media, being superior to any substitute as it remains solid (other jellies useless—melting under requisite conditions), with a smooth, firm surface at the higher temperature required for cultivating certain species of bacteria. In chronic constipation (instead of mineral oil), the action depends on its property of absorbing and holding water, along with it becoming a lubricant and mild mechanical

GELIDIACEÆ

stimulant, unaffected by digestive enzymes or intestinal bacteria; action not violent, as ordinary cathartics, and leaves no harmful after-effects, being best when stools unduly dry. In Japan and China long esteemed as a food in making jellies and candy, thickening soups, ice cream, fruits, meats, fish, etc. It is a valuable dressing for wounds, and its emulsion for photographic plates is superior to that of ordinary gelatin. May be taken in granular powder, or emulsionized with mineral or other oils, or mixed with cereal, bread, biscuit, chocolate agar, etc. It is a poor substitute for sodium stearate in suppositories, as it absorbs only 70 p. c. of glycerin, and melts at higher than body temperature. Native "Kanten" and "Funori," from related algæ, are used to impart gloss to textiles, silk, stiffening linen (starch), decorating china, plastering walls, sizing, glue, etc. Dose, 3j-4 (4-15 Gm.).

Allied Plants:

1. *Chondrus crispus* or *Gigartina mamillosa*, *Irish Moss*, *Carrageen*, *N. F.*—Gigartinaceæ. The dried, bleached plants, with not more than 2 p. c. of foreign organic matter; Atlantic Ocean, New England, Irish coast. Entire plants small, matted together, slender dichotomously branching stalk; segments flattened, emarginate, cleft at tips, 5-15 Cm. (2-6') long, 1-10 Mm. ($\frac{1}{2}$ - $\frac{2}{3}$ ') broad, yellowish-white, transparent, somewhat cartilaginous, frequently coated with calcareous deposit which effervesces with hydrochloric acid; sporangia embedded (*C. crispus*) or on short stalks (*G. mamillosa*); odor slight, seaweed-like; taste mucilaginous, saline; solvent: water; contains mucilage (carrageenin—not precipitated by alcohol—gum, or by lead acetate—pectin, or blue with iodine—starch, only slightly adhesive) 55-90 p. c., minerals 14 p. c., albuminoids 9 p. c., water 18 p. c., ash 8-15 p. c. Demulcent, nutritive, dietetic; bronchitis, diarrhea, kidney and bladder affections—diet instead of tapioca, sago, barley. Plants green (fresh) or purplish (dry) are taken from the beach after storms, or are torn by boatmen with rakes from rocks, 3-6 M. (10-20°) under water, then washed in sea water and spread high on shore for drying and bleaching—a process frequently repeated several times. Dose, 3j-2 (4-8 Gm.); 1. *Mucilago Chondri*, 3 p. c.—emulsifier; Decoction, 5 p. c. (water or milk, sweetened and flavored), 3j-2 (30-60 cc.). *G. acicula'ris* and *G. pistilla'ta* have similar appearance and properties.

2. *Fucus vesiculosus*, *F. serratus*, *F. nodosus*, or *F. siliculosus*, *Fucus*, *Bladderwrack*, *N. F.*—The dried thallus with not more than 3 p. c. of foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; Atlantic Ocean; grows on muddy rocks and often floats to the shore. It is 1 M. (3°) long, or less, .5-4 Cm. ($\frac{1}{5}$ -1 $\frac{3}{5}$ ') broad, dichotomously branched, brownish-black, whitish incrustation, flat, smooth, entire or serrate, with or without stout midrib, with or without oval air-vesicles, single or pairs, apex of thallus occasionally swollen, numerous conceptacles; odor strongly seaweed-like; taste saline, nauseous. Powder, reddish-brown—polygonal and elongated cells, pseudo-parenchyma with thick mucilaginous walls; solvents: water,

diluted alcohol; contains organic matter (mainly mucilage with little mannite (fucose), fats, etc., 62 p. c., volatile oil (trace), moisture 22 p. c., ash 2.5–20 p. c.—K, Na, chlorides, bromides, iodides, phosphates, sulphates. Alternative; obesity, enlarged glands, goiter. Dose, $\bar{5}$ ss–2 (2–8 Gm.); 1. *Fluidextractum Fuci* (75 p. c. alcohol), dose, $\bar{5}$ ss–2 (2–8 cc.); Decoction, 5 p. c., $\bar{3}$ j–2 (30–60 cc.); Extract (alcoholic), gr. 5–10 (.3–.6 Gm.)

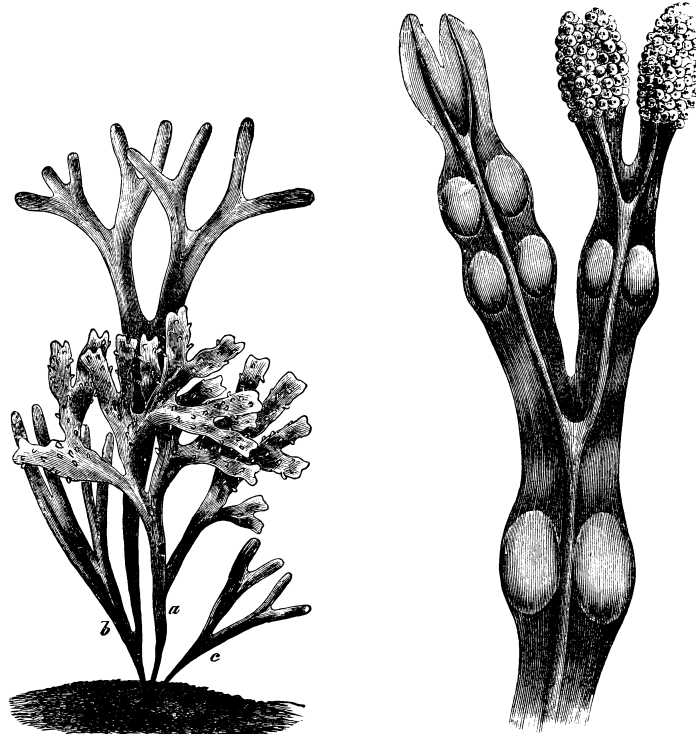


FIG. 3.—*Gigartina mamillata*: a, narrow form, with fruit; b, large form; c, small form.

FIG. 4.—*Fucus vesiculosus*: fruiting branch, natural size.

3. *Dulse* (*Halymenia* (*Fucus*) *palmarum* and *H. vaui*).—Atlantic and Mediterranean coasts; blood-red—when dry dark purple, fronds flat.

4. *Ceylon Moss*.—Indian Ocean. Mostly *Sphaerococcus lichenoides*, 10 Cm. (4') long, 1.5 Mm. ($\frac{1}{16}$ ') thick, cylindrical, forked, filiform above; reddish—when dry whitish, brittle.

5. *Corsican Moss*.—Mediterranean. A mixture of 20–30 different Algae species, mainly *Sphaerococcus* (*Fucus*) genus; these are yellowish-brown.

HYPOCREACEÆ

CLASS 2. FUNGI.

2. HYPOCREACEÆ. Flesh-consuming Family.

Hy-poc-re-a'se-e. L. fr. Gr. ὑπο, under, through, by, + κρέας, flesh—*i. e.*, some of the species live upon meat (caterpillars and other insects). Exist mostly upon dead organic matter, sometimes upon living plants and insects; rarely with chlorophyll, mycelium inconspicuous, frequently producing a dense homogeneous tissue; ascocarps complex and either open from the first or at a later period; conidium formation occurs in many ways both from the mycelium and stoma; temperate climates; hemostatic, ecboic, poisonous.

Genus: 1. **Claviceps**.

ERGOTA. ERGOT, U.S.P.

Claviceps purpurea, { The dried sclerotium, developed on rye plants
(Fries) Tulasne. { with not more than 5 p. c. seeds, fruits, or
other foreign organic matter.

Habitat. Eastern countries, Russia; cultivated in Spain, Germany, France.

Syn. Ergot of Rye, Spurred Rye, Cockspur Rye, Smut of Rye, Mother of Rye, Hornseed, Secale Clavatum, Mater Secalis, Clavus Secalinus; Fr. Ergot de Seigle, Seigle Ergoté (noir), Blé Cornu; Ger. Secale cornutum, Mutterkorn, Zapfen-, Hunger-korn.

Er'go-ta. L. fr. Fr. *ergot*, *argot*, a spur—*i. e.*, its spur shape.

Clav'i-ceps. L. *clava*, a club—*i. e.*, shape of the mycelium or sclerotium.

Pur-pu're-a. L. *purpureus*, purple colored—*i. e.*, the purple claviceps—color of the sclerotium.

Scle-ro'ti-um. L. fr. Gr. σκληρός hard—*i. e.*, a hard body formed by certain fungi.

PLANT.—Rye: culm 1.5–2 M. (5–6°) high; leaves .25–.5 M. (10–20') long, upper surface rough; spike 10–15 Cm. (4–6') long, 2-sided, 2-flowered spikelet, June; fruit July; seed (grain) oblong, grooved on upper side, hairy at summit, brownish. SCLEROTIUM (ergot), cylindraceous, obscurely 3-angled, fusiform, obtuse, somewhat curved, 1–4.5 Cm. ($\frac{2}{5}$ – $1\frac{4}{5}$ ') long, 3–5 Mm. ($\frac{1}{8}$ – $\frac{1}{5}$ ') thick, purplish-black, longitudinally furrowed; fracture short, white, tinged with purple or gray; odor characteristic but free from mustiness or rancidity; taste oily, somewhat acrid, disagreeable. POWDER, grayish-brown—purplish and whitish fragments of outer tissue and thin-walled cells. *Tests*: 1. Shake 1 Gm., for 5 minutes in a closed flask, with ether 20 cc. + 15 drops of 20 p. c. sulphuric acid, shake filtrate thoroughly with 15 drops of cold saturated sodium bicarbonate solution, the separated lower aqueous layer—red or violet (pres. of sclererythrin). 2. Hot water added to crushed or powdered—no rancid or ammoniacal odor.

Ergot that breaks with a sharp snap, devoid of pinkish fracture, hard, brittle between the teeth, odorless and tasteless, should be rejected. Should be dried at a low temperature, and as it deteriorates

with age should not be kept longer than one year. *Solvent*: diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

Commercial.—Rye is to Russia what corn is to America, its bread approximating nearer that of wheat than any other grain. The origin of the sclerotium is the biennial thallophyte (fungus) *Claviceps purpurea*, parasitic during moist seasons on the ovary of grains, grasses, sedges—*Carex*, *Cyperus* species, etc. (that of rye alone being collected for medicine),—the development having three stages: 1, *mycelial*—when blooming a few ovaries in some grain heads become covered with sweet, yellow mucus, *honey-dew of rye*, whose disagreeable odor repels bees, but attracts ants, beetles, and flies—the once supposed cause of the diseased grain, but now known only to aid its dissemination and thereby the spreading of the disease; the filamentous cells (hyphæ), collectively forming the mycelium, spread over the lower portion of the ovary and cause decomposition of ovarian tissue, production of honey-dew (sugar), and innumerable reproductive bodies (conidia) imbedded therein; 2, *sclerotial*—when this conidial formation is at its height the mycelium ceases its superficial growth, presses into the ovary and begins to form a denser tissue at its base and central portion, and, growing upward, ruptures it and develops into a purplish-black, horn-like body, sclerotium (official ergot)—the dormant or resting form of the fungus; 3, *thalloidic*—when in the following spring ergot sprouts in many heads (stromata), consuming its fixed oil and other constituents, and becoming shriveled and worthless; have formed upon the head's surface spherical-topped excrescences, size of small pin's head, containing the orifices of flask-shaped cavities (conceptacles, perithecia) from whose base many cells (spore-sacs, asci) arise, each containing 8 filiform spores formed synchronous with rye flowers, so that the two (spores, flowers) acting together develop again the sphacelia (sclerotium), hence the necessity of using fresh ergot in medicine, at the end of the second stage, prior to the beginning of the third.

Ergot must be dried (too much causing injury, too little moldiness) and stored (very dry, in well-stoppered bottles) with great care, as the fixed oil soon inclines to become rancid, and a mite oftentimes will



FIG. 5.—Ergotized rye.

HYPOCREACEÆ

attack it, in either case rendering the product worthless. This deterioration may be prevented largely by either (1) deoleation—extracting fixed oil with ether or petroleum benzin, drying, (2) adding occasionally a few drops of chloroform to the closed container, (3) suspending in the container a tube of potassium sulphate saturated with formaldehyde, (4) keeping over unslaked lime, (5) coating with ethereal solution of Tolu or (6) mixing powdered drug with benzoin (5 p. c.); in any event only the preservation of the sclerotium (entire) can be relied upon. There are three varieties: 1, *Spanish*, largest, finest-looking, highest-priced, bluest; 2, *Russian*, reddish-purple, considered most active; 3, *German*, reddish-purple.



FIG. 6.—Ergot, with fruit heads.

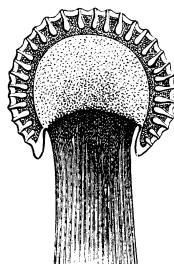


FIG. 7.—Longitudinal section of fruiting head, showing conceptacles.



FIG. 8.—Ergota.

CONSTITUENTS.—Alkaloids .38–.6 p. c.: Ergotoxine, Parahydroxyphenylethylamine (Tyramine), Histamine, Isoamylamine, Ergamine, Enzymes (2). Fixed oil 30 p. c., sclererythrin (coloring matter), scleromucin (mucilage); ergotininic acid, clavine, ergotinine, all three more or less inactive; ash 5 p. c. Such names as cornutine, sphacelotoxine, ergotinic acid, etc., only represent indefinite substances and should be abandoned.

Ergotoxine.—This, the essential active constituent, produces the true therapeutic effect of ergot (bluing of the cock's comb, contracting uterus, etc.): it is amorphous, but forms crystalline salts, phosphate, sulphate, tartrate, suitable for hypodermic injection; its presence in the other constituents often contribute its marked properties; action may largely be due to the amino group, in which fresh ergot is richest—just before rye is ripe.

Para-hydroxyphenylethylamine (Tyramine).—This and other amines (ammonia from putrefaction) may stimulate the uterine muscular wall (nerve-endings) and raise blood-pressure, while histamine stimulates uterine action, but lowers decidedly blood-pressure, both serve chiefly as synergists to the action of ergotoxine.

Enzymes.—These (one diastasic, the other hydrolyzing fats) rapidly deteriorate and reduce the physiological activity of ergot that has

been dried slowly and imperfectly, forming a rancid, fatty odor (trimethylamine); both enzymes lose hydrolytic power by prolonged keeping or complete drying of the ergot, hence the necessity of proper care in this process.

Fixed Oil.—This is a dark brown liquid containing oleic acid 68 p. c., oxyoleic acid 22 p. c., palmitic acid 5 p. c., sp. gr. 0.925, and when removed by ether or petroleum benzin the ergot retains full alkaloidal strength which remains unimpaired for years if kept with care.

PREPARATIONS.—1. *Fluidextractum Ergotæ*, Fluidextract of Ergot. (Syn., Fldext. Ergot., Fluid Extract of Ergot; Br. Extractum Ergotæ Liquidum; Fr. Extrait fluide d'Ergot de Seigle; Ger. Extractum Secalis cornuti fluidum, Mutterkornfluidextrakt.)

Manufacture: Percolate 100 Gm. with sufficient purified petroleum benzin to remove fixed oil, discard benzin percolate; remove ergot from percolator, expose it to air, when dry moisten with sufficient 1st menstruum (diluted alcohol 98 cc. + hydrochloric acid 2) to keep damp while macerating 6 hours in a tightly covered container, pack in percolator, add remainder of 1st menstruum, then 2d menstruum (diluted alcohol) to saturate and cover; macerate 48 hours, percolate with 2d menstruum until exhausted; reserve first 85 cc., reclaim alcohol from remainder, concentrate residue at 60° C. (140° F.) to soft extract, which dissolve in the reserved portion, mix thoroughly, add 2d menstruum q. s. 100 cc. When administered by intramuscular injections to single-comb, white Leghorn cocks, in doses of .5 cc. for each Kg. of body weight of cock—the comb becomes darkened in degree as by same dose of standard fluidextract; contains alcohol 37–42 p. c. Dose, m_{xv} –60 (1–4 cc.).

2. *Extractum Ergotæ Aquosum, Ergotine, N.F.*—Ergot 200 Gm., chloroform water q. s. to exhaust, evaporate to 100 cc., cool, add alcohol 100, evaporate to pilular consistence. Dose, gr. 1–5 (.06–.3 Gm.) + water, hypodermically.

Unoff. Preps.: *Extract* (menstruum same as official fluidextract), gr. 2–10 (.13–.6 Gm.); *Infusion* (Br.), 5 p. c., \mathfrak{z} j–2 (30–60 cc.); *Tincture*, 15 p. c.; *Wine*, 20 p. c.; *Ergotin* (Bonjean's—aqueous extract deprived of scleromucin by precipitating with alcohol, filtering, evaporating), dose, hypodermically, gr. $\frac{1}{4}$ –5 (0.16–.3 Gm.).

PROPERTIES.—Emmenagogue, ecbotic, parturient, astringent, hemostatic, excitomotor, poisonous. Value depends upon (1) bluing (gangrene) of the cock's comb, (2) contracting the uterus, (3) raising the blood-pressure: contracts all unstriped (involuntary) muscle, especially uterus and intestine, expelling their contents. Depresses heart muscle, hence slows pulse, contracts arterioles (hemostatic), thus increasing arterial pressure; diminishes sweat, saliva, milk, urine. In large doses gastro-intestinal irritant, causes nausea, vomiting, colic, thirst, purging, convulsions, “acute ergotism,” or by many small doses may have “chronic ergotism;” this last may be in two forms: 1. Convulsive, causing tetanoid spasms of the flexors, respiratory

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muscles, death by asphyxia. 2. Gangrenous, causing cold, numb limbs, loss of sensibility, gangrene of lower extremities, buttocks, etc., epileptic convulsions, coma, death.

USES.—In labor to increase the power and duration of uterine contractions—tetanic spasm; these are continuous while natural labor-pains are intermittent, hence ergot is dangerous in thoughtless hands. Should never be used until after head is born, when it simply promotes firm uterine contraction; it is still wiser to withhold it until after birth, to prevent postpartum hemorrhage and aid uterine contraction (fluid-extract ʒj (4 cc.) by mouth, or better, hypodermically. A small dose (one-third) often controls uterine inertia in labor, where nerve-stimulants (coffee, strychnine, etc.) fail; this does not bring on constant tetanic contraction, but simply the “to-and-fro” movements. Effect lasts half an hour, being felt in 15 minutes, and should be repeated every 15 minutes until action manifest. Used also in epistaxis, night-sweats, dysentery (bloody), diarrhea (serous), hemorrhoids (bleeding), chronic metritis, dysmenorrhea, menorrhagia, fibroids, polypi, plethoric amenorrhea, atonic spermatorrhea, atonic arterial hemorrhage (males and females), spinal congestions, splenic enlargement, lax sphincters, incontinence of urine, aneurisms, diabetes. Externally to hemorrhoids.

For hypodermic injection—employ “Ergot Aseptic,” or “Ergone,” or solid extract deprived of alcohol and dissolved in water—introduce near seat of trouble; results here much better than by mouth; should have bladder and bowels freely open. The ergot formed on grasses is often sufficient to cause grazing animals to abort, and flour made of grain containing much of it will also sometimes act medicinally.

Poisoning: Have gastric disturbance, vomiting, diarrhea, thirst, burning pain in feet, tingling in fingers, cramps in extremities, dilated pupils, cold surface, dizziness, small and feeble pulse, convulsions. Evacuate stomach (pump, emetics, purgatives), use tannic acid, stimulants, amyl nitrite (inhalation), strychnine, digitalis, friction, hot baths.

Incompatibles: Cardiac and motor depressants (aconite, veratrum, lobelia, etc.), caustic alkalies, metallic salts.

Synergists: Digitalis, belladonna (circulation), strychnine (nerves), ustilago, cotton root bark, hydrastine, emmenagogues.

Allied Plants:

1. *Saccharomyces (Tor'ula) cerevis'ia*, *Cerevisia Fermentum Compressum*, *Compressed Yeast*, *N.F.*—*Saccharomycetaceæ*. The moist living cells of this or other species, combined with a starchy or absorbent base; must only be used when fresh and free from mildew and musty or foul odors. Yeast plant is unicellular, multiplies by budding, being produced during alcoholic fermentation of malt liquors or saccharine fluids. There are two varieties: 1, Top or surface yeast—most active, semi-fluid frothy mass, odorous, cellular, fermenting in 3–4 days, at 15–20° C. (59–60° F.); 2, Bottom or sediment yeast—much slower,

at 6–8° C. (43–46° F.); reproducing by isolated spores; when liquid becomes hard, dry (yeast cake), vitality retained for a long time. It is in white, yellowish, soft, easily broken masses, characteristic, slightly sour odor, faintly acid reaction; under microscope—numerous oidium and mycoderma cells, starch grains; contains enzymes—zymase, invertase, diastase, maltase; insoluble in alcohol, water, ceases to vegetate below 5° C. (41° F.); will stand –60° C. (–70° F.) without being killed. Tonic, stimulant, laxative, antiseptic poultice; typhoid, diabetes, diarrhea, scurvy, diphtheria, sores, bruises. Dose, $\overline{3}$ ss–1 (15–30 Gm.); 1. *Lac Fermentatum, Kumyss*, .3 p. c., dose, $\overline{3}$ vij (240 cc.).

2. *Roccella (tinctoria)* and *Lecanora (tartarea)* species, or other lichens; *Persio, Cudbear, N.F.*—Parmeliaceæ. A purplish-red powder prepared from these lichens, yielding 12 p. c. ash; Holland. Made by heating lichens for a week with diluted ammonia, drying, powdering; alcoholic preparations deep red—lighter with acids, purplish-red with alkalis. To color preparations; 1, *Tinctura Persionis*, 10 p. c. (75 p. c. alcohol); Prep.: 1. *Syr. Phos. Co.*, $\frac{1}{6}$ p. c. 2. *Tinctura Persionis Composita*, 1.5 p. c. + caromel 10 p. c. (33 p. c. alcohol); Preps.: 1. *Elix. Ammon. Valer.*, $\frac{1}{6}$ p. c.; 2. *Elix. Cinchon. Alk.*, 5 p. c.; 3. *Syr. Bromidor.*, $\frac{1}{6}$ p. c.; 4. *Elixir Aromaticum Rubrum*, $\frac{1}{6}$ p. c.; 5. *Elixir Pepsini Compositum*, $\frac{1}{10}$ p. c.; 6. *Liquor Aromaticus Alkalinus*, $\frac{1}{6}$ p. c.; 7. *Syrupus Pini Albæ Compositus*, $\frac{1}{10}$ p. c. *Lacmus, Litmus*, a blue pigment from these lichens by mixing (powder) with potassium carbonate, diluted ammonia water, exposing to air 6 weeks for fermentation, when it gradually turns red, purple, blue, and at the different stages is mixed with chalk and formed into cakes. *Orchil* is prepared likewise adding diluted ammonia, sulphuric acid and sodium chloride—deep purple.

3. *Cetraria islandica, Iceland Moss*.—The dried plant, U.S.P. 1820–1890; N. hemisphere. Thallus 5–10 Cm. (2–4') long, foliaceous, fringed, and channeled lobes, brownish above, whitish beneath, apothecia (fruits) brown, flattish, brittle, inodorous; taste mucilaginous, bitter; contains cetraric acid (bitter) 2–3 p. c., which removed leaves digestible food product containing proteins 2.8 p. c., fat .4 p. c., cellulose 4–6 p. c., lichenin (starch) 79.2 p. c., related substance, water 6 p. c., ash 6.99 p. c. Demulcent (starch), tonic (cetraric acid), nutritive; chronic catarrhs, pulmonary affections (bronchitis, consumption), chronic diarrhea, dysentery; bread, instead of acacia. Dose, $\overline{3}$ ss–1 (2–4 Gm.); decoction, .5 p. c., $\overline{3}$ j–4 (30–120 cc.).

4. *Polyporus (Boletus) officinalis, Agaricus; Agaric, White (Larch) Agaric, N.F.*—Polyporaceæ. The dried fruit body, deprived of outer rind, with 5 p. c. foreign organic matter, yielding to boiling alcohol 50 p. c. non-volatile resinous extract; C. and S. Europe—growing on *Pinus, Larix, Picea* species. In light, fibrous, spongy, irregular pieces, grayish, brownish; internally yellowish, resinous; fracture tough; friable, difficult to powder; odor faint; taste sweetish, acrid, bitter. Powder, yellowish-brown—numerous narrow mycelial threads, few calcium oxalate crystals; solvent: diluted alcohol; contains agaracin. Antihydrotic;

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sweating from coal-tar products and salicylates—acts upon nerve filaments in the sweat-glands. Dose, gr. 5–10 (.3–6 Gm.); 1. *Pilula Antiperiodica*, $\frac{1}{8}$ gr.; 2. *Tinctura Antiperiodica*, $\frac{1}{5}$ p. c., +; *Agaricin*, gr. 1–2 (.06–.12 Gm.).

5. *P. (Boletus) fomentarius*, *Agaric of the Oak (Touch Wood)*.—The fungus, U.S.P. 1830; Europe, on *Quercus* and *Fagus* species. It is formed by an additional layer of fibers each year; is collected Aug.-Sept., and resembles the horse's hoof, being 15–25 Cm. (6–10') wide. When young is soft, velvety, but becomes hard and ligneous; when deprived of outside ligneous portion, brownish above and yellowish-white beneath, porous, fibrous, tough, inodorous, tasteless; when for use is deprived of harder rind, sliced, boiled in lye, washed, beaten, until soft and pliable, then absorbs twice its weight of water; contains extractive, resin, nitrogenous matter, KCl, CaSO₄; the ash—Fe, Ca,

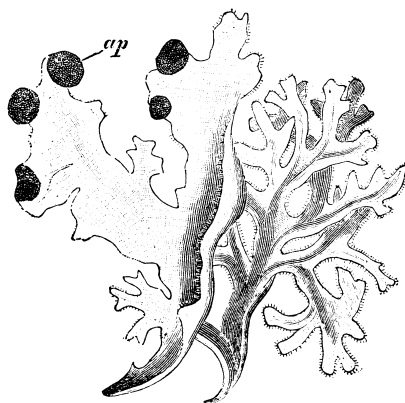


FIG. 9.—*Cetraria islandica*: ap, apothecium.

Mg, phosphate. Used locally with pressure to arrest hemorrhage. Agaric steeped in nitre solution yields spunk or tinder.

6. *Agaricus muscarius* (*Amanita muscaria*), *Fly Fungus (Agaric)*.—N. Europe, Russia. This mushroom grows in the autumn mainly, under pine trees; stalk is white, tuberous at base, 7.5–15 Cm. (3–6') high, 1.8 Cm. ($\frac{3}{4}$ ') thick. Cup (pileus) 10–15 Cm. (4–6') broad, orange-red; contains chiefly *muscarine* (muscarina), C₅H₁₅O₃N, a colorless, odorless, crystalline, deliquescent alkaloid, yielding deliquescent salts (nitrate, sulphate); all usually occur as brown, syrupy liquids, soluble in water, alcohol; resembles Calabar bean in action; antihydrotic, antispasmodic, myotic. Reduces force and frequency of pulse, contracts muscles of intestines and bladder, increases abdominal secretions, causes dyspnea, paralysis, death. Given for intestinal torpor, duodenal catarrh, diabetes, antidote to atropine, to replace physostigmine. Dose (muscarine), gr. $\frac{1}{30}$ – $\frac{1}{15}$ (.002–.004 Gm.).

7. *Ustilago Maydis*, Corn Smut.—The fungous growth upon *Zea Mays*, U.S.P. 1880. United States, etc. The fungus is abundant upon stem, grains, and tassel; in irregular, globose masses 10–15 Cm. (4–6') broad, consisting of a blackish, gelatinous membrane enclosing many blackish, globular, nodular spores; odor and taste disagreeable. Should be kept dry and not longer than one year; contains fixed oil 2.5 p. c., sclerotic acid, crystalline principle (ustilagine) and alkaloid (secaline), volatile base, sugar, mucilage, ash 5 p. c. Emmenagogue, parturient, increases uterine pains during labor, like ergot. Dose, gr. 15–30 (1–2 Gm.).

SUB-KINGDOM II. PTERIDOPHYTES—A.

Vascular cryptogams (ferns), mostly terrestrial; stems, roots, leaves, woody fibers, and vessels well developed, spores go into flat or irregular prothallia bearing antheridia and archegonia.

CLASS 3. FILICINÆ.

3. POLYPODIACEÆ. Fern Family.

Pol-i-po-di-a'se-e. L. *Polypodium* + aceæ, fr. Gr. *πολύς*, many, + *πούς*, *πόδος*, foot—many feet, rays—*i. e.*, from the branched rootstocks of some species. Include nine-tenths of our ferns, being the typical family. Herbaceous with a permanent stem, which is usually prostrate or subterranean. Fronds large, simple, pinnate, pinnatifid or decom-pound, coiled in veneration; numerous sporangia, on the underside or margins, in clusters (sori). Sori with or without membranaceous covering (indusium), prothallium green; universal, bitter, astringent, anthelmintic, mucilage, tonic.

Genus: 1. *Dryopteris*.

ASPIDIUM. ASPIDIUM. U.S.P.

Dryopteris Filix-mas, (Linné) Schott. { The rhizome and stipes, yielding not less than 6.5 p. c. oleoresin, nor more than 3 p. c. acid-insoluble ash.

Habitat. N. America, N. Asia, Europe, N. Africa. (Canada, westward to Rocky Mountains, Mexico, S. America, Andes, Himalaya Mountains, Polynesian Islands.).

Syn. Male Fern, Male Shield Fern, Bear's Paw Root, Sweet Brake, Knotty Brake, Shield Root; Br. Filix Mas, Radix Filicis maris; Fr. Fougère mâle; Ger. Rhizoma Filicis, Farnwurzel, Wurmfarne, Waldfarne, Johanniskraut.

Dryop'te-ris. L. fr. Gr. *δρυοπτερίς* = *δρύς*, of the oak, growing among trees, in thickets, + *πτερίς*, a feather, wing or fern—*i. e.*, their favored place of growth.

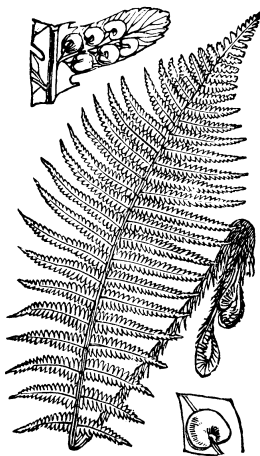
Filix-mas. L. *filix*, a fern, fr. Gr. *πτερίς*, a fern, frond, etc., + *mas*, male—*i. e.*, referring to its asexual fructification.

Aspid'i-um. L. fr. Gr. *ασπίδιον*, a little shield—*i. e.*, shape of the indusium.

PLANT.—Tall, handsome, perennial fern; frond .3–1 M. (1–3°) high or long, bipinnate, pinnæ lanceolate, circular fruit dots situated on the

POLYPODIACEÆ

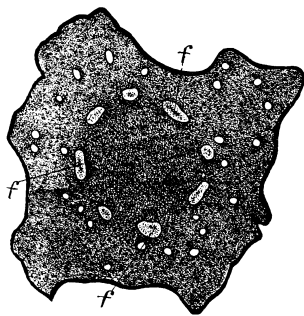
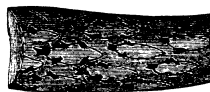
veins, near the midrib, covered by a heart-shaped indusium. RHIZOME, horizontal, 15–30 Cm. (6–12') long, 5–7.5 Cm. (2–3') thick, covered with stipe-bases, "fingers," which remain green several years and often

FIG. 10.—*Dryopteris Filix-mas*.

constitute the greater bulk of the official drug; when peeled (deprived of stipes, roots) the rhizome itself is 7.5–15 Cm. (3–6') long, 1–3 Cm. ($\frac{3}{8}$ – $1\frac{1}{8}$ ') thick, cylindraceous, nearly straight, or curved, tapering toward one end, usually split longitudinally, roughly scarred with remains of the stipe bases, or bearing several coarse longitudinal ridges and grooves; stipes nearly cylindrical but tapering toward one end, nearly straight or somewhat curved, 3–5 Cm. ($1\frac{1}{3}$ –2') long, 8 Mm. ($\frac{1}{3}$ ') thick; brownish-black, if peeled—light brown; fracture short, pale green (inner half), spongy, exhibiting an interrupted circle of 6–12 small vascular bundles (steles); odor slight; taste sweetish, astringent, bitter, acid. POWDER, greenish, brownish—must be prepared freshly.

Solvents: alcohol; acetone; ether—extracting filicic acid, filicin, volatile oil, resin, chlorophyll, fixed oil, all occurring in the official oleoresin. Dose, $\overline{\text{ss}}$ –2 (2–8 Gm.).

ADULTERATIONS.—Rhizomes of many indigenous ferns (chiefly *Osmunda* species) resembling the official, although such are thinner, free from chaff, and have stipes rarely closely imbricate, but when peeled and mixed practically defy detection; composition and properties are less subject to change in the unpeeled, while adult-

FIG. 11.—*Filix-mas*; transverse section magnified 3 diam.; *f*, fibro-vascular bundles.FIG. 12.—*Filix-mas*; surface of peeled rhizome.

erations are recognized more easily; carelessness often renders the drug unreliable.

Commercial.—The "uncomminuted rhizome" covered with stipes (fingers) should be collected when strongest, autumn, freed from roots

and dead portions of rhizome and stipes (only such parts being retained as have green fracture), dried at 70° C. (120° F.), and quickly made into preparations, as it deteriorates rapidly, usually becoming inert in 1–2 years; soil and climate have greater influence upon amount of filicic acid than time of collection, etc.; the richest yield being from plants growing on strata of volcanic origin.

CONSTITUENTS.—Filicic acid 5–10 p. c., Filicin 19–31 p. c. (rohfilicin), fixed oil 6–7 p. c., filitannic acid 10 p. c., filix red, chlorophyll, volatile oil, 2 resins, ash 3 p. c. Böhm isolates aspidin (2–3 p. c.), albaspidin, aspidimin, aspidinol, and flavaspidic acid, and claims virtue to be chiefly in aspidin and filicic acid combined; Kraft and Jaquet believe the virtue to reside in filmaron. Dose, gr. 7–10 (.5–.6 Gm.).

Filicic (Filicinic) Acid, $C_{35}H_{42}O_{13}$.—Most active constituent, white, amorphous or crystalline, tasteless, more soluble than its anhydride, poisonous. Dose, gr. 10–20 (.6–1.3 Gm.).

Filicin (Filicic Anhydride), $C_{35}H_{40}O_{12}$.—Yellowish-white, non-poisonous, inactive, crystalline, soluble in most solvents except aqueous; yields with fusing potassium hydroxide butyric acid and phloroglucin.

PREPARATIONS.—1. *Oleoresina Aspidii*. Oleoresin of Aspidium. (Syn., Oleores. Aspid., Oleoresin of Male Fern, Oil of Fern; Br. Extractum Filicis Liquidum, Oleum Filicis Maris; Fr. Extrait (oléo résineux) de Fougère mâle; Ger. Extractum Filicis, Farnextrakt, Wurmfarneextrakt, Wurmfarneöl.)

Manufacture: Percolate slowly, in a covered glass percolator, 100 Gm. with ether, added in successive portions, until exhausted, reclaim most of the ether on water-bath, transfer residue to a dish, allow remaining ether to evaporate spontaneously in a warm place; yield 10–15 p. c. (acetone 18 p. c.). It is a dark green, thick liquid containing filicic acid 5–10 p. c., some of which deposits in granular crystals on standing, and must be mixed thoroughly with the liquid portion before dispensing. Should be preserved in well-stoppered bottles. Dose, \mathfrak{z}_{ss} –1 (2–4 cc.); more than \mathfrak{z}_{iss} (6 cc.) is dangerous, while death has occurred from \mathfrak{z}_{vj} (24 cc.).

Unoff. Preps.: *Extract*, gr. 15–30 (1–2 Gm.). *Fluidextract*, \mathfrak{z}_{j} –2 (4–8 cc.).

PROPERTIES.—Tæniifuge, tonic, astringent, poisonous.

USES.—This was known to the ancients as a vermifuge, being mentioned by Dioscorides, Galen, Pliny, Theophrastus, etc. In 1775 the King of France bought and made public this secret tapeworm remedy from the Swiss surgeon Nouffer's widow. It is next to pelletierine in reliability, and valuable in uncinariasis. In giving it for tapeworm the patient should fast the previous day, being nourished only by a little bread and milk; at night take \mathfrak{z}_{j} (30 cc.) of castor oil, to expel nidus, and on the following morning a full dose of oleoresin, still fasting, and 2 hours later a full dose of Epsom salt; a full dose of calomel, jalap, gamboge, or saline enema may also clear away the dead worm.

LYCOPODIACEÆ

Poisoning: Excessive doses may produce gastro-enteritis, abdominal pain, muscular relaxation, vomiting, purging, somnolence, albuminuria, glycosuria, paralysis, temporary blindness, convulsions, collapse, coma, death. Strong coffee, tea, tannin, empty stomach if vomiting has not been free (zinc sulphate, mustard, etc.), cardiac and respiratory stimulants—brandy, whisky, aromatic spirit of ammonia, strychnine, atropine, digitalis, morphine, artificial heat—avoid castor oil.

Allied Plants:

1. *Dryopteris marginalis*.—Canada, United States, Rhizome, U.S.P. 1880–1910, similar to that of *D. Filix-mas*, except it has 6 steles instead of 10–20, and the round fruit dots are nearer the margin than the midrib. *D. rigida* (*Aspidium rigidum*); S. Europe, California. Rhizome longer, thinner, with 6 vascular bundles. *D. athaman'tica* (*A. athaman'ticum*); S. Africa. Rhizome thicker, firmer than official, inside brownish, with black resin dots, broader vascular bundles.

2. *Polypo'dium vulga're*, *Common Polypody*, *Adian'tum peda'tum*, *Maiden hair*, and *Osmun'da rega'lis*, *Flowering Fern*.—All used for chronic catarrh, asthma, pectoral demulcent, tonic.

CLASS 4. LYCOPODINÆ.

4. LYCOPODIACEÆ. Club-Moss Family.

Li-ko-po-di-a'se-e. L. *Lycopodi-um* + aceæ, fr. Gr. *λύκος*, a wolf, + *πούς*, *ποδός*, a foot—*i. e.*, from appearance of the shoots to a wolf's foot. Herbs resembling mosses. Distinguished by creeping stems, corms; leaves small, sessile, 4–16 ranks; sporangia in axis of leaves or scales, 1–3-celled, often reniform, 2-valved, containing many yellow spores, of one kind only, marked at summit with 3 radiating lines; prothallia subterranean, with or without chlorophyll; monœcious; universal; emetic, purgative, aphrodisiac, acrid principle poisonous, some spores inflammable.

LYCOPIDIUM. LYCOPIDIUM, U.S.P.

***Lycopodium clavatum*,** } The spores.
Linne.

Habitat. Europe, Asia, N. America, in dry woods.

Syn. Lycopod., Club Moss, Clubfoot Moss, Running Moss, Snake (Staghorn) Moss, Ground (Running) Pine, Wolf's Claw, Fox Tail; Vegetable Sulphur (Brimstone), Semen Lycopodii; Fr. Lycopode, Soufre végétal, Pied de Loup; Ger. Bärlappsporen, Hexenmehl, Streupulver, Blitzpulver.

Ly-co-po'di-um. L. see etymology, above, of Lycopodiaceæ.

Cla-va'tum. L. *clavatus*, club-like—*i. e.*, alluding to club-like appearance of the fertile spikes.

PLANT.—Low creeping perennial; stem .6–3 M. (2–10°) long, slender, tough, flexible, woody; branches ascending, leafy, the fertile terminated

by a slender peduncle 10–15 Cm. (4–6') long, with 1–2 linear, cylindrical spikes—thecae, cones, capsules, 2.5–5 Cm. (1–2') long; leaves linear, awl-shaped, 6 Mm. ($\frac{1}{4}$ ') long, dense, light green, tipped, as are also the numerous bracts, on the flowering spikes with a fine bristle; in axils of bracts have the kidney-shaped sporangia containing the spores. SPORES, a light yellow, very mobile powder, odorless, tasteless; spores shaped like 3-sided pyramid with convex base, .025–.04 Mm. ($\frac{1}{4000}$ – $\frac{1}{625}$ ') broad; outer surface reticulate—reticulations polygonal and formed by straight-sided delicate ridges, which form a delicate fringe at edges of spore; viewed with the rounded surface of spore on the under side, a distinct triangular marking is seen, formed by edges of flat surfaces of the spore. *Tests*: 1. Not wetted by water—floats upon it; when boiled with water—sinks, when thrown into a flame—burns with a quick flash. 2. Shows very few, if any, pollen grains, .04–.07 Mm. ($\frac{1}{25}$ – $\frac{1}{36}$ ') broad, and consisting of a central convex, generative cell separating two spherical cells or wings containing air (abs. of pine pollen). 3. Boiled with water and cooled, + iodine T. S.—no bluish color (abs. of starch), or reddish color (abs. of dextrin).

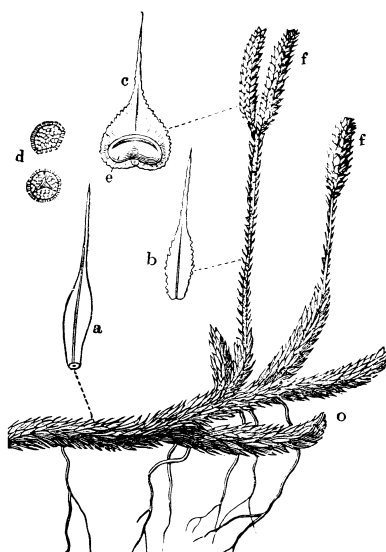


FIG. 13.—*Lycopodium clavatum*: o, a fragment of stem with spore-bearing spikes, f, f; a, leaf of stem; b, leaf of fertile branch; c, cone scale (bract) showing sporangium e; d, spores.



FIG. 14.—*Lycopodium*.

ADULTERATIONS.—Pine pollen (coarser, less mobile, mixes more easily with water), starch, flour (sometimes 25 p. c., sinks in carbon disulphide), dextrin (soluble in water, when concentrated—precipitated by alcohol), sulphur (dissolves in carbon disulphide, remaining upon evaporation), rosin (treat with alcohol, evaporate), turmeric (reddish-brown with alkalis), talc, gypsum, ferruginous earth, sand

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(increasing ash beyond 3–5 p. c., and quickly subsiding when shaken with carbon disulphide, chloroform, or water).

Commercial.—Collected, July–August, in Scandinavia, Baltic lands, Northeastern Poland, Russia, etc., chiefly from *L. clavatum*, rarely *L. complanatum* (spikes (cones) or sporangia, and spores of each very

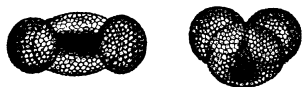


FIG. 15.—Pollen of pine.

similar), by villagers in wooded areas, who sell their product to local agents, who, after drying it 1–2 weeks, avoiding artificial heat, shake the spores out through ordinary flour sieves, when it contains 5–10 p. c. of impurities (leaves, scaly fragments, sand, wheat

and rye flour, etc.). Spikes when ripe yield pure spores 23 p. c., when green 10–15 p. c.

CONSTITUENTS.—Fixed oil 47–49 p. c., cane-sugar (sucrose) 2 p. c., volatile base (methyamine), ash 3–5 p. c. (sand + 1 p. c. P_2O_5). The substance of the cell-wall is called pollenin; when treated with potassium hydroxide gives yellow color, becoming blue upon the addition of sulphuric acid and iodine. The oil, similar to expressed oil of almonds, contains palmitic, stearic, myristic, and oleic acids—the latter 80 p. c. being slightly abnormal.

PROPERTIES.—Once considered diuretic, antispasmodic for rheumatism, epilepsy, pulmonary and renal disorders, dysentery.

USES.—Externally to protect tender and raw surfaces, erysipelas, eczema, herpes, ulcers, chafing in infants; in pharmacy as a basis for insufflations, also to prevent adhering of pills, suppositories, etc. Popular “homeopathic medicine” (1 to 100 lactose triturated till oil liberated); internally gives excited circulation, urinary irritation, often cures dyspepsia, flatulence, constipation, aneurism, diphtheria, mucous membrane affections of lungs and bronchi.

SUB-KINGDOM III. **SPERMATOPHYTES-A** (**PHANEROGAMIA**).

Seed-producing plants, each containing a complete embryo, and includes the greatest number (120,000), as well as the highest forms of plants.

CLASS 5. **GYMNOSPERMÆ (Seeds naked, not enclosed in an ovary).**

5. **PINACEÆ (CONIFERÆ). Pine Family, Conifers.**

Pi-na'se-e. L. *Pin-us* + aceæ, fr. Celtic *pin*, *pyn*, a mountain, rock—*i. e.*, habitat of some species. Trees, evergreen shrubs. Distinguished by abounding in oleoresinous juice, leaves needle-shaped, entire, parallel-veined; flowers monœcious—staminate in catkins, with-

out calyx or corolla—pistillate in cones; ovules naked, 2 or more on upper surface of each scape (carpel); fruit woody cone; seeds naked, cotyledons 2 or many, wood without ducts, with discoid markings; temperate climates; stimulant, diuretic, emmenagogue, anthelmintic, expectorant, timber.

Genera: 1. **Pinus**. 2. **Juniperus**.

TEREBINTHINA. TURPENTINE, *N.F.*

1. **Oleum Terebinthinæ**. Oil of Turpentine, *U.S.P.*

2. **Resina**. Rosin, *U.S.P.*

Pinus palustris, *Miller*,
and other species, yield-
ing exclusively terpene
oils. } The volatile oil (1), and residue left (2) from
distilling the oleoresin (turpentine).

Habitat. S. United States, Virginia to Texas, near the coast.

Syn. Long leaved (Yellow Pitch, Broom, Pitch, Swamp, Georgia) Pine; Common Frankincense, Terebinthina Communis, Thus Americanum, Frankincense, Crude Turpentine: 1. Ol. Tereb., Turpentine Oil, Spirits of Turpentine; Fr. Térébenthine (du Pin) de Bordeaux; Essence de Térébenthine officinale; Ger. (Gemeiner) Terpentin; Terpentínöl; 2. Resin, Colophony; Fr. Résine blanche (jaune); Ger. Colophonium, Kolophonium, Geigenharz.

Pinus. L. see etymology, page 72, of Pinaceae.

Palustris. L. *paluster*, swampy—*i. e.*, it inhabits swamps or near marshy places.

Ter-e-bin'thi-na. L. *terebinthus*; Gr. *τερεβινθος*, of or from the *terebinth*—*turpentine tree*.

Tur'pen-tine, fr. *turpentine*, *terebinthine*, *terebinthina*.

PLANT.—Large tree, 18–30 M. (60–100°) high, .3–.6 M. (1–2°) thick; bark thin, scaled, furrowed; wood hard, resinous; leaves many, crowded at end of branches, in 3's, 25–40 Cm. (10–16') long, very narrow, sharp-pointed, triquetrous, in clusters surrounded by a sheath 25 Mm. (1') long; flowers sterile in violet aments, 5 Cm. (2') long; Fruit cone, large, oblong, 15–25 Cm. (6–10') long, scales armed with short spine. Oleoresin—Terebinthina, Turpentine, *N.F.* Concrete oleoresin containing not more than 2 p. c. of foreign matter, occurs in yellowish, opaque masses, lighter internally, sticky, more or less glossy, brittle in cold; odor and taste characteristic; freely soluble in alcohol, ether, chloroform, glacial acetic acid; alcoholic solution acid reaction; rarely seen as yellow, opaque, viscid liquid.

CONSTITUENTS.—(CONCRETE) OLEORESIN: Volatile oil 20–30 p. c., Rosin (resina, resin) 50–60 p. c., bitter principle, formic, succinic, and possibly other resin acids—pinic and sylvic acids.

1. **Oleum Terebinthinæ**. Oil of Turpentine, $C_{10}H_{16}$.—Obtained by distilling with water or steam the (concrete) oleoresin (turpentine); it is a colorless liquid, characteristic odor and taste, both becoming stronger and less pleasant on aging or exposure (owing to formation of ozone, resin, formic and acetic acids), soluble in 5 vols. of alcohol, sp. gr. 0.861, rotation—dextro (variable), with hydrochloric acid

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forms artificial crystalline camphor, $C_{10}H_{16}HCl$; contains chiefly *d*-pinene (French oil *l*-pinene), also derivatives of pinene, and often camphene and fenchone. *Tests*: 1. Evaporate 5 cc. over boiling water—residue .1 Gm. (abs. of petroleum, paraffin, rosin oils). 2. Expose to air 3 drops on unsized white paper—evaporates without leaving permanent stain (abs. of fixed oils). 3. Shake vigorously 5 cc. with equal volume of hydrochloric acid—only a light straw-yellow color in either acid or oily layer on standing 5 minutes, no brown or green. Must be added to fuming acids drop by drop, and should be kept cool, in well-stoppered containers.

FIG. 16.—*Pinus palustris*.

ADULTERATIONS. — Tar oils, kerosene, petroleum benzin, paraffin oils, rosin oil, etc.

2. **Resina. Rosin.**—This residue, left after distilling off the volatile oil from the (concrete) oleoresin (turpentine), is usually in sharply angular, translucent, amber-colored fragments, frequently covered with a yellow dust, fracture brittle at ordinary temperatures shiny and shallow-conchoidal; odor and taste slightly terebinthinate; freely soluble in alcohol, ether, benzene, glacial acetic acid, fixed or volatile oils, dilute solutions of the fixed alkali hydroxides; contains anhydride of abietic acid, $C_{44}H_{62}O_4$, 80–90 p. c., pinic and sylvic acids. *Tests*: 1. Alcoholic solution—acid; sp. gr. 1.08. 2. Easily fusible and burns with a dense yellowish smoke; ash .05 p. c. 3. Shaken with warm diluted alcohol—abietic anhydride converted into abietic acid, $C_{44}H_{64}O_5$, crystalline; boiled with alkaline solution—greasy salts of abietic acid (rosin soap); distil with super-heated steam—benzene and toluene. The varieties depend upon color, and this upon degree of heat employed in distillation; the older the trees, the greater the yield of rosin, the smaller the yield of oil.

Commercial.—The *P. palustris* (*P. australis*—*i. e.*, southern) grows in dry sandy soil from the sea to 100 miles (160 Km.) inland, the young trees resembling brooms, the older furnishing (Florida, Georgia, N. and S. Carolina) most of the turpentine and rosin of commerce. The oleoresin secretes in the sapwood, and sparingly exudes spontaneously, so that to obtain it economically on a large scale the trees are *cornered* and *chipped*, which consists in removing, according to size of tree, one or two sections of bark—each one-fourth the entire circumference, and a foot from the ground upward 4–5 feet—then hacking the exposed wood in shape of the letter L, which may be extended slightly higher every few weeks to increase the flow. Formerly at the base of each decorticated section the experienced axman cut a triangular-shaped cavity (*box—boxing*), 4–8 pints (2–4 L.), capacity, to

catch the exudation, which was ladled out with "turpentine dippers" every 2-3 weeks, poured into barrels (250 pounds; 110 Kg.) and subsequently distilled at a nearby station. But these deep-seated wounds were so depleting as to render the trees worthless, save for lumber, in 4-5 years, consequently this method has been replaced by the less destructive "cup and gutter system," which consists in suspending from a zinc nail near the base of scarified section a detachable terra cotta (Herty) or zinc cup, similar in appearance to the quart-flower pot, and above that nailing at incline, on either side of median line, a zinc gutter, 6 x 2', to direct flow into the cup, which, when filled, is easily removed, emptied into barrels and returned. The first season's yield is about 100 gallons per 100 trees, diminishing thereafter. The "crude" begins to flow early in March, becomes most rapid July-August when hot and dry, then slackens September-October. The first year's product is best, *virgin dip*, yielding $6\frac{1}{2}$ gallons (24 L.) of oil per barrel and "window-glass rosin;" succeeding years give *yellow dip*, yielding 4 gallons (15 L.) of oil per barrel and medium grades of rosin; some hardens on trees, *scrapings*, *scrape*, yielding 2 gallons (7.5 L.) of oil per barrel and brownish-black rosin. In France covered pails or cups with lips, to avoid evaporation, chips, bark, etc., are used, into which the sap flows by a gutter through comparatively small hacked spaces, which, when alternating 5 working with 2 resting seasons, insures a handsome yield for 2 generations. The comminuted wood has been distilled with water, steam, alkali, etc., but with questionable satisfaction.

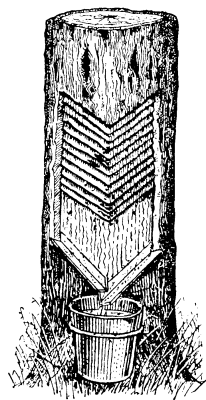


FIG. 17.—Cup and gutter system, cornered and chipped pine tree.

In the distillation of concrete oleoresin, when the volatile oil ceases to come over, the resin (rosin) while hot is run off from the bottom of still and strained into barrels, while the condensed distillate (oil), floating above the water, is dipped out and barrelled for market.

PREPARATIONS.—I. OIL: 1. *Oleum Terebinthinæ Rectificatum*. Rectified Oil of Turpentine. (Syn., Ol. Tereb. Rect., Rectified Turpentine Oil; Fr. Essence de Térébenthine rectifiée; Ger. Gereinigtes Terpentinsel.)

Manufacture: Shake thoroughly oil of turpentine, a convenient quantity, with an equal volume of sodium hydroxide solution, recover about three-fourths of the oil by distillation, separate the clear oil from the water, dry it by shaking with anhydrous calcium chloride or anhydrous sodium sulphate, filter. It is a colorless liquid, conforming to the properties and tests of oil of turpentine, sp. gr. 0.858; evaporate 5 cc.—residue .015 Gm. Should be kept cool, dark, in well-stoppered, amber-

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colored bottles, and dispensed when oil of turpentine is required for internal use. Dose, stimulant, diuretic, $\text{m}\nu$ -30 (.3-2 cc.); anthelmintic, ss -4 (2-15 cc.), on sugar or emulsified.

Preps.: 1. *Emulsum Olei Terebinthinæ*. Emulsion of Oil of Turpentine. (Syn., Emuls. Ol. Tereb., Turpentine Emulsion; Fr. Emulsion d'essence de Térébenthine; Ger. Terpentinölemulsion.)

Manufacture: 15 p. c. Add to dry bottle acacia 15 Gm., then rectified oil of turpentine 15 cc. and water exactly 10, agitate briskly until emulsified, add water q. s. 100 cc. Dose, ss j-8 (4-30 cc.).

2. *Terpini Hydras*. Terpin Hydrate, $\text{C}_{10}\text{H}_{18}(\text{OH})_2\cdot\text{H}_2\text{O}$. (Syn., Terpin. Hyd.; Fr. Dihydrate de térébenthène (terpilène); Ger. Terpinum hydratum, Terpinhydrat.)

Manufacture: This hydrate of the dihydric alcohol terpin is obtained by mixing in a shallow dish rectified oil of turpentine (4), alcohol (3), nitric acid (1), allowing to stand 3-4 days, collecting crystals, draining, drying on filter paper, recrystallizing from alcohol rendered slightly alkaline to remove adhering acid. It is in colorless, lustrous, rhombic prisms, nearly odorless, slightly aromatic (resembling fresh lilacs, but not turpentine); somewhat bitter taste, efflorescent in dry air; soluble in water (200), boiling water (34), alcohol (13), boiling alcohol (3), chloroform (135), boiling glacial acetic acid (1); hot, saturated aqueous solution not acid to litmus. *Tests*: 1. Heated slowly at 100°C . (212°F .)—sublimes in fine needles; quickly heated—melts at 116°C . (241°F .) with the loss of water; also loses water of crystallization slowly over sulphuric acid. 2. Hot aqueous solution with a few drops of sulphuric acid—turbid, developing a strongly aromatic odor; incinerate 2 Gm.—ash .05 p. c. Should be kept cool, in well-closed containers. Dose, gr. 2-15 (.13-1 Gm.).

Preps.: 1. *Elixir Terpini Hydratis*, *N.F.*, 1.75 p. c. Prep.:

1. *Elixir Terpini Hydratis et Codeinæ*, *N.F.*—codeine $\frac{1}{5}$ p. c.; 2. *Elixir Terpini Hydratis et Creosoti Compositum*, *N.F.*, .44 p. c. + creosote .44, calcium glycerophos. .875, sodium glycerophos. .875. Dose, each, ss j-2 (4-8 cc.).

2. *Terebenum*. Terebene, $\text{C}_{10}\text{H}_{16}$. (Syn., Tereben.; Fr. Terebène; Ger. Tereben.)

Manufacture: This liquid, consisting of dipentene (chiefly) and other hydrocarbons (terpinene, cymol, camphene, etc.) is obtained by adding gradually sulphuric acid (1) to oil of turpentine (20), allowing to stand for 24 hours, removing supernatant layer, neutralizing with chalk, distilling, further rectifying with steam. It is a colorless, thin liquid, rather agreeable, thyme-like odor, aromatic, somewhat terebinthinate taste, soluble in alcohol (3), slightly in water; on exposure to light gradually becomes resinified and of acid reaction, sp. gr.

0.863, boils at 166° C. (331° F.). *Impurities*: Rosin, unaltered oil of turpentine. Should be kept dark, in well-closed containers. Dose, m̄v–15 (.3–1 cc.).

3. *Ceratum Cantharidis*, 15 p. c. 4. *Linimentum Terebinthinæ*, *Kentish Ointment*, *N. F.*, 35 p. c., + rosin cerate 65. 5. *Linimentum Opii Compositum*, *N. F.*, 22 p. c. 6. *Linimentum Terebinthinæ Aceticum*, *Linimentum Album*, *Stoke's Liniment*, *St. John Long's Liniment*, *N. F.*, 40 p. c.—triturate 40 cc. + 2 fresh eggs + yolks of 2 other eggs, oil of lemon 16; then add acetic acid 80, water q. s. 1000 cc. 7. *Petroxolinum Sulphuratum Compositum*, *N. F.*, 30 cc. in 100 cc. product.

II. ROSIN: 1. *Ceratum Resinæ*. Rosin Cerate. (Syn., *Cerat. Res.*, *Basilicon Ointment*, *Unguentum Tetrpharmacum*; Br. *Unguentum Resinæ*; Fr. *Cérat* (onguent) de Résine anglais; Ger. Königssalbe, Harzsalbe, Zugsalbe.)

Manufacture: 35 p. c. Heat until liquefied rosin 35 Gm., add yellow wax 15, lard 50, strain, allow to congeal, stirring occasionally; in cold weather may use yellow wax 12, lard 53.

Prep.: 1. *Linimentum Terebinthinæ*, *N. F.*, 65 p. c., see above.

2. *Emplastrum Adhæsivum*. Adhesive Plaster. (Syn., *Emp. Adhæs.*, *Emplastrum Elasticum*, Rubber Adhesive Plaster; Fr. *Emplâtre caoutchouté* simple; Ger. Kautschukheftpfaster.)

Manufacture: Mix mechanically rubber 20–30 p. c., resins, waxes, and an absorbent powder (zinc oxide, orris root or starch), and spread upon cotton cloth.

3. *Ceratum Cantharidis*, 17.5 p. c. 4. *Ceratum Resinæ Compositum*, *N. F.*, 22.5 p. c. 5. *Solutio Resinæ Chloroformica*, *N. F.*, 20 p. c.

III. OLEORESIN: 1. *Ceratum Resinæ Compositum*, *Deshler's Salve*, *N. F.*, 11.5 p. c.—melt rosin 22.5 Gm.; yellow wax 22.5, turpentine 11.5, prepared suet 30, add linseed oil 13.5, strain, stir.

PROPERTIES. I. OIL OF TURPENTINE AND OLEORESIN.—Internally—stimulant, carminative, cathartic, anthelmintic, hemostatic, expectorant, diuretic, diaphoretic, antipyretic. Externally—rubefacient, irritant, counter-irritant, antiseptic, disinfectant; contracts vessels, increases peristalsis, gastric secretion, stimulates heart, depresses nervous system. Large doses produce gastro-enteritis, vomiting, diarrhea, suppressed urine, lumbar pains, urethral burning, hematuria, strangury, insensibility, death by paralyzed respiration. It is excreted by the skin, bronchi, and kidneys; inhaling vapors give nasal, ocular, and renal irritation.

II. TERPIN HYDRATE.—Antiseptic (arresting the development of tubercle bacilli), expectorant, diuretic, diaphoretic.

III. TEREbene.—Stimulant, disinfectant, expectorant, astringent.

IV. RESIN.—Antiseptic, slight stimulant.

USES.—I. OIL OF TURPENTINE AND OLEORESIN: Internally—chronic bronchial catarrh, cystitis, gonorrhea; leucorrhea, gleet, chronic urinary troubles, piles, hemorrhages, puerperal fever, inflammation of bowels, traumatic erysipelas, intestinal worms, pneumonia, phos-

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phorus-poisoning (old oil). Externally—rheumatism, sciatica, lumbago, neuralgia, bronchitis, pleurisy, peritonitis, tympanites, renal colic, gangrene, sprains, wounds, scabies, ringworms, enlarged glands, burns, frost-bites, colic; vapors of oil in whooping-cough, diphtheria, laryngitis. Often associated with various liniments, chloroform, camphor, olive oil, narcotic extracts, etc. The oleoresin may be given in pill form, hardened with magnesium oxide. Dose, gr. 15–60 (1–4 Gm.).

II. TERPIN HYDRATE.—Acute and chronic bronchitis, hay fever, whooping-cough, chronic nephritis, chronic cystitis, gonorrhea.

III. TEREBENE.—Chronic bronchitis by inhalation and on sucrose (sugar) fermentative dyspepsia.

IV. RESIN.—Indolent ulcers, sores, wounds, in plasters, ointments, as emulsifying agent, chronic enteritis.

Poisoning: Have giddiness, gastro-enteritis, strangury, bloody, scanty urine, with violet odor; may have purging, cyanosis, dilated pupils, stertorous breathing, feeble, rapid pulse, coma, collapse. Give emetics, if no purging use enema, then plenty of water and demulcent drinks, hot fomentations to loins, opium to allay pain.

Allied Products:

1. **Pix Pini, Pine Tar**, U.S.P.—(Syn., Pix Pin., Pix Liquidæ, Resina Empyreumatica Liquidæ; Fr. Goudron végétal; Ger. Holztheer, Theer.) A product obtained by the destructive distillation of the wood of *Pinus palustris* or other species of *Pinus* (*P. Taeda*, *P. rigida*, *P. sylvestris*, and *Larix sibirica*.)

Manufacture: Refuse pine wood, cut in billets, is stacked compactly and covered with earth, except an opening at the apex for ignition and the escape of gases; slow combustion without flame is allowed to proceed, while a ditch at the bottom serves to run off the tarry liquid that is ladled into barrels; the wood is converted into charcoal and this becomes a valuable by-product. In Europe permanent clay furnaces are used over and over. It is a true, impure turpentine, semi-liquid, viscid, blackish-brown, non-crystalline, translucent in thin layers, granular and opaque with age; odor empyreumatic, terebinthinate, taste sharp, empyreumatic; miscible with alcohol, ether, chloroform, glacial acetic acid, fixed or volatile oils; heavier than water, slightly soluble in it—solution pale yellowish-brown, acid reaction; ash .25 p. c. *Test:* 1. Shake 1 cc., for 10 minutes, with water 10, add to filtrate a drop of ferric chloride T. S.—greenish, then brown color. Dose, gr. 5–30 (.3–2 Gm.), in pill.

CONSTITUENTS.—Acetic acid, small quantities of formic, propionic, capronic acids, acetone, methyl alcohol, mesit, toluol, xylol, cumol, methol (all passing over with the light oil of tar), naphthalene, pyrene, chrysene, paraffin, phenols, creosote (25 p. c.), pyrocatechin, empyreumatic resin.

PREPARATIONS.—1. *Unguentum Picis Pini*. Tar Ointment. (Syn., Ung. Pic. Pin., Unguentum Picis Liquidæ; Fr. Pomatum cum Pice, Pommade de Goudron; Ger. Theersalbe.)

Manufacture: 50 p. c. Melt yellow wax 15 Gm., add petrolatum 35, and to melted mixture pine tar 50, previously warmed, incorporate thoroughly, strain, stir until congealed.

2. *Oleum Picis Rectificatum*. Rectified Oil of Tar. (Syn., Ol. Pic. Rect., Oleum Picis Liquidæ Rectificatum; Fr. Huile volatile de Goudron rectifiée; Ger. Gereinigtes Theeröl.)

Manufacture: Distil wood-tar and collect that fraction of the distillate lighter than water, redistil. This volatile oil is a thin liquid, dark reddish-brown color, strong, empyreumatic odor and taste; soluble in alcohol, solution being acid, sp. gr. 0.975; contains hydrocarbons, phenols, acetic acid and other acids, undetermined empyreumatic products present in tar, being largely oil of turpentine.

Dose, mij-5 (.13-.3 cc.), in pills, water, or syrup.

Preps: 1. *Syrupus Picis Pini*. Syrup of Pine Tar. (Syn., Syr. Pic. Pin., Syrupus Picis Liquidæ, Syrup of Tar, Syrupus Piceus; Fr. Sirop de Goudron; Ger. Theersirup.)

Manufacture: $\frac{1}{10}$ p. c. Mix oil .1 cc. with water 45, agitate mixture frequently during 15 minutes, set aside 24 hours, shaking occasionally; dissolve in filtrate sacrose 85 Gm., add water q. s. 100 cc., mix thoroughly, strain. Dose, 3j-4 (4-15 cc.).

2. *Unguentum Picis Compositum*, N.F., 4 p. c. + zinc oxide 3, tincture of benzoin 2.

3. *Glyceritum Picis Pini*, N.F., 6.3 p. c., glycerin 25.

PROPERTIES.—Pine tar similar to oil of turpentine, but milder, scarcely ever vesicates, stimulant, expectorant, counter-irritant, insecticide. Internally—disturbs digestion, large doses may cause vomiting, colic, pain, headache, dark urine similar to phenol.

USES.—Internally—bronchitis, phthisis, vesical catarrh, constipation. Externally—scabies, scaly eruptions, eczema, burns, boils, sores, ulcers, gangrene, fissured nipples, hemorrhoids; fumes destroy foul odors.

2. *Pix Carbonis*, Coal Tar, *Pix Lithanthracis*, N.F.—The tar obtained as a by-product in the destructive distillation of coal for illuminating gas. A nearly black, thick liquid or semi-solid, heavier than water, odor characteristic, naphthalene-like, taste sharp burning; soluble in benzene, carbon disulphide, chloroform, partly so in alcohol, acetone, methyl alcohol, purified petroleum benzin, slightly so in water, imparting its characteristic odor and taste; alkaline reaction; burns with reddish, luminous sooty flame, being consumed by strong heat, ash 2 p. c.; 1. *Liquor Picis Carbonis*, Liquor Carbonis Detergens, 20 p. c. + quillaja 10 (70 p. c. alcohol).

3. *Larix Larix* (*L. europæa*, *Pinus Larix*), *Venice Turpentine* (*Terebinthina Laricis—Veneta*).—Obtained from heartwood by bore holes; yellowish-green, transparent, fluorescent, odor terebinthinate, balsamic, soluble in alcohol.

4. *European Turpentine* from *P. Pinaster*, *P. Laricio*, *P. sylvestris*, *P. rotundata* and other allied species; similar to oleoresin terebinthina.

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5. *Chian Turpentine, Terebinthinæ Chia (Pista'cia Terebin'thus)* from Island of Chio or Scio. It is a greenish-yellow liquid, hardens to transparent mass, odor fennel-like, terebinthinate, taste mildly bitter. Once used for uterine cancer, but now in disfavor. Dose, gr. 20 (1.3 Gm.).

Allied Plants:

1. *Pinus Tæ'da, Loblolly, Old Field or Frankincense Pine*.—Delaware, Florida, thence Texas, Arkansas. Grows along with *P. palustris*, and like it is a large tree, 18–30 M. (60–100°) high, but leaves (15–25 Cm.; 6–10' long) and cones (7.5–12.5 Cm.; 3–5' long) are smaller. This yields not near so great a per cent of oleoresin as official plant, but one quite as good, consequently it is utilized for this and other purposes.

2. *P. sylves'tris, Wild Pine, Scotch Fir*.—Europe. Tree 21–24 M. (70–80°) high, leaves and cones only 5–7.5 Cm. (2–3') long; this yields much of the common European turpentine; *P. Pinaster (P. marit'ima)*, S. Europe, much used for obtaining turpentine, pitch, and tar.

3. *P. Stro'bus, Pinus Alba, White Pine Bark, N.F.*—The dried inner bark, with not more than 2 p. c. of outer bark and 2 p. c. of foreign organic matter; N. America. Large handsome tree. Bark in flat pieces of variable size, 1–3 Mm. ($\frac{1}{25}$ – $\frac{1}{8}$ ') thick, yellowish, brownish, periderm patches, cottony, scattered pits, inner surface finely striate; fracture short; odor slight, terebinthinate; taste slightly mucilaginous, bitter, sweet, astringent. Powder, brownish—starch grains, calcium oxalate prisms, resin, few tracheids. Dose, ʒss–1 (2–4 Gm.); 1. *Syrupus Pini Albæ Compositus*, 8.5 p. c. Prep.: 1. *Syrupus Pini Albæ Compositus cum Morphina*, morphine sulphate $\frac{1}{25}$ p. c. Dose, each, ʒss–1 (2–4 cc.).

4. *Thu'ja occident'al'is, Thuja, Arbor Vitæ, N.F.*—The dried, leafy, young twigs with not more than 2 p. c. of stems over 4 Mm. ($\frac{1}{8}$ ') thick or other foreign organic matter—only the recently dried drug should be used; Canada, United States. Handsome evergreen tree, resembling *Chamæcyp'aris sphæroi'dea (Cupres'sus thyoi'des)* 6–15 M. (20–50°) high, trunk crooked, bark pale, shreddy, wood light, soft, durable. Twigs fan-shaped, flattened, leaves appressed in 4 rows, edges boat-shaped, glands on the back; odor strongly balsamic, aromatic, pungent; taste camphoraceous, terebinthinate, bitter. Powder, greenish-brown—chlorenchyma, stomata, guard cells, long fibers, oblique pores; solvent: alcohol; contains volatile oil 1 p. c., resin, tannin, pinipicrin, thujin, thujigenin, ash 7 p. c. Stimulant, diuretic, irritant, emmenagogue (resembling savin); fevers, bronchial catarrh, rheumatism, dropsy, worms, ulcers, warts. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluid-extractum Thuja* (alcohol).

PINUS PUMILIO. DWARF PINE.

Oleum Pini Pumilionis. Oil of Dwarf Pine Needles, U.S.P.

Pinus montana, *Miller.* { A volatile oil distilled from the fresh leaves,
yielding not less than 5 p. c. esters calculated as
bornyl acetate.

Habitat. C. Europe: Tyrolese Alps, Carpathian Mountains, 1300–2500 M. (4200–8200') elevation.

Syn. Dwarf Pine, Mountain Pine; Ol. Pin. Pumil., Dwarf Pine Oil, Pine Needle Oil; Ger. Latschenkieferöl, Krummholzöl.

Mon-ta'na. *L. montanus*, mountainous—*i. e.*, preferred place of growth.

Pu-mil'io. *L. pumilio*, *onis*, fr. *pumilus*, dwarfish, diminutive—*i. e.*, in reference to its small size.

PLANT.—Small tree, branches decumbent or knee-like, more or less erect; bark persistent, dark colored; leaves 2 in a sheath, 2–5 Cm. ($\frac{4}{5}$ –2') long, straight, scythe-shaped, obtuse apex, dull green, slightly glaucous; fruit (cones) ovoid, 4 Cm. ($1\frac{3}{5}$ ') long, pyramidal protuberance on each scale on exposed side (outer).

CONSTITUENTS.—Volatile oil, resin, tannin, bitter extractive.



FIG. 18.—*Abies Abies (excelsa)*.

Oleum Pini Pumilionis. Oil of Dwarf Pine Needles.—This volatile oil, distilled from the fresh leaves (needles), is a colorless, faintly yellowish liquid, pleasant, aromatic odor, bitter, pungent taste, sp. gr. 0.861, no portion distills below 165° C. (329° F.), levorotatory, neutral, slightly acid; contains *l*-pinene, *l*-phellandrene, sylvestrene, bornyl acetate (to which odor is due), cadinene. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mj–5 (.06–.3 cc.), on sugar, capsules, pastilles.

PROPERTIES AND USES.—Antirheumatic, expectorant, stimulant, antiseptic; chronic rheumatism (internally), chronic bronchitis,

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laryngitis (inhaled); may rub on rheumatic joints, and cover with cotton; inhalant or vapor (oil 10 cc., + magnesium carbonate 5 Gm. + distilled water q. s. 100 cc.; of this add ʒj (4 cc.) to hot water ʒxx (600 cc.) and inhale through it; allays irritation and diminishes bronchial secretion, catarrhal inflammation. A juice (Hungarian balsam) exudes spontaneously from the tips of young branches, to which flasks are attached for easy collection, and this possesses properties of turpentine as well as of the oil.

Allied Plants:

1. *Abies Abies (excl'sa)*, *Pix Burgundica*, *Burgundy Pitch*.—The prepared resinous exudation, U. S. P. 1820–1890; S. Europe (Burgundy province, France). Lofty tree, 24–45 M. (80–150°) high; leaves short, 4-cornered, green; flowers, staminate and pistillate; fruit purple, cylindrical; scales oval. The oleoresin (Jura turpentine) is obtained from incisions made through the bark, after which it is melted in water and strained, thus yielding the once official product. It is yellowish-brown, hard, yet gradually conforming to the container, shining, conchoidal fracture, opaque or translucent, brittle, softened by heat, aromatic, terebinthinate, sweetish, not bitter; contains volatile oil 5 p. c., water 5–10 p. c. (absorbed during treatment), remainder is resin (chiefly abietic acid). Stimulant, counter-irritant, in plasters, as a base and for support; rheumatism, joint affections, chest troubles, pleurisy, bronchitis, catarrh, asthma, hepatitis, phthisis, pneumonia.

2. *A. balsam'ea*, *Terebinthina Canadensis*, *Canada Turpentine*.—The liquid oleoresin (balsam of fir), U. S. P. 1820–1900; Canada, United States, chiefly Laurentine Mountains, Quebec. Beautiful, ornamental tree (American Silver Fir), 9–15 M. (30–50°) high, pyramidal shape; bark smooth, reddish-gray when young, filled with blisters (reservoirs) containing the oleoresin; leaves 2 Cm. ($\frac{4}{5}$ ') long, linear, silvery beneath;



FIG. 19. — Can for collecting balsam of fir.

flowers, staminate—catkins, pistillate—cones, 5–10 Cm. (2–4') long, 2.5 Cm. (1') broad; pollen bright yellow; seed with wing. Oleoresin (Canada turpentine), viscid, yellowish, transparent, odor agreeable; taste terebinthinate, bitter, acrid, soluble in ether, chloroform, benzene; collected by puncturing vesicles with the sharp-pointed nozzle of the "balsam-collector's" can; contains volatile oil 24 p. c., acid resin 63 p. c., indifferent resin 12 p. c., acids (4)—canadinic, canadolic, *a*- and *b*-canadinolic. Properties and uses, similar to oil of turpentine, except this dries into an adhesive, transparent varnish, thus becoming valuable in microscopic technique. Dose, gr. 15–60 (1–4 Gm.). *A. Fra'seri*.—Resembles the preceding, but cones only 5 Cm. (2') long, sharp-pointed scales projecting and recurved; New England, North Carolina, in mountains; used for collecting balsam of fir.

3. *A. Pi'cea (pectina'ta)*, *Strassburg Turpentine* (*Terebinthina Argentoraten'sis*).—Vosges. Obtained like Canada balsam, chiefly dif-

fering in odor (lemon); taste bitter, not acrid; completely soluble in absolute alcohol. *A. Menzie'sii*, *Oregon Balsam of Fir*, resembles Canada balsam when fresh, but becomes gradually granular and opaque.

4. *Tsu'ga* (*Abies*) *canaden'sis*, *Pir Canadensis* (*Canada Pitch*, *Hemlock Pitch*).—Prepared resinous exudation, U.S.P. 1830–1880; N. America. Hemlock spruce is an evergreen tree 18–24 M. (60–80°) high, .6–1 M. (2–3°) thick, trunk straight, uniform size for 12–15 M. (40–50°), bark rough, leaves 18 Mm. ($\frac{3}{4}$ ') long, 2 Mm. ($\frac{1}{12}$ ') wide, in 2 rows, numerous, glaucous, silvery beneath, cones ovate, 2.5 Cm. (1') long, resin (oleoresin) reddish-brown, translucent, or opaque, nearly hard, brittle, fracture shining, conchoidal; odor mild, balsamic, terebinthinate. Oleoresin is obtained by exudation, incision, or boxing; yield small. Used as stimulant, irritant, in plasters. *Emplastrum Picis Canadensis*, U. S. P. 1860–1880.

5. *Pini'tes succin'ifer* (*Pi'cea succinif'era*), *Succinum* (*Amber*).—Fossil resin, U. S. P. 1820–1850; Baltic Sea, Prussia, coal mines. There are 50 Pinaceæ species that yield this resin. Such trees have been submerged under seawater, and from time to time yield by natural exudation this oleoresin, which is found along shores under and above water in irregular-sized pieces, that of 13 pounds (6 Kg.) being, so far, the largest; it is rough, dull, hard, brittle, fracture conchoidal, glossy, transparent, yellowish-red, sp. gr. 1.09, aromatic when heated, tasteless, melts at 288° C. (550° F.), yielding succinic acid, if heated higher get water, volatile acids, empyreumatic oil; contains succinic acid, C₄H₆O₄, several resins. Used for preparing succinic acid and (empyreumatic) oil of amber, for fumigation, in the arts. *Oleum Succini*, U. S. P. 1820–1880. *Oleum Succini Rectificatum*, U. S. P. 1830–1870. Stimulant, antispasmodic, diuretic; hysteria, whooping-cough, infantile convulsions, intestinal irritation, amenorrhea. Externally—rheumatism, rubefacient liniments. Dose, m̄v–15 (.3–1 cc.).

6. *Ag'athis loranthifo'lia* (*Dam'mara*), *Dammar*.—E. India. A spontaneous resinous exudation, in transparent, straw-colored rounded masses, almost odorless, and tasteless, fracture conchoidal; contains resin of which 40 p. c. is insoluble in alcohol and 60 p. c. soluble; by distillation get terpene, C₁₀H₁₆. Used mostly in varnishes, rarely in plasters. That from New Zealand—*Kauri Resin*—is found also fossil and often sold as copal.

7. *Cal'litris quadrival'vis*, *Sandaraca* (*Sandarac*).—N. W. Africa. It is a resin which exudes spontaneously or from incisions made through the bark; occurs in elongated pale yellow tears 5–15 Mm. ($\frac{1}{3}$ – $\frac{2}{3}$ ') long, covered with whitish dust, of a glass-like luster, transparent, hard, brittle; odor and taste terebinthinate, balsamic, bitter, soluble in hot alcohol, ether; it resembles peas in size, often mixed with mastic, owing to its cheapness, but distinguished by being pulverulent when chewed (and not adhesive as with mastic); contains 3 resins, differing in solubility, also bitter principle; according to Tschirch—sandura-

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colic acid 85 p. c., callitricolic acid 10 p. c., volatile oil (amount depending upon freshness); mild stimulant; mainly used in varnishes.

JUNIPERUS. JUNIPER BERRY, *N.F.*

Oleum Juniperi. Oil of Juniper, *U.S.P.*

Juniperus communis, { A volatile oil distilled from the dried ripe
Linné. fruit.

Habitat. N. America (Canada, N. United States), Asia, Europe, N. Africa; dry woods, hills.

Syn. Juniper Bush, Juniper Berries, Fructus (Baccæ) Juniperi; Fr. Genièvre, Baies de Genièvre; Ger. (Gemeiner) Wachholderbeeren; Ol. Junip., Juniper Oil, Oil of Juniper Berries, Oleum Fructus (Baccæ) Juniperi; Fr. Essence de Genièvre; Ger. Wachholder(beer)öl.

Ju-nip'e-rus. L. fr. Celtic *juniperus*, rough—*i.e.*, its foliage; or fr. *L. juvenis*, young, + *parere*, to produce—*i.e.*, young fruit, leaves, etc., are continually replacing the old.

Com-mu'nis. L. common, general—*i. e.*, the usual or ordinary kind.

PLANT.—Evergreen shrub 2–5 M. (6–15°) high, with many close branches, some often prostrate; leaves narrow, longer than fruit, 12 Mm. ($\frac{1}{2}$ ') long, in whorls of 3's, sharp-pointed, channeled, deep green; flowers diœcious—staminate catkins, pistillate cones. Fruit (galbulus)—*Juniperus*, Juniper Berry, *N.F.* The carefully dried ripe fruit with not more than 10 p. c. of immature or discolored berries and 3 p. c. of foreign organic matter. It is nearly globular, 8 Mm. ($\frac{1}{3}$ ') thick, blackish-purple, blue-gray bloom, apex 3-furrowed—cohesion of 3 fleshy bracts; internally loosely fleshy, many schizogenous cavities, 3 ovate seed, oil-glands on surface, ripens second year; odor aromatic; taste sweet, pleasant, terebinthinate, bitter. Powder, dark brown—stone cells, calcium oxalate prisms, polygonal cells, aleurone grains, oil globules, resin masses.

CONSTITUENTS.—Volatile oil .5–2.5 p. c., sugar 15–30 p. c., resin 10 p. c., juniperin, proteins 4 p. c., fat, wax, malates, formic and acetic acids.

Oleum Juniperi. Oil of Juniper.—Obtained from the dried ripe fruit by distillation with salt and water, or steam; it is a colorless, faintly green or yellow liquid, characteristic odor and taste of juniper berries, soluble in 4 vols. of alcohol with not more than slight cloudiness, neutral, slightly acid, sp. gr. 0.870, levorotatory; contains chiefly pinene, $C_{10}H_{16}$, with some cadinene, $C_{15}H_{24}$, juniper camphor, and an ester to which odor and taste are due. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\mathfrak{m}\nu$ –15 (.3–1 cc.).

PREPARATIONS.—BERRY: 1. *Fluidextractum Juniperi, N.F.* (80 p. c. alcohol), dose, \mathfrak{ss} –2 (4–8 cc.): Prep.: 1. *Elixir Buchu, Juniperi et Potassi Acetatis, N.F.*, 7.5 p. c. 2. *Fluidextractum Buchu Compositum, N.F.*, 12.5 p. c.: Prep.: 1. *Elixir Buchu Compositum, N.F.*, 25 p. c.

Extract; Infusion; *Succus Juniperi Inspissatus* (Ger.), 20 p. c. OIL: 1. *Acetum Aromaticum*, N.F.; $\frac{1}{20}$ p. c. *Spirit*, 5 p. c. + alcohol, 3j-4

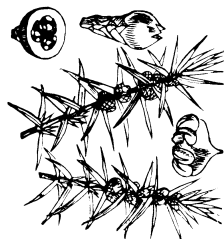


FIG. 20.—*Juniperus communis*.

(4-15 cc.). *Compound Spirit*, $\frac{2}{5}$ p. c. —oil of juniper $\frac{2}{5}$ p. c., oil of caraway $\frac{1}{20}$, oil of fennel $\frac{1}{2}$, 70 p. c. alcohol q. s. 100 cc., 5j-4 (4-15 cc.—substitute for gin.).

PROPERTIES.—Similar to turpentine; stimulant, diuretic, anodyne, emmenagogue, carminative, stomachic, antiseptic.

USES.—Renal dropsy, vesical catarrh, rheumatic pains, swellings.

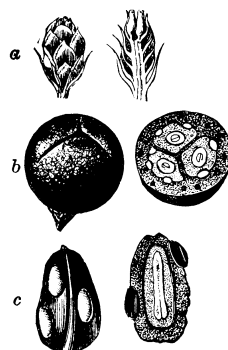


FIG. 21.—*Juniperus*: a, fertile catkin and longitudinal section; b, gallbulb and transverse section; c, seed and longitudinal section magnified.

JUNIPERUS OXYCEDRUS. PRICKLY CEDAR.

Oleum Cadinum. Oil of Cade, U.S.P.

Juniperus Oxycedrus, { An empyreumatic volatile oil obtained from
Linné. { the wood.

Habitat. S. Europe, Spain.

Syn. Prickly (Spanish, Berry-bearing) Cedar, Large Brown-fruited Juniper; Ol. Cadin., Cade Oil, Oil of Juniper Tar, Oleum Juniperi Empyreumaticum (Nigrum); Fr. Huile de Cade; Ger. Kadeöl, Takinöl, Spanisch-Cederöl.

Ox-y-ce'drus. L. fr. Gr. ὄξυς, sharp, pointed, + κέδρος, cedar—*i. e.*, cedar with pointed leaves.

Ca-di'num. L. fr. Fr. cade, juniper; Bohem. kadik, juniper—*i. e.*, European cedar.

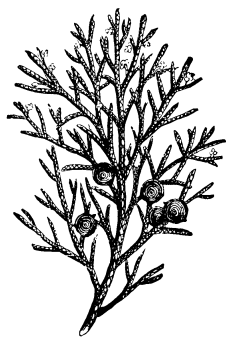
PLANT.—Shrub 2.4-3.7 M. (8-12°) high, resembling *J. communis*, branches spreading, drooping; leaves medium size, awl-shaped, pointed, 2 furrows on upper edge; fruit 12 Mm. ($\frac{1}{2}$ ') thick, reddish, shining, 2 white lines on apex.

CONSTITUENTS.—Volatile oil, resin, tannin, extractive (acetic acid, pyroligneous acid, acetone, methyl alcohol, etc.).

Oleum Cadinum. Oil of Cade.—Should be dry (downward) distilled from the heartwood, similar to obtaining tar, pieces of wood being laid carefully upon one another and covered with earth except an opening at the top, thus permitting slow combustion; inverted

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iron pots also are filled with billets, surrounded with worthless wood and set on fire, producing sufficient heat for distillation; product is caught in receptacles, set aside 15–20 days for separation of tarry and aqueous layers, the upper oily one constituting the commercial product. It is a dark brown, clear, thick liquid, tarry odor, warm, faintly aromatic, bitter taste, slightly soluble in water, imparting to it acid reaction, partially soluble in alcohol, petroleum benzin, completely soluble in ether (3), amyl alcohol, chloroform, glacial acetic acid, oil of turpentine, sp. gr. 0.980–1.055; contains phenols and sesquiterpene—cadinene, $C_{15}H_{24}$. *Test*: 1. Shake 1 part with warm distilled water (20); filtrate,

FIG. 22.—*Juniperus Sabina*.

+ 3 drops of ferric chloride solution (1 in 1000)—red; or + silver ammonium nitrate T. S.—blackens (cold); or + alkaline cupric tartrate T. S. (hot)—red precipitate. *Impurities*: Rosin, rosin oil. The oil from wood of *J. communis* often substituted. Dose, \mathfrak{mij} –5 (.2–3 cc.).

PREPARATIONS.—1. *Petroxolinum Cadinum*, N.F., 25 cc. in 100 cc. of product. 2. *Linimentum Saponis Mollis Compositum*, N.F., 2 p. c. 3. *Petroxolinum Sulphuratum Compositum*, N.F., 10 cc. in 100 cc. of product. 4. *Unguentum Sulphuris Compositum*, N.F., 15 p. c.

PROPERTIES. — Anthelmintic, externally parasiticide.

USES.—Psoriasis, pityriasis rubra, chronic eczema, prurigo, psora, favus. This oil may replace the U.S.P. *Oleum Picis Rectificatum*, both having about the same effect.

Allied Plants:

1. *Juniperus Sabina*, *Savin*, *Shrubby Red Cedar*.—The tops, U.S.P. 1820–1900; Europe, Siberia, N. America, rocky banks, mountains. Evergreen shrub, procumbent or erect, 1–4.5 M. (3–15°) high, branched, bark greenish (young), brownish (old); flowers dioecious; fruit galbulus, bluish, size of a pea, 1–3-seeded. Tops yellowish-green, subquadrangular branchlets; leaves 4 rows, dark green, scale-like, ovate-lanceolate, acute, imbricated, shallow groove on back, roundish gland in middle; odor peculiar, terebinthinate; taste disagreeable, resinous, bitter; solvents: boiling water, alcohol; contains volatile oil 2–5–10 p. c., resin, tannin, salts (K, Ca). Diuretic, emmenagogue, ecboic, irritant, hemagogue: amenorrhea, dysmenorrhea, menorrhagia, rheumatism, gout; warts, ulcers, dental caries, tinea capitis, polypi. *Poisoning*: Abdominal pain, vomiting, strangury, convulsions, coma—magnesium sulphate (full dose), demulcents, anodynes, stimulants. Dose, gr. 5–15 (.3–1 Gm.), in syrup, honey; fluidextract (alcohol), \mathfrak{mv} –15 (.3–1 cc.); cerate (25 p. c.), to prolong secretion from blisters, etc.; Infusion, Tincture.

2. *J. virginiana*, Red Cedar.—The tops, U.S.P. 1820-1870; United States. Slow-growing evergreen, 6-24 M. (20-80°) high, 15-45 Cm. (6-18') thick, branches spreading, horizontal near the ground; leaves small, glandular, ternate in pairs; odor of tops peculiar; taste pungent; contains volatile oil, resin, tannin; wood yields volatile oil (of red cedar) containing cedrene, $C_{15}H_{24}$, and cedrene camphor, $C_{15}H_{26}O$. Differs from *J. Sabina* in habit, smaller erect fruit, more acute leaves, reddish durable heartwood, yellowish sapwood, and weaker properties, but the tops and volatile oils may be substituted for each other. Branchlets bear excrescences (cedar apples), which are used as anthelmintic. Dose, gr. 10-30 (.6-2 Gm.), ter die.

CLASS 6. ANGIOSPERMÆ (Seeds clothed, enclosed in an ovary).

SUB-CLASS 1. MONOCOTYLEDONES (Embryo with one cotyledon, stem endogenous, leaves parallel-veined).

6. GRAMINACEÆ. Grass Family.

Gram-i-na'se-e. L. fem. pl. of *gramin-eus* + aceæ, of or pertaining to grass—*gramen*, grass. Herbs, shrubs, or aborescent plants, largest endogenous order except Orchidaceæ. Distinguished by having leaves 2-ranked with split sheaths and ligule; stems (culms) hollow, closed at joints; flowers glumaceous, paleæ (chaff, husk) 2, stamens 3, hypogynous; anthers versatile; ovary superior, ovule 1; fruit caryopsis, stigma feathery, hairy; universal; purgative, poisonous, cereals, fodder, sugar, volatile oil.

Genera: 1. *Zea*. 2. *Saccharum*. 3. *Hordeum*.

AMYLUM. STARCH, U.S.P.

Zea Mays, Linné. { The granules separated from grain, with a trace of foreign organic matter, yielding not more than .5 p. c. ash nor 14 p. c. moisture.

Habitat. S. America; cultivated in warm temperate zones.

Syn. Corn, Indian (Turkish) Corn, Maize, Mealies, Guinea (Turkey) Wheat; Amyl., Corn Starch; Fr. Mais, Fécule (Amidon) de Maize; Ger. Mais, Amylum Tritici, Weizenstärke, Stärke, Kraftmehl, Maisstärke.

Ze'a. L. fr. Gr. ζῆω, to live—*i. e.*, from its life-supporting properties to beast and man.

Ma'ys. L. *maydis*, Sp. *maíz*, fr. *mahiz*, its native name in the Haitian Island language, its native habitat.

Am'y-lum. L. starch, Gr. ἄμυλον = α, not, + μύλη, a mill—*i. e.*, so fine as not requiring to be ground in a mill.

Starch, fr. *stark*, strong, stiff, so called from its use in stiffening various substances.

PLANT.—An annual; stem 1.2-4.5 M. (4-15°) high, erect, stiff, unbranched, grooved on one side, smooth, solid, with spongy center, jointed; roots fibrous; leaves many, linear, .6-1 M. (2-3°) long, 5-7.5

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Cm. (2-3') wide, channeled; flowers monœcious—staminate spikelets numerous, in pairs, forming a long-stalked terminal panicle (tassel), —pistillate thick spikes, from the husks of which project long, slender styles and stigmas (silk); fruit, caryopsis (kernel) and rachis (cob) form the spike (ear), which is enclosed by the bracts of the spathe (husks); kernels (seed, grain) occur in 8-10-12 rows, or some even

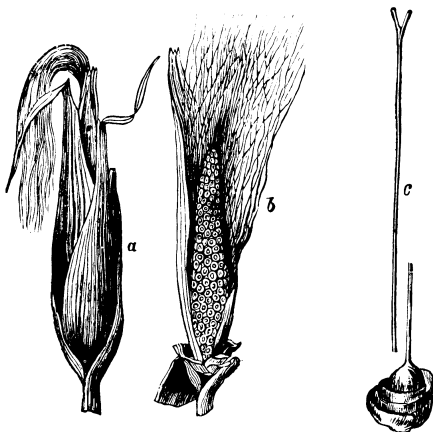


FIG. 23.—*Zea Mays*: *a*, spadiceous flower with styles protruding; *b*, the same freed from cover leaves reduced in size; *c*, a single style with stigma.

number—yellow, white, red, purple. STARCH, in fine powder, irregular, angular, white masses, consisting chiefly of polygonal, rounded, spheroidal starch grains, .003-.035 Mm. ($\frac{1}{8}$ $\frac{1}{3}$ $\frac{2}{5}$ $\frac{1}{5}$ $\frac{1}{10}$ $\frac{1}{10}$) broad, usually with lenticular, 3-several-rayed central cleft (rounded—circular marking); insoluble in cold water, alcohol; inodorous; taste slight, characteristic.

Tests: 1. With iodine T. S.—deep blue. 2. Boil 1 Gm. with water (15), cool—translucent, whitish jelly. 3. Incinerate—ash .5 p. c.; aqueous mixture neutral. 4. With diluted acids or diastase—dextrin, $C_{12}H_{20}O_{10}$, dextrose, $C_6H_{12}O_6$, water, H_2O , which reveals the starch formula to be $(C_6H_{10}O_5)_3$. 5. To 1 Gm. add distilled water 10 cc. + hydrochloric acid .5, + 3 drops of potassium ferrocyanide T. S.—no blue color within 5 minutes (abs. of iron). *Solvents*: water, glycerin—boiling. Dose, \mathfrak{ss} -2 (2-8 Gm.).

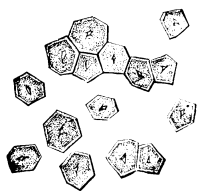


FIG. 24.—Corn starch.

ADULTERATIONS.—Allied starches, especially of wheat, potatoes (white and sweet), yam, etc., all recognized by the microscope in the shape of the granules.

Commercial.—Starch is prepared from the grain by soaking in hot water, to which an alkali sometimes is added, until the testæ are softened, then grinding under water and washing it upon large sieves

with water; by this means the starch is suspended in the water and will deposit upon being allowed to remain undisturbed for some hours; the gluten when present remains in the supernatant alkaline water or upon the sieve. When all the starch is deposited on the bottom of the container (tank), the liquid is racked off, the starch cut into blocks and carefully dried in suitable chambers. The finely ground corn meal may also be kneaded under a stream of running water until milkiness ceases, then allowing the milky water to subside.

CONSTITUENTS.— $C_6H_{10}O_5$, or a multiple of this, ash .5 p. c.

PREPARATIONS.—1. *Glyceritum Amyli*. Glycerite of Starch. (Syn., Glycer. Amyl., Plasma, Glycamyl; Br. Glycerinum Amyli, Glycerin of Starch; Fr. Glycéré d'Amidon, Glycéral simple (d'Amidon); Ger. Unguentum Glycerini, Glycerinsalbe.)

Manufacture: 10 p. c. Triturate, until homogeneous, starch 10 Gm., with water 20 cc., add this gradually to hot glycerin 70 cc., in porcelain dish, continue heat, below 144° C. (291° F.), until translucent jelly. 2. *Powdered Extracts: Belladonna, Cascara Sagrada, Colchicum, Colocynth, Hyoscyamus, Nux Vomica, Osgall, Rhubarb, Stramonium, N.F.: Euonymus, Hydrastis, Ignatia, Krameria, Leptandra, Opium, +, etc.*—as excipient and dryer. 3. *Pasta, N.F.: Resorcinolis Fortis; Resorcinolis Mitis; Zinci*. 4. *Stili, N.F.: Acidi Salicylici*. 5. *Tabullæ, N.F.: Hydrargyri Chloridi Mitis; Sodii Bicarbonatis; Sulphuris et Potassii Bitartratis, etc.*

Unoff. Preps.: Iodized Starch (Amylum Iodatum), 95 p. c., + iodine 5, + little distilled water—bluish-black powder, 5j-4 (4-15 Gm.). Paste, Poultice, Water.

PROPERTIES.—Nutritive, demulcent, protective, absorbent.

USES.—Mostly externally as a dusting-powder to allay itching and burning of the skin in erythema, urticaria, erysipelas, small-pox, to saturate bandages for fractures, as an injection for inflamed rectum or bladder, as a vehicle for enemata, to harden pills, antidote to iodine poisoning. Owing to starchy foods fermenting they should be avoided in fermentative dyspepsia.

Derivative Product:

1. *Zea Mays, Zea, Corn Silk, N.F.*—The fresh styles and stigmas, collected when corn is in milk, and used in the green condition when manufacturing pharmaceutical preparations. It is in slender filaments, 10-20 Cm. (4-8') long, .4 Mm. ($\frac{1}{60}$ ') thick, yellowish, reddish, brownish; stigmas bifid, segments slender, often unequal, .4-3 Mm. ($\frac{1}{60}$ - $\frac{1}{8}$ ') long. *Tests*: 1. Digest in diluted alcohol, filtered solution—pale purplish-red, or + acids—purplish, yellowish-red, or + alkalies—green, or + ferric chloride T. S.—olive-green, changing to greenish-brown, or + aqueous solution of alum—bluish, purplish; contains maizenic acid, resin, fixed oil, mucilage, sugar. Diuretic, demulcent, lithotriptic, alterative; cystitis, gravel, dropsy, gonorrhea, incontinence of urine. Dose, 5j-2 (4-8 Gm.); 1. *Fluidextractum Zeæ* (diluted alcohol), dose, 5j-2 (4-8 cc.). *Prep.*: 1. *Elixir Sabal et Santali Compositum*, 26 p. c. *Infusion* 10 p. c., 3j-2 (30-60 cc.).

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Allied Starches:

While the official starch is a product from corn, hence called corn starch, it should be borne in mind that there are many plants that also yield starch, but each kind peculiar to itself. This should not be accepted to infer total physical and chemical difference, because these in the main are uniform. It is only in the shape of the starch granules as viewed under a microscope that we recognize a varying form,

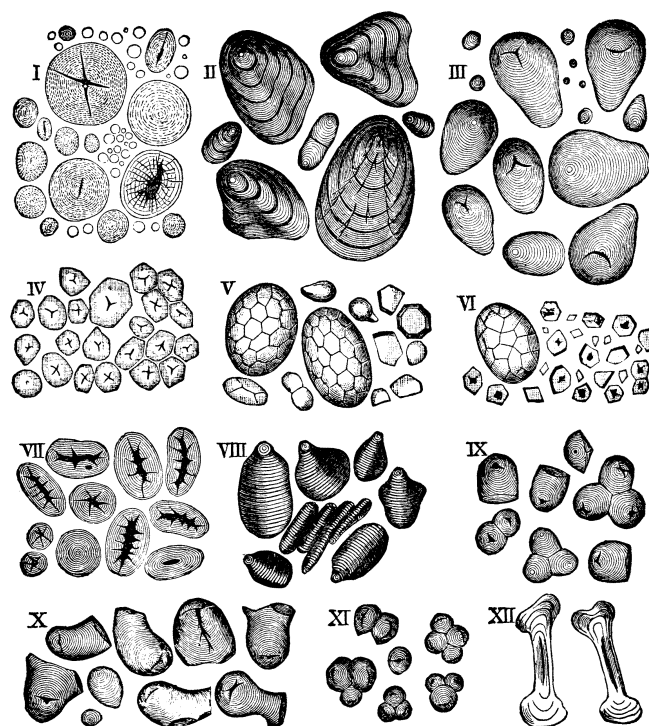


FIG. 25.—Starch granules, magnified 475 diameters.

and that this is characteristic alone for the source whence derived. Thus, when given a starch or mixture of starches, a small portion moistened with water and viewed under high power readily reveals its origin by the various outline granules. In this way (from their contained starch) it is possible to distinguish many official roots, rhizomes, seeds, fruits, etc., as it is also the cereals, edible fruits, and vegetables.

I. *Wheat Starch* (*Agropy'ron* (*Trit'icum*) *a'sti'vum*). U. S. P. 1880. Lenticular, large and small granules, layers indistinct, hilum slight, near the center.

II. *Potato Starch* (*Sola'num tubero'sum*). Ovate, granules unusually large, layers very distinct, hilum rather small and at the narrow end.

III. *Maranta Starch* (*Maran'ta arundina'cea*). Ovate granules, layers delicate, distinct, hilum at the broad end, often cleft.

IV. *Corn Starch* (*Ze'a Ma'ys*). Polyhedric granules, layers not easily distinguishable, hilum central, large.

V. *Oat Starch* (*Ave'na sati'va*). Polyhedric granules often united in ovoid masses (compound), layers and hilum indistinct.

VI. *Rice Starch* (*Ory'za sati'va*). Polyhedric granules, uniform, similar but much smaller than corn starch, hilum very small.

VII. *Bean Starch* (*Phase'olus vulga'ris*). Ellipsoidal granules, layers distinct, crossed by fissures radiating from center.

VIII. *Curcuma Starch* (*Cur'cuma lon'ga*, +). Elliptic granules, flat, contracted at one end; layers numerous, delicate, hilum small, at narrow end.

IX. *Tapioca*. *Brazilian Arrow-root* [*Man'ihot Manihot (utilis'sima)*]. *Cassava Starch*. Muller-shaped, layers indistinct, hilum near rounded end, often cleft.

X. *Sago*. *Pearl Sago* (*Metrox'ylon Rum'phii* and *M. Sa'gu*). Ovate granules, 1 end truncate, layers more or less distinct, hilum at rounded end, often cleft.

XI. *Sarsaparilla Starch* (*Smi'lax officina'lis*). Roundish, compound, usually with cleft hilum.

XII. *Euphorbia Starch* (*Euphorbiaceæ Plantæ*). Elongated, bone-shaped nodular ends, layers distinct.

Derivative Products:

1. **Glucosum.** **Glucose**, $C_6H_{12}O_6$, or hydrated, $C_6H_{12}O_6 \cdot H_2O$, U.S.P. —(Syn., Glucos., Liquid Glucose, Syrupy Glucose, Grape-sugar, Dextrose, Starch-sugar, Saccharum Amylaceum (Uveum); Fr. Sirop Cristal, Glucose Masse; Ger. Stärke-, Trauben-, Kartoffel-zucker, Glukose, Glykose.)

Manufacture: From grapes, decomposition of glucosides, but chiefly by the incomplete hydrolysis of starch—boil starch (100), water (400), sulphuric acid (.5–1.25) until iodine gives no starch reaction, neutralize (free acid) with chalk, clarify and decolorize liquid with clay and animal charcoal, filter, concentrate in vacuum-pan, when much calcium sulphate separates, filter, concentrate for glucose (liquid) or grape-sugar (crystals). It is a colorless, slightly colored, thick, syrupy liquid; odorless or nearly so; sweet taste; soluble in water, sparingly in alcohol; aqueous solution neutral, slightly acid; contains chiefly dextrose (*d*-glucose), $C_6H_{12}O_6$, 34–43 p. c., and dextrans, 30–45 p. c., maltose 0–19 p. c., water 14–23 p. c. *Tests:* 1. Add few drops of aqueous solution (1 in 20) to 5 cc. of hot alkaline cupric tartrate T. S.—copious red precipitate of cuprous oxide (dist. from sucrose).

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2. Incinerate—ash .5 p. c. *Impurities*: Heavy metals, arsenic, sucrose, water, free acid, starch, sulphur dioxide. Dose, *ad libitum*.

PREPARATIONS.—1. *Pilular Extracts of Belladonna, Conium, Hyoscyamus, Stramonium*, etc.

PROPERTIES AND USES.—Similar to cane-sugar (sucrose), nearly equal to it as a food; diuretic, dropsy, etc. One-half as sweet as cane-sugar; acts as a strong reducing agent in alkaline solutions; calcium sulphite often added as a preservative which accounts for its decolorizing free iodine. Crystals whitish, yellowish, brownish, soluble in water (1); contains dextrose 64–99.5 p. c., dextrin 0–22 p. c. Syrupus Glucosi (Br.)—liquid glucose (25) and syrup (50).

2. *Dextrinum Album, White Dextrin*, $C_6H_{10}O_5$, *N.F.*—A mixture of soluble carbohydrates: amylo-, achroo-, erythro-, malto-dextrin + unconverted starch, obtained by the incomplete hydrolysis of starch—heating it to 204° C. (400° F.) in a cylinder or flat vessel—commercial *British Gum*, or by the action of an acid—heating it 110° C. (230° F.) with diluted nitric acid. It is a white, glistening, non-hygroscopic, amorphous powder, harsh sensation when rubbed in the hand; odorless, sweetish taste, partly soluble in cold water, completely in boiling water (3). *Tests*: 1. Cold filtered aqueous solution, + iodine T. S.—wine-red; hot solution, + iodine T. S.—blue; solution, + alkaline cupric tartrate solution—no change, but reduced on boiling; ash .5 p. c. *Impurities*: Dextrose, metals, oxalic acid, natural gums, moisture: 1. *Pasta Dextrinata*, 33 p. c. + glycerin 33, water q. s. 100 Gm.; 2. *Stili Acidi Salicylici*, 35 p. c.

SUCROSUM. SUCROSE, *U.S.P.*

Saccharum officinarum, *Linné*. { A sugar, $C_{12}H_{22}O_{11}$, obtained from this plant and other sources.

Habitat. S. Asia, cultivated in tropics and subtropics, Africa, E. and W. Indies, Cuba, Brazil, S. United States, especially Louisiana.

Syn. Sucros., Saccharum, Sugar, Cane-sugar; Br. Saccharum Purificatum, Refined Sugar (Sucrose); Fr. Sucre Blanc officinal, Sucre de Canne, Sucre; Ger. Zucker, Rohrzucker, Weisszucker.

Sac'cha-rum. L. sugar, Gr. *σάκχαρον*, fr. Ar. *sukkar*, Hung. *zukur*, ML. *succarum*, after *succus*, a juice, fr. Skt. *carkara*, candied sugar, orig. grit, gravel.

Of-fi-ci-na'rum. L. *officina*, workshop—*i. e.*, *opus*, work, + *facere*, to do, = of or belonging to the shop or store.

Su-cro'sum. L., *sucrose*, Eng., fr. Fr. *sucré*, sugar, after *succus*, a juice—*i. e.*, from evaporating sweet juice.

PLANT.—Perennial herb; rhizome thick, jointed, solid; roots fibrous; stems many, 2–4.5 M. (6–15°) high, 2.5–5 Cm. (1–2') thick, jointed, solid, containing white juicy pith, and, according to variety, outside yellow, greenish-yellow, purple, or striped, joints 7.5 Cm. (3') apart, giving rise to encircling leaves; leaves 1–1.2 M. (3–4°) long, 5 Cm. (2') wide, flat, acuminate, white, midrib, longitudinally striate, dentate;

flowers pinkish, in large terminal panicles. SUCROSE, in white, hard, dry crystals, blocks, or white, crystalline powder, odorless, sweet taste, permanent, soluble in water (.5), boiling water (.2), alcohol (170), insoluble in chloroform, ether; aqueous solution (1 in 20—syrup) neutral, dextrorotatory, sp. gr. 1.313; by ferments in air or by boiling with diluted acids syrup is converted into invert sugar (dextrose + levulose) which then is directly fermentable and reduces red cuprous oxide from alkaline solution of cupric oxide; kept for a time at 180° C. (356° F.) becomes converted into levulosane, $C_6H_{10}O_5$, and dextrose (glucose), $C_6H_{12}O_6$, without loss of weight. *Tests*: 1. Saturated solution in large, well-closed, completely filled bottle—deposits no sediment on prolonged standing (abs. of insoluble salts, ultramarine, Prussian blue). 2. Aqueous solution (1 in 1) viewed horizontally through vertical glass cylinder of 25 Mm. (1') diameter—colorless, faintly yellow; incinerate—ash .05 p. c.

ADULTERATIONS.—Inferior sugars whitened with ultramarine or Prussian blue, insoluble salts, calcium, chloride, sulphate.

Commercial.—Plants of the sugar cane (there being several varieties) all resemble more or less our Indian corn, produce shoots readily, and are cultivated by cuttings planted in rows, while those of the sugar beet are practically acaulescent, biennial, and grown directly by planting the seeds annually under careful tillage, in rich soil. Cane-sugar was used by the ancients only as a medicine, being brought first from India to Europe by the Venetians during the Crusades; with the discovery of Cape of Good Hope and sea route to E. Indies the Portuguese secured its commercial control, after which cultivation extended to Arabia, Egypt, Sicily, Spain, Canaries, America, W. Indies (1494). It is obtained by cutting off ripe cane stems near the ground and passing them through iron rollers, thereby expressing the grayish, turbid, sweet juice, which is run into shallow copper pans and boiled with lime (1 in 800) to neutralize free acid and to clarify (by coagulating albumen and gluten—removed by occasional skimming), and, when sufficiently concentrated, tenacious and granular, transferring to coolers, where it is stirred frequently, thence to casks with perforated bottoms, where it is drained 24 hours and then strongly agitated with wooden stirrers, causing granulation in 6 hours, thus yielding yellowish *raw, open pan, muscovado sugar*, which is packed into hogshheads and exported, the drainings being known as treacle or molasses.



FIG. 26.—*Saccharum officinarum*.

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It is refined by dissolving in water with steam, heating with bullock's blood, skimming, filtering through canvas bags, percolating through large cylinders of animal charcoal, evaporating the colorless percolate in steam vacuum pans (to reduce pressure and heat) at 77° C. (170° F.), and, when sufficiently concentrated, running off the product into conical molds (centrifugals) having orifices closed, from which, after solidification, stoppers are removed for draining (treacle), loaves sugared by pouring over them saturated syrup, which by slow infiltration passes through carrying with it all coloring matter and impurities, without dissolving any crystallized sugar, thus yielding whitish *refined, vacuum pan, loaf sugar*. Sugar may also be obtained from beet, maple, birch, palm, etc.

CONSTITUENTS.—Juice 80 p. c., which contains sucrose 16–21 p. c., water 78–84 p. c., mucilage, resin, fat, albumin .3–.4 p. c.

PREPARATIONS.—1. *Syrupus*. Syrup. (Syn., Sirup, Simple Syrup, Syrupus (Simplex) Sacchari; Fr. Sirop (de Sucre) simple; Ger. Syrupus simplex, Weisser Sirup.)

Manufacture: Dissolve sucrose 85 Gm., by cold percolation, or by heat, in distilled water 45 cc., heat to boiling point, strain, add through strainer distilled water q. s. 100 cc., mix thoroughly; should have sp. gr. 1.313, and contain 64.54 p. c., by weight, of sucrose. Dose, *ad libitum*.

Preps.: 1. *Compound or Medicated Syrups, Elixirs, Emulsions, Mixtures*, as well as an ingredient of other preparations. 2.

Liquor Magnesii Citratis, 17 p. c.

2. *Ferri Carbonas Saccharatus*, 70 p. c. 3. *Massa Ferri Carbonatis*, 25 p. c. 4. *Pilulæ Ferri Carbonatis*, $\frac{3}{8}$ gr. (.04 Gm.). 5. *Pulvis Cretæ Compositus*, 50 p. c. 6. *Pulvis Glycyrrhizæ Compositus*, 50 p. c. 7. *Pilulæ Ferri Iodide*, N.F., $\frac{3}{8}$ gr. (.04 Gm.). 8. *Confections, Elixirs, Mixtures, Powders, Solutions, Syrups, Tablets, Troches*, etc.—of various kinds.

PROPERTIES.—Demulcent, lenitive, stimulant, laxative, aliment, condiment, externally in certain ulcerations.

USES.—Chiefly as vehicle, corrigent, preservative, antiseptic, excipient. Syrups protect ingredients against putrefaction, not always against fermentation, prevent iron preparations from oxidation; in troches, powders and mixtures covers taste of nauseous medicines, rendering insoluble substances more miscible with water; in food nutrient to adipose tissue, and a respiratory fuel; diuretic on healthy kidneys, has no effect on the teeth, good in cough, hoarseness, hiccough, aphthæ, ulcers, wounds, corneal and eyelid granulation, chronic laryngitis, chronic ozena (as snuff), ascarides (by injection), fumes destroy offensive effluvia.

Allied Products:

1. *Fructose, Fruit-sugar (Levulose)* $C_6H_{12}O_6$.—This often accompanies grape-sugar in fruits, honey, etc., sometimes in plants with cane-sugar. It is usually a colorless uncrystallizable syrup, nearly as sweet

as cane-sugar, levorotatory, soluble in water. May be produced from inulin by diluted acids; with nascent hydrogen yields mannite, with nitric acid is oxidized into succinic, acetic, and oxalic acids.

2. *Inosite, Phaseo-mannite*, $C_6H_{12}O_6 \cdot 2H_2O$.—Found in juices of some meats, green fruits (Leguminosæ), asparagus, etc.; it is very sweet, crystallizes from water, alcohol; does not ferment, but with nitric acid yields explosive compounds and oxalic acid.

3. *Syrupus Fuscus, Molasses (Melasses)*, U. S. P. 1860–1870. Have two kinds: 1, W. India; black, ropy, peculiar odor, sweet, empyreumatic taste; yields by fermenting and distilling commercial rum, and is the kind once official; 2, Sugar House (Golden Drips, Grocer's Syrup); same as preceding, only thicker, different flavor, often largely adulterated with glucose, sp. gr. 1.40, contains solid matter 75 p. c. Both kinds have uncrystallizable sugar with some cane-sugar which failed to crystallize out; also have gum, coloring matter. If these be boiled with a strong solution of potassium dichromate, get violent reaction, green liquid; but if adulterated with one-eighth starch-sugar molasses, the reaction is wanting, color not changed.

Derivative Products:

1. *Rock Candy, Saccharum Crystallizatum*.—Heat concentrated cane-sugar syrup, add spirit, and upon cooling, white, transparent, oblique, 4-sided prisms form; this is the purest kind of sucrose and makes most excellent official syrup.

2. *Barley-sugar, Saccharum Hordeatum*.—Cane-sugar melted carefully ($185^{\circ}C.$; $365^{\circ}F.$) and suddenly cooled; it is amorphous, yellowish, transparent, gradually becoming crystalline and opaque externally.

3. *Caramel, Saccharum Ustum, Burnt Sugar Coloring*, $C_{12}H_{18}O_9$, *N.F.*—A concentrated aqueous solution of the product obtained by heating glucose (sugar) until sweetness destroyed and a uniform dark brown mass results, a small amount of alkali or alkali carbonate being added while heating. It is a thick, dark brown liquid, characteristic odor of burnt sugar, pleasant bitter taste; soluble in diluted alcohol, but on increasing to 80 p. c.—precipitates; insoluble in ether, chloroform, acetone, benzene, petroleum benzin, oil of turpentine; mixes with water in all proportions—1 in 1000—sepia tint, clear; no change or precipitate from 6 hours of sunlight, sp. gr. 1.350; contains colorless bitter caramelan $C_{12}H_{18}O_9$, saccharane, $C_{12}H_{22}O_{11} \cdot 2H_2O$ (chief coloring principle), red-brown carameline, and other compounds. *Tests:* 1. Aqueous solution (1 in 20), + .5 cc. of phosphoric acid—no precipitate; incinerated—swells, forming cake-like charcoal—ash 8 p. c. Used in coloring liquid preparations; 1. *Elixir Pepsini et Bismuthi*; 2. *Elixir Vanillini Compositum*; 3. *Tinctura Antimonii*; 4. *Tinctura Opii et Gambir*; 5. *Tinctura Persionis Composita*.

Allied Plants:

1. *Ave'na sati'va, Oat, N.F.*—The grain with not more than 5 p. c. of other seeds or of foreign organic matter; Asia, Europe. Plant .6–1.3 M. (2–4°) high, culm smooth, leaves linear, veined, rough, panicles

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loose, spikelets 2-3-flowered, paleæ (husk) cartilaginous. Grain pale yellow, up to 1.5 Cm. ($\frac{3}{8}$ ') long, 3 Mm. ($\frac{1}{8}$ ') thick, fusiform, scar at base, apex showing lemma and palet, groove on ventral side having 2-veined palet or scale, straight or slightly twisted awn (strongly twisted—*Wild Oat*), caruncle at micropylar end, dense hairs at apex; odor slight; taste starchy. Powder, whitish—epicarp, pointed hairs, frag-

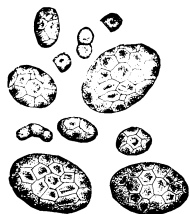


FIG. 27.—Oat starch: magnified 250 diam.

ments of lemma and palet, coarse unicellular hairs, endosperm, starch grains up to .06 Mm. ($\frac{1}{400}$ ') broad, polygonal or fusiform individual grains up to .01 Mm. ($\frac{1}{2500}$ ') broad. Grain composed of husk 25 p. c., grain (kernel) 75 p. c.; the former contains fixed oil 1-1.5 p. c., sugar and gum .25-.75 p. c., proteins 2 p. c.; the latter starch 64-66 p. c., fat 5-7 p. c., proteins 18-21 p. c. (mainly avenin), salts 1-3 p. c. The grains when ground yield—oatmeal, when deprived of paleæ—groats.

Oatmeal (*Farina Avenæ*) is not uniform, but is yellowish-white, with gluten and husk present, bitterish, starch granules polyhedric, muller-shaped. Demulcent, laxative, dietetic, nutritive; indigestible husks act as a mechanical irritant, exciting peristalsis, but may constipate by compaction; porridge or gruel may ferment and impair digestion. Dose, *ad libitum*; 1. *Fluid-extractum Avenæ Sativæ* (33 p. c. alcohol), dose, \mathfrak{zj} -2 (4-8 cc.). Prep.: 1. *Elixir Hydrastis Compositum*, 1.75 p. c.

2. *Andropogon squarrosa* (*muricatus*), *Vetiveria* (*Vetivert*).—E. India. The fibrous wiry roots from the rhizome; yellowish-brown, waxy, 15-20 Cm. (6-8') long, 1 Mm. ($\frac{1}{25}$ ') thick, tough, aromatic, balsamic; contains volatile oil, resin. Used as tonic, stimulant, in perfumery, sachet powders (violet), etc.

3. *Sorghum vulgare*, *Broom Corn*.—Fruit 4 Mm. ($\frac{1}{6}$ ') long, oval, flattened, brownish-yellow. Used in decoction (10 p. c.) for cystitis, etc.

MALTUM. MALT, U.S.P.

Hordeum vulgare, { The grain of one or more varieties, partially germinated artificially, and containing amylolytic enzymes.
Linné.

Habitat. W. Asia, China, Egypt; cultivated.

Syn. Hordeum Decorticatum (Perlatus), Maltum Hordei, Barley Malt; Fr. Orge Perlé, Malt d'Orge, Dreche; Ger. Perlgerste, Perlgrauen, Malz, Gerstenmalz.

Hor'de-um. L. barley, classical Latin name, fr. *horrere*, bristle—*i. e.*, spikelets pointed with an awn, or of the bristle form.

Vul-ga're. L. *vulgaris*, common, ordinary—*i. e.*, kind growing wild and in general use.

PLANT.—Annual grain, culm, .6-1 M. (2-3°) high, leaves 15-37.5 Cm. (6-15') long, linear, scabrous, spike 7.5-10 Cm. (3-4') long, fruit

in 2 rows, seed elliptical, 8 Mm. ($\frac{1}{3}$ ') long, flat back, angled sides grooved front, smooth, grayish-yellow from adherent paleæ, when removed brownish; deprived of outer integuments (pericarp) gives "pot barley," and by partial grinding get "pearl barley," having the integuments and a portion of the kernel removed, and ends of seed rounded off, producing grains 2.5–4 Mm. ($\frac{1}{10}$ – $\frac{1}{6}$ ') long, and about as broad; contains starch 60–68 p. c., protein compounds (gluten, albumin) 12–16 p. c., oil 2–3 p. c., cellulose 8–12 p. c. MALT, in yellowish, amber-colored grains, crisp when fractured, interior nearly white, agreeable, characteristic odor, sweet taste, due to conversion of the starch in the seed to maltose through the action of diastase, floats in cold water; capable of converting 5 times its weight of starch into sugars. *Tests*: 1. The solid soluble constituents from evaporating aqueous infusion (5 p. c.) to dryness should be 70 p. c. of the malt taken. 2. The acidity of malt, calculated as lactic acid, should not exceed .3 p. c. *Solvent*: cold water dissolves about 70 p. c. Dose, *ad libitum*.

Commercial.—Barley seed are soaked in water, placed in heaps, when heat is generated spontaneously, being prevented from rising too high by occasional turning; germination takes place, and when the germ (acrosire) has acquired the proper length ($\frac{1}{3}$ of grain), the grain is dried rapidly to kill the embryo, thereby arresting further action of diastase, hence conversion of starch to maltose, sprouts removed, and thus constitutes malt. According to degree of heat used in drying will be obtained the pale, pale-amber, or amber-brown varieties; the grain increases 9 p. c. in size, but loses 20 p. c. in weight, becoming soft and easily crumbled.

CONSTITUENTS.—Diastase .2–1 p. c., peptase (converts albumin into peptones and para-peptones), hordenine, dextrose, sugar, starch.

Diastasum, Diastase.—A mixture containing amylolytic enzymes from an infusion of malt; it is a yellowish-white amorphous powder, odorless, tasteless; converts starch into dextrin and maltose, and 50 times its weight of potato starch into sugars—power diminished by age, heat and acid or alkaline media. *Taka-Diastase* is a kindred ferment, claimed to convert 100 times its weight of starch into sugar (glucose) within 10 minutes. Dose, gr. 5–8 (.3–.5 Gm.), alone or with pepsin, usually just after meals.

PREPARATION.—1. *Extractum Malti*. Extract of Malt. (Syn., Ext. Malt.; Fr. Extrait (Essence) de Malt; Ger. Malzextrakt.)

Manufacture: Infuse malt with water at 60° C. (140° F.), concentrate at same temperature, add 10 p. c., by weight, of glycerin; sp. gr. 1.350–1.430—consistency of thick honey; yield 65–75 p. c. It is a sweet, viscous, light brown liquid extract, with agreeable characteristic odor, acid reaction, soluble in water, turbid, then flocculent precipitate

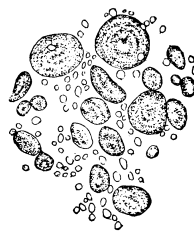


FIG. 28.—Barley starch

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with alcohol, tannin, alkaloidal reagents, mercuric chloride, gradually liquefies starch-paste, which will not become blue with iodine; contains water 20–25 p. c., maltose 48–70 p. c., dextrin 2–16 p. c., glucose, diastase 1–2 p. c., proteins 8 p. c., phosphoric acid .3–.4 p. c., lactic acid .75–1.5 p. c., ash 1.5 p. c.; converts not less than 5 times its weight of starch into water-soluble sugars. Should be kept cool, in well-closed containers. Dose, \mathfrak{zj} –4 (4–15 Gm.).

PROPERTIES AND USES.—Barley: As a nutritive in bronchial affections, sore throat, febrile diseases, pulmonary and urinary disorders; Malt: Yields to cold water its active constituents (diastase .2–1 p. c., dextrin, sugar, starch, etc.), producing an infusion or wort which by adding hop and fermenting gives several kinds of malted liquors (ale, porter, lager beer, brown stout, etc.)—infusion may be used in wasting diseases, cholera infantum, diarrhea; Extract: Good for dyspepsia, phthisis, wasting diseases, as an emulsifying agent, as a basis for cod-liver oil emulsion; dry extract as food for infants.

Allied Plants:

1. *Agropyron repens*, *Triticum*, *Couch Grass*, *Dog Grass*, N.F.—The dried rhizome and roots with not more than 2 p. c. of foreign



FIG. 29.—*Agropyron repens*.

organic matter, yielding not more than 3 p. c. of acid-insoluble ash; Europe, N. America. Perennial weedy grass (farmer's pest); culm .6–1.2 M. (2–4°) high; spikes resemble wheat, spikelets 3–8-flowered, 2-ranked glumes shortened or acute. Rhizome, usually in pieces 4–12 Mm. ($\frac{1}{6}$ – $\frac{1}{2}$ ') long, 1–2.5 Mm. ($\frac{1}{25}$ – $\frac{1}{10}$ ') thick, yellowish, furrowed, smooth, lustrous, nodes, leaf- and root-scars; fracture tough, fibrous, hollow pith; roots filiform, brownish root hairs; odor slight, aromatic; taste sweetish. Powder, light yellowish—tracheæ, pores, sclerenchymatous fibers, epidermal cells separated by a narrow cell, parenchyma; solvent: water; contains tritacin 8 p. c., fruit sugar 2.5–3.5 p. c., inosite,

glucose, mucilage, malates, ash 2–3 p. c. Diuretic, aperient, demulcent, vulnerary; cystitis, irritable bladder, dysuria, gravel, fevers, jaundice, bronchitis, gout. Dose, \mathfrak{zss} –3 (2–12 Gm.); 1. *Fluidextractum Tritici* (water—when finished add one-fifth vol. of alcohol, as preservative); 2. *Elixir Sabal et Santali Compositum*, 26 p. c., + triticum 26. *Decoction* (Br.) 5 p. c.; *Infusion*, 5 p. c.

2. *Sere'noa serrula'ta*, *Saw Palmetto Berries*, N. F.—Palmaceæ. The partially dried, ripe fruit with not more than 1 p. c. of foreign organic matter; should contain 10–15 p. c. of its natural moisture when used for pharmaceutical preparations; S. United States—near seacoast. Small, stout, evergreen shrub, large underground trunk; leaves orbic-

ular, .6–1 M. (2–3°) long, .3–.6 M. (1–2°) broad, 10–12-cleft, petioles acuminate-serrate. Fruit, 1-seeded drupe, similar to olive, ovoid, 1.5–3 Cm. ($\frac{3}{8}$ – $1\frac{1}{2}$) long, 1–1.5 Cm. ($\frac{2}{5}$ – $\frac{3}{5}$) broad, bluish-black, smooth, oily, shriveled from contraction of sarcocarp; epicarp and sarcocarp forming thin coriaceous shell enclosing thin reddish-brown endocarp which encloses an ovoid, reddish-brown seed; odor pronounced, aromatic; taste sweetish, aromatic, acrid. Powder, yellowish-brown—parenchyma cells of sarcocarp, yellowish amorphous substance, endosperm,

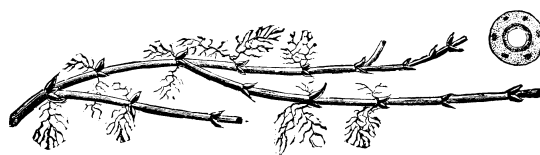


FIG. 30.—*Agropyron repens*: rhizome and transverse section, magnified 3 diam.

large pores, stone cells: solvent: 80 p. c. alcohol; contains volatile oil .5–1 p. c., fixed oil 10–15 p. c., fat, alkaloid, resin, dextrin, glucose; seed—fixed oil 12 p. c. Sedative, diuretic, expectorant, tonic, anti-catarhal; chronic bronchitis, phthisis, inflammation of genito-urinary tract, nose, larynx, atonic impotence. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Sabal* (80 p. c. alcohol), dose, mxxv –60 (1–4 cc.); 2. *Elixir Sabal et Santali Compositum*, 26 p. c. + triticum 26, *fdext. zea* 26, *fdext. sandalwood* 6.5; 3. *Tinctura Sabal et Santali*, 20 p. c. + sandalwood 6.5 (80 p. c. alcohol), dose, 3j –2 (4–8 cc.). Inhalation—mix alcoholic solution with boiling water—inhalation vapor.

3. *Metroxylon Rum'phii* (*Sa'gus Rum'phii*), *Pearl Sago*.—The prepared fecula, U. S. P. 1820–1870; E. India Islands, Borneo, Moluccas, etc. Medium-sized palm, 6–9 M. (20–30°) high, stem thick, covered with leaf-stalk remains, many pinnate leaves at apex; fruit round nut, covered with an imbricate coat, 1-seeded. The stem center contains medullary matter like elder pith, which is obtained by felling and splitting the tree trunk, washing pith to extract the starch, which may be powdered, forming sago meal, or granulated. Each tree yields 500–600 pounds (225–270 Kg.) of sago. Pearl sago is the best, in pearl-like grains, brownish, diaphanous, unaltered granules oblong, truncate, muller-shaped, layers, distinct, hilum at rounded end often cleft; common sago (*M. Sa'gu*) is larger grained. Used as demulcent, nutrient for sick with weak digestion, fevers; it is easily digested, non-irritating, prepared by boiling 1 part in water 32, straining, flavoring. Factitious sago is made from potato starch.

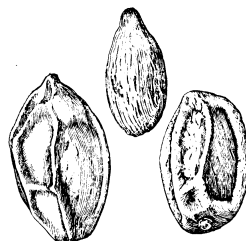


FIG. 31.—Saw Palmetto; fruit and seed.

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4. *Dæmon'orops* (*Cal'amus*) *Dra'co*, *Draconis Resina* (*Dragon's Blood*).—Borneo, Sumatra. A spontaneous resinous exudation from the ripening fruit; occurs in tears, globular pieces 4 Cm. ($1\frac{2}{3}$ ') thick, cylindrical sticks .3 M. ($1\frac{1}{2}$ ') long, or in irregular cakes, dark brown, inside bright red, fracture dull, irregular, inodorous; when heated aromatic like benzoin, tasteless; contains red resin (draconin), benzoic acid

or cinnamic acid, or both wanting, dracoresinotannol, dracoresin, dracoalban, ash 8–9 p. c. Mild stimulant, astringent. Used in tooth powders, plasters, varnishes.

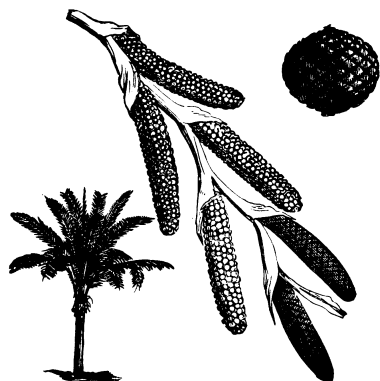
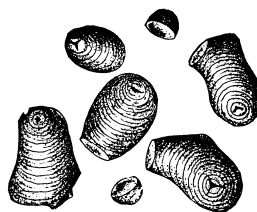
FIG. 32.—*Metroxylon Rumphii*.

FIG. 33.—Sago starch.

5. *Ar'eca Cat'echu*, *Areca Nut*.—East Indies; cultivated. Large palm tree 15–18 M. ($50\text{--}60^\circ$) high, fruit orange-color, size of hen's egg, contains 1 seed (nut), roundish, conical, 25 Mm. ($1'$) long, 9 Mm. ($\frac{3}{8}'$) thick, brown, with many reddish veins, inside horny, white, odor faint, taste astringent; contains fat 14 p. c., tannin, resin, arecoline, $\text{C}_8\text{H}_{13}\text{O}_2\text{N}$ (poisonous, tæniifuge), arecaine, guvacine; astringent, tæniifuge. Dose, ʒij-3 (8–12 Gm.).

FIG. 34.—*Areca Catechu*.

6. *Elæ'is guineen'sis*, *Oleum Palmæ* (*Palm Oil*).—W. Africa. Heat fruit with water and express. It is a solid fat, harder than butter, orange-red, bleached by light and heat, violet odor, bland taste, fuses at 27°C . (81°F .), upon keeping acquires rancid odor and lighter color; demulcent: used in ointments, but mostly in soaps and candles.

7. *Co'cos nucif'era*, *Oleum Cocois* (Cocoanut Oil).—Tropics. A fixed oil expressed from palm seeds after being boiled with water; yield 50–60 p. c.; it is a white solid, consistence of butter, odor disagreeable, soon becoming rancid; demulcent; mostly used in soaps.

8. *Arisæ'ma* (*A'rum*) *triphyllum*, *Indian Turnip*.—The cormus, U. S. P. 1820–1860; N. America. Plant acaulescent, leaves 2, 3-divided, 5–17.5 Cm. (2–7') long, 2.5–7.5 Cm. (1–3') wide. Corm 2.5–5 Cm. (1–2') broad, brownish-gray, inside white, mealy, taste burning, acrid: contains volatile acrid principle, starch, fat, gum, resin, calcium oxalate (gives acidity). Stimulant, expectorant, diaphoretic; irritant; colic, flatulence, asthma, whooping cough, chronic catarrh, rheumatism, bronchitis, aphthous sores, ringworm; in honey, syrup, ointment. Dose, gr. 5–15 (.3–1 Gm.).

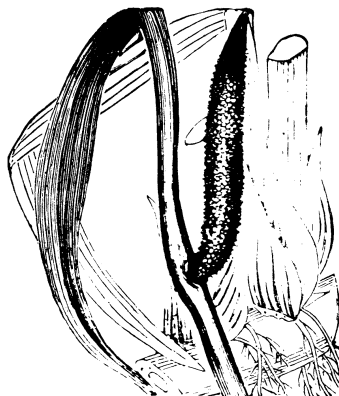


FIG. 35.—*Acorus Calamus*.

9. *Spathye'ma* (*Symplocar'pus*) *fæ'tida*, *Skunk Cabbage*.—The dried rhizome and roots, U. S. P. 1820–1870. Perennial, spathe appears first in spring, covered with purplish spots and stripes, flowers dull purple, leaves .3–.6 M. (1–2') long, .3–.4 M. (12–15') wide. Rhizome obconical, truncate, 7.5–10 Cm. (3–4') long, 5 Cm. (2') thick. Many rootlets, brownish-gray, inside whitish, many wood-bundles, whole plant fetid, more so when triturated, taste acrid, biting; contains volatile oil, gum, fat, resin, starch. Emetic, diuretic, antispasmodic, stimulant, narcotic; asthma, chronic catarrh, rheumatism, chorea, hysteria, dropsy, bronchitis, in infusion, tincture. Dose, gr. 5–15 (.3–1 Gm.).

10. *Ac'orus Cal'amus*, *Calamus Root*, *Sweet Flag*.—Araceæ. The unpeeled, dried rhizome, U. S. P. 1820–1900; N. America, Europe, Asia, swamps. Perennial herb; leaves, like those of *Iris versicolor*, 1–1.3 M. (3–4') long, 2–4 Cm. ($\frac{4}{5}$ – $1\frac{3}{5}$ ') wide, equitant, sharp-pointed, sharp-edged; flowers on scape, spadix (spike) 5–10 Cm. (2–4') long,

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1 Cm. ($\frac{2}{5}$ ') thick, minute, greenish-yellow. Rhizome, .6-1 M. (2-3°) long, 1-2 Cm. ($\frac{2}{5}$ - $\frac{4}{5}$ ') thick, entire or longitudinally split pieces, cylindrical, yellowish-brown, wrinkled, annulate (remnants of leaf-sheaths), leaf-scars above, pitted root-scars beneath, fracture short, sharp, corky, spongy, whitish, showing oil cells; odor aromatic; taste

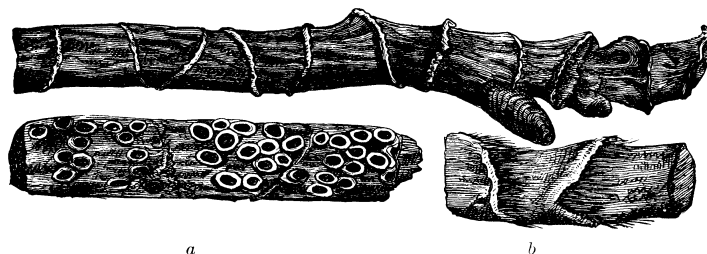


FIG. 36.—*Acorus Calamus*, rhizome: *a*, under surface; *b*, upper surface.

pungent, bitter; solvents: alcohol, hot water partially; contains (most in cortex) volatile oil 1.5-3.5 p. c., acorin .2 p. c., choline (calamine), resin. Stimulant, carminative, tonic, bitter, aromatic; dyspepsia, colic, flatulency, coughs, flavoring. Dose, gr. 15-60 (1-4 Gm.); fluid-extract (75 p. c. alcohol), m̄xv-60 (1-4 cc.; tincture 20 p. c., 3j-2 (4-8 cc.); infusion.

11. *Epiprem'num mirab'ile* (*Rhaphidoph'ora vitien'sis*—Araceæ), and *Prem'na traiten'sis*, *Tonga*.—Verbenaceæ; Fiji Islands. The mixed bark contains tongine (volatile alkaloid), volatile oil. Anodyne; neuralgia, rheumatism, in combination with salicylates. Dose, gr. 15-60 (1-4 Gm.).

7. MELANTHACEÆ. Bunch-flower Family.

Me-lan-tha'se-e. L. *Melanth-ium* + aceæ, fr. Gr. μέλας, black, + ἄνθος, flower—*i. e.*, alluding to the darker color which the persistent perianth assumes after blossoming. Leafy-stemmed herbs. Distinguished by being rarely bulbous; leaves grass-like, parallel-veined with transverse veinlets; perianth 6, stamens 6, ovary 3-celled, superior; fruit capsule, septicidal; seeds tailed or appendaged; temperate climates; sedative, diaphoretic, sternutatory, poisonous.

Genus: 1. **Veratrum**.

VERATRUM VIRIDE. VERATRUM VIRIDE, U.S.P.

Veratrum viride , <i>A.P.C.</i>	{	The dried rhizome and roots, with not more than 5 p. c. stems or other foreign organic matter, yield- ing not more than 4 p. c. acid-insoluble ash.
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Habitat. N. America, Canada to Georgia, in rich, wet woods, swamps.

Syn. Verat. Vir., Green Hellebore, American Hellebore, American White Hellebore, Swamp or False Veratrum (Hellebore), Devil's Bite, Duckretter, Bugbane, Bugwort, Earth Gall, Indian Poke (their ordeal poison), Tickle (Itch) Weed (to bare-legged boys); Veratri Viridis Rhizoma; Fr. Vêratre vert; Ger. Grüner Germer.

Ve-ra'trum. L. *vere*, truly, + *ater*, black, dark—*i. e.*, the color of the roots of some species.

Vir'i-de. L. *viridis*, green—*i. e.*, flowers are greenish.

PLANT.—Large, luxuriant, perennial herb; stem annual .6–2 M. (2–7') high, stout, cylindrical, solid, nearly smooth, pale green, unbranched except in the inflorescence; leaves 12.5–20 Cm. (5–8') long, oblong, acuminate, sheathing the stem, plaited, nerved, pubescent; flowers May–July, many polygamous, nearly sessile, greenish-yellow, racemes with downy peduncles, sepals petaloid; fruit of 3 nearly distinct follicles 2.5 Cm. (1') long, pericarp dry, brown, ventral dehiscence; seed flat, about 12 in each carpel. **RHIZOME**, upright, obconical, usually cut longitudinally into 2–4 pieces, 2–7 Cm. ($\frac{4}{5}$ –3') long, 1.5–3 Cm. ($\frac{3}{5}$ –1 $\frac{1}{5}$ ') thick, brownish, frequently numerous thin leaf-bases closely arranged at the summit, otherwise rough, wrinkled, somewhat annulate from scars of bud-scales; inodorous; taste bitter, acrid. Roots numerous, nearly cylindrical, 3–8 Cm. (1 $\frac{1}{5}$ –3') long, 1–4 Mm. ($\frac{1}{2}$ – $\frac{1}{6}$ ') thick, usually brittle, whitish, more or less starchy. **POWDER**, grayish-brown—strongly sternutatory, numerous starch grains .003–.02 Mm. ($\frac{1}{8}$ – $\frac{1}{2}$ – $\frac{1}{5}$ – $\frac{1}{10}$ ') broad, raphides of calcium oxalate, tracheæ scalariform or reticulate, often with lemon-yellow contents, lignified porous fibers; few reddish-brown cork fragments. *Solvent*: alcohol. Dose, gr. 1–4 (.06–.26 Gm.).

ADULTERATIONS.—Rhizome of allied plants, also those of *Spathyema* (*Symplocarpus*) *fætida*.

Commercial.—Rhizome is collected chiefly in autumn, sometimes just before flowering, washed, dried, entire or sliced, and, owing to likely deterioration, should not be kept more than a year. Fresh leaves in contact with the skin often produce itching, and when carelessly gathered and cooked, as spinach, in place of marsh marigold (cowslip—*Cal'tha palus'tris*), cause very serious results.

CONSTITUENTS.—Protoveratrine .03 p. c., Jervine .1 p. c., Rubijervine .005 p. c., Pseudojervine, Protoveratridine (decomposition product), Cevadine, veratramarin (bitter glucoside), jervic acid, fat, resin, gum, starch; veratroidine no longer considered an alkaloid, but a mixture of amorphous bases.

Protoveratrine, $C_{32}H_{51}O_{11}N$.—Most important; white shining crystals, soluble in chloroform, hot alcohol; solution greenish with H_2SO_4 , changing to blue, violet.

Jervine, $C_{26}H_{37}O_3N$.—Most abundant; white crystals, tasteless, non-sternutatory, slightly toxic, soluble in alcohol, acetone, chloroform.

Rubijervine, $C_{26}H_{43}O_2N.H_2O$.—White prisms, distinguished from jervine by the ready solubility of its nitrate and sulphate; almost inert.

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Pseudojervine, $C_{29}H_{43}O_7N$.—White crystals, soluble in alcohol; almost inert.

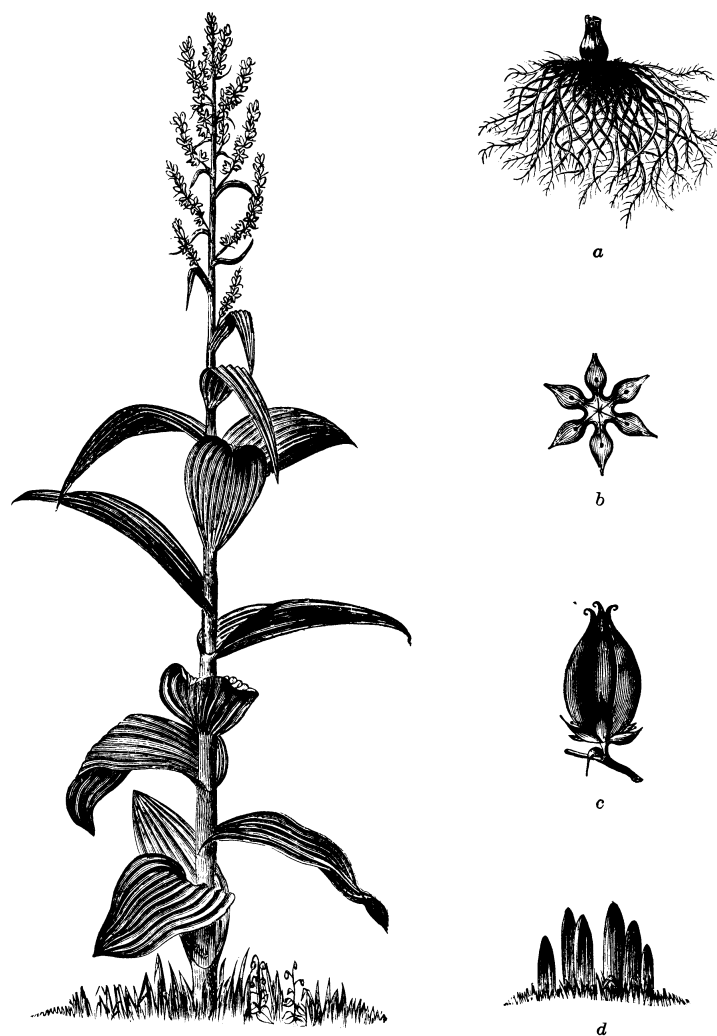


FIG. 37.—*Veratrum viride*: a, root; b, flower; c, ovary; d, plant at its early age.

PREPARATIONS.—1. *Tinctura Veratri Viridis*. Tincture of *Veratrum Viride*. (Syn., Tr. Verat. Vir., Tincture of Green (American) Hellebore; Fr. Teinture de Vérate vert; Ger. Grün Nieswurzeltinktur.)

Manufacture: 10 p. c. Moisten 10 Gm. with sufficient alcohol, transfer to percolator without pressing, let stand, well-covered, for 6 hours, pack firmly, add alcohol to saturate and cover, macerate for 24 hours, percolate with alcohol q. s. 100 cc. Dose, mij-10 (.13-.6 cc.).

Unoff. Preps.: *Extract*, dose, gr. $\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 Gm.). *Fluidextract*, dose, mj-4 (.06–.24 cc.). *Dr. Norwood's Tincture*, 50 p. c., saturated, being the same strength as the U. S. P. tincture of 1870, dose, mv-8 (.3–.5 cc.).

PROPERTIES.—Sedative, emetic, diaphoretic, irritant, sternutatory, errhine. This resembles aconite very closely in action, being a cardiac depressant and spinal paralyzant. It diminishes the frequency and force of cardiac contractions, by depressing heart muscle, and stimulating inhibition (vagus), lowers arterial and blood-pressure, depresses spinal cord, causing muscular relaxation, induces cutaneous relaxation, hence free sweating; large doses produce rapid but very feeble pulse, cold, clammy skin, vomiting, debility, giddiness, impaired vision, partial unconsciousness; it is eliminated by the bowels. Protoveratrine, the most active heart content, slows the pulse by its powerful stimulating influence upon the vagus nerve, while jervine, constituting more than one-half of the total alkaloids, plays an important part in lowering arterial tension by depressing powerfully the heart and vasomotor center; the so-called veratroidine depresses the cord, paralyzes respiration, and causes emetocatharsis, thereby often preventing fatal results.

USES.—To reduce arterial excitement, spinal spasms, pneumonia, cardiac diseases, typhoid fever. Always given in the commencing or inflammatory stages, heart disease, nervous palpitation, puerperal and epileptiform convulsions, tetanus, chorea, mania-a-potu, diphtheria.

Poisoning, Incompatibles, Synergists: Same as for aconite.

Allied Plants:

1. *Veratrum al'bum*, *White Hellebore* (*Veratrum*).—The rhizome, U. S. P. 1820–1870; Europe—Alps, Pyrenees, Balkans. Plant nearly identical with the official, slight variations being due possibly to climate and soil; constituents same in character and name, except there is no cevadine; the veratralbine of former writers is no longer considered an alkaloid, but a mixture of amorphous bases. Properties and uses precisely as the official.

2. *Asagraea officina'lis*, *Sabadilla*, *Cevadilla*; *Veratrina*, *Veratrine*, *Veratria*, *N.F.*—A mixture of alkaloids obtained from the seed; Mexico. Bulbous perennial herb; bulb ovoid covered with black scales;

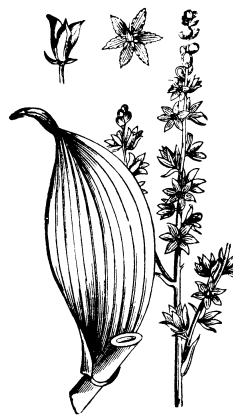


FIG. 38.—*Veratrum album*.

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scape 1.2–1.5 M. (4–5°) high; fruit 3-celled capsule (follicle). Seed 6 Mm. ($\frac{1}{4}$) long, dark brown, fusiform; contains veratrine (cevadine, veratridine, cevadilline, sabadine, sabadinine), angelic acid, methylcrotonic acid, cevadic acid, veratric acid, fixed oil, ash 3.5 p. c.

Veratrina. Veratrine, $C_{37}H_{53}O_{11}N$.—This mixture of alkaloids is obtained by exhausting seed with alcohol, evaporating to syrupy consistency, adding water to remove resin, oil, coloring matter, etc., precipitating the filtrate containing veratrine veratrate with ammonia water in excess; or may boil alcoholic extract in acidulated water (HCl or H_2SO_4), decompose with magnesium oxide, take up alkaloids with acidified alcohol, evaporate, filter through animal charcoal, precipitate with ammonia water. Commercial or medicinal veratrine usually consists of veratrine, cevadine (most important, sternutatory, with

potassium hydroxide splitting into methylcrotonic acid and amorphous cevine, $C_{27}H_{43}O_8N$), veratridine, cevadilline (amorphous, insoluble in ether, benzene), sabadine (non-sternutatory, crystallizes from ether in needles and, like the preceding alkaloids, is colored yellow, then red by sulphuric acid), sabadinine (resembles sabadine, but turns red at once with sulphuric acid), and their derivatives. It is a white, grayish-white, amorphous



FIG. 39.—*Asagrea officinalis*: a, fruit-bearing stem; b, root, bulb, and leaves.

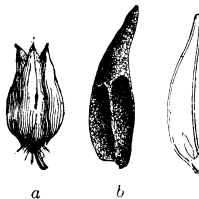


FIG. 40.—*Sabadilla*: a, fruit, natural size; b, seed and longitudinal section, magnified.

powder, odorless, but causing intense irritation and sneezing; slightly hygroscopic, soluble in water (1760), hot water (1345), alcohol (2.8), chloroform (.7), ether (4.2), insoluble in purified petroleum benzin; alcoholic solution alkaline; with sulphuric acid—yellow, orange-red, greenish fluorescence, intensified by sulphuric acid; alcoholic solution + platinic chloride T. S.—clear (abs. of foreign alkaloids). Sedative, powerful irritant, sternutatory, errhine, great depressant, reduces force and rate of pulse; externally—muscular and articular rheumatism, neuralgia, sciatica, headache, pneumonia. *Poisoning*: same as aconite. Must be cautious in handling it—never use on abraded surface, and should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{32}$ – $\frac{1}{12}$ (.002–.005 Gm.—seldom given internally); 1. *Oleatum Veratrinæ*, 2 p. c.; 2. *Unguentum Veratrinæ*, 4 p. c.

3. *Chamæli'rium lu'teum*, *Helonias*, *False Unicorn*, *N. F.*—The dried rhizome and roots with not more than 5 p. c. of foreign organic matter; N. America. Fragrant perennial herb; stem .3–.7 M. (12–18') high, from basal rosette of lanceolate leaves terminating in plume-like raceme—pistillate greenish, staminate creamy-white; fruit capsule. Rhizome .5–3 Cm. ($\frac{1}{3}$ –1 $\frac{1}{3}$ ') long, 1 Cm. ($\frac{2}{3}$ ') thick, roundish, grayish-brown, annulate from scars of bud-scales, leaf bases above, many yellowish wiry roots beneath, 5–8 Cm. (2–3') long; fracture hard, horny, internally grayish-yellow, cortex 3–4 Mm. ($\frac{1}{8}$ – $\frac{1}{6}$ ') thick, odor slight; taste bitter, astringent. Powder, yellowish—parenchyma cells with unaltered starch grains, bundles of calcium oxalate raphides, lignified cork and fibers, tracheæ; solvent: diluted alcohol: contains chamelirin (bitter saponin-like glucoside) 10 p. c. Tæniifuge, diuretic, uterine tonic, emetic; tape-worm, atony of gastro-intestinal and genito-urinary mucous membranes, dropsy. Dose, \mathfrak{z} ss–1 (2–4 Gm.); 1. *Fluid-extractum Heloniadis* (diluted alcohol). Preps.: 1. *Elixir Heloniadis Compositum*, 3.2 p. c. (fldext.), + fldext. of caulophyllum 3.2, fldext. of viburnum opulus 3.2, fldext. of mitchella 12.5, dose, \mathfrak{z} ss–1 (2–4 cc.); 2. *Elixir Aletridis Compositum*, 6.5 p. c. Helonin ("Eclectic" extract), dose, gr. 1–5 (.06–.3 Gm.).

8. LILIACEÆ. Lily Family.

Lil-i-a'se-e. L. *Lili-um* + aceæ, a lily, fr. Celtic *li*, whiteness, alluding to beautiful white flowers of original species. Herbs, shrubs, trees. Distinguished by having bulbs, rhizomes, tubers, or fibrous roots; leaves parallel-veined; flowers regular symmetrical, 6-androus, perianth non-glumaceous, petaloid, free from 3-celled, superior ovary; anthers 2-celled; fruit many- or few-seeded pod or berry; temperate climates, tropics; purgatives, emetic, diuretic, diaphoretic, stimulant, astringent, acrid; fibers, food, condiment.

Genera: 1. **Colchicum**. 2. **Aloe**. 3. **Urginea**.

COLCHICUM. COLCHICUM.

1. COLCHICI CORMUS. Colchicum Corm, *U.S.P.*
2. COLCHICI SEMEN. Colchicum Seed, *U.S.P.*

Colchicum autumnale, *Linné*, $\left\{ \begin{array}{l} 1. \text{ The dried corm, yielding not less than } \\ \quad .35 \text{ p. c. of colchicine.} \\ 2. \text{ The dried ripe seed, yielding not less } \\ \quad \text{than } .45 \text{ p. c. of colchicine.} \end{array} \right.$

Habitat. C. and S. Europe, N. Africa (England, Greece, Turkey, Switzerland); moist pastures and meadows.

Syn. Colch. Corm., Colchicum Root, Colch. Sem., Meadow Saffron, Naked Ladies, Autumn-, Fog-, Meadow-, Michaelmas-, or Purple-Crocus, Upstart,

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Bulbus (Tuber) Colchici; Colchici Radix; Colchici Semina; Fr. Colchique, Safran bâtard, Bulbe de Colchique—de Safran bâtard, Semences de Colchique; Ger. Semen Colchici, Zeitlosensamen, Herbstzeitlose, Wiesensafran, Zeitlosenknollen.

Col'chi-cum. L. fr. Gr. κολχίς, Colchis. An ancient province in Asia Minor, east of Black Sea, where this poisonous plant flourished; also the home of Medea, the sorceress and poisoner of ancient legend.

Au-tum-na'le.—*L. au(c)tumnalis*, belonging or peculiar to autumn—*i. e.*, the plant blooms Sept.-Oct., covering meadows with saffron-colored flowers resembling a carpet.

PLANT.—Bulbous perennial, several inches high; leaves radical, 3–5, sheathing 15–30 Cm. (6–12') long, 2.5–5 Cm. (1–2') wide, erect, entire, strap-shaped, smooth, shiny dark green; flowers 2–6, large, lilac-purple, resembling crocus except anthers extrorse; corolla-tube



FIG. 41.—*Colchicum autumnale*: 1, closed capsule; 2, open capsule; 3, styles; 4, cross-section of capsule; 5, seed.

12.5–15 Cm. (5–6') long, two-thirds being underground; fruit of 3 inflated follicles, united at base, 4 Cm. (1 $\frac{3}{5}$ ') long, brown, papery, dehiscent; seed numerous. **CORM**, ovoid, convex on one side, flattish with a groove on the other, 25 Mm. (1') long, 18 Mm. ($\frac{3}{4}$ ') thick; epidermis thin, brownish, wrinkled; internally whitish, solid; usually in reniform, transverse or ovate longitudinal slices, 2–5 Mm. ($\frac{1}{12}$ – $\frac{1}{8}$ ') thick; flat surfaces whitish, slightly roughened, crystalline under hand lens; fracture short, mealy; odor slight; taste bitter, acrid. **POWDER**, grayish-brown—numerous starch grains, .003–.03 Mm. ($\frac{1}{8000}$ – $\frac{1}{3000}$ ') broad, triangular, star-shaped central cleft, few tracheæ and fragments of epidermal cells. **SEED**, ovoid, irregularly globular, pointed at hilum, 2–3 Mm. ($\frac{1}{12}$ – $\frac{1}{8}$ ') broad, when fresh several seed cohering, brownish, finely pitted, tough, of bony hardness (by which they are distinguished readily

from other seeds of similar appearance); internally whitish, mostly endosperm; nearly inodorous; taste bitter, acrid. **POWDER**, light brown—oil globules, aleurone grains, starch grains, .005–.02 Mm. ($\frac{1}{20000}$ – $\frac{1}{12500}$ ') broad. **Solvents**: diluted alcohol; vinegar; wine. **Dose**, **CORM**, gr. 2–8 (.13–.5 Gm.); **SEED**, gr. 1–5 (.06–.3 Gm.).

Commercial.—Plant resembles our garden tulip, requiring 2 years for the cycle of complete development, but all parts have medicinal properties. Planting the bulb in the spring, by autumn a new cormus is formed on the lateral inferior portion, being still embraced half around by the parent whose place it is destined to take, sending roots downward and a spathe upward from which flowers emerge, Sept.—

Oct., but as yet no leaves; the lower corolla-tube, underground, whitish, perishes by Nov., while the fruit rudiment (ovary) remains underground until the following spring, when it rises on the stem in the shape of a 3-lobed, 3-celled capsule, bringing with it the first leaves. The corm is most active when a year old, and should be collected June–August of the second year, after seed are ripe and just before the sprouting forth of fall flowers from newly-forming cormus; it is then most developed and least exhausted from the formation of new bud

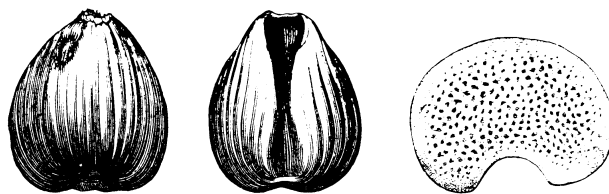


FIG. 42.—Colchicum corm (tuber): front and rear view; also transverse section.

and soon to be evolved corm, provided it be left in the ground. It now is dug, washed, sliced, and dried by sun or fire (65°C. ; 150°F.), and resembles the tulip bulb, although without concentric scales; loses upon drying 70 p. c. The seed are the most concentrated portion of the plant and should be collected when fully ripe, July–August; their horny albumen renders powdering difficult, which is accomplished best in a mill with hardened plates; if pestle and mortar used, seed must be absolutely dry or be macerated in their menstruum to soften, so as to mash easily. Unless very fine, cold solvents extract only one-third of the colchicine, but hot solvents exhaust irrespective of fineness. England and Germany furnish our supply, the quality usually being determined simply by the degree of bitterness.

CONSTITUENTS.—Colchicine .5 p. c. (Colchicine), Colchicoresin, Beta-colchicoresin, starch, sugar, fixed oil (seed—5–6 p. c.), gum, ash 2.6–8 p. c.

Colchicina, Colchicine, $\text{C}_{22}\text{H}_{25}\text{O}_6\text{N}$, U.S.P.—(Syn., Fr. Colchicine; Ger. Colchicin.). This alkaloid is prepared by exhausting seed with hot alcohol, recovering latter, adding water (to remove resin, fat, wax), shaking from brown filtrate with 4 portions chloroform, mixing these, distilling, dissolving residue in water, shaking with chloroform, evaporating last solution, thereby getting crude colchicine-chloroform; dissolve in alcohol, evaporate, treat with warm ether, crystallize, heat crystals with water, evaporate. It is in pale yellow, amorphous scales or powder, darker on exposure, odorless or nearly so; bitter taste; soluble in water (22), hot water (21), ether (220), benzene (100), alcohol, chloroform, insoluble in petroleum benzin; aqueous solution



FIG. 43.—Colchicum seed: a, natural size; b, section magnified.

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(1 in 30) neutral, levorotatory, yellowish, intensified by inorganic acids; melts at 144° C. (291° F.). *Tests*: 1. Stir .001 Gm. with a few drops of sulphuric acid—lemon-yellow, changed by a drop of nitric acid to greenish-blue, red, yellow, + excess of sodium hydroxide T. S.—color changed to red. 2. Aqueous solution (1 in 100) 5 cc. + 2 drops of ferric chloride T. S.—no color (abs. of colchicine); heat—brownish-red, then brownish-black. 3. Alcoholic solution (1 in 20) 1 cc., + a drop of ferric chloride T. S.—garnet-red; incinerate .1 Gm.—ash negligible. 4. Heat .01 Gm. + sodium hydroxide T. S. 2 cc. + a drop of aniline—no odor of phenyl-isocyanide (abs. of chloroform). This alkaloid and its salicylate are the best forms for use. Should be kept dark, in well-closed containers, and great caution must be used in tasting and handling. Dose, gr. $\frac{1}{160}$ – $\frac{1}{120}$ (.0004–.0005 Gm.); 1. *Elixir Tongæ et Salicylicum*, N.F., .0035 p. c.

Colchicine, $C_{21}H_{23}O_6N \cdot \frac{1}{2}H_2O$.—Not in drug, but produced as a result of hydrolysis in percolating with acid menstrua; readily converted into colchicine by etherification with methyl alcohol and hydrochloric acid, or with methyl iodide + sodium hydroxide in methyl alcohol; with mineral acids splits into acetic acid, methyl alcohol, and apocolchicine; it occurs in white crystals, non-toxic, inodorous, soluble in alcohol, chloroform, hot water, also in alkalies and their carbonates giving yellow solutions.

Colchicoresin, $C_{51}H_{60}O_{15}N_2$.—Brown, amorphous, soluble in chloroform, alcohol; insoluble in ether, sparingly in cold water.

Beta-colchicoresin, $C_{34}H_{39}O_{10}N$.—Blackish-brown, soluble in chloroform, strong alcohol; insoluble in water or ether. These last 2 are affected but slightly by tannin, are brownish-green by ferric chloride, and dissolve in potassium hydroxide with a brown color.

PREPARATIONS.—I. CORM: 1. *Extractum Colchici*. Extract of Colchicum. (Syn., Ext. Colch., Extractum Colchici Cormi, Powdered Extract of Colchicum, Extractum Colchici Radicis, Acetic Extract of Colchicum; Br. Extractum Colchici; Fr. Extrait de Colchique (acétique); Ger. Zeitlosen Essigextrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol until exhausted (200 cc.), reclaim alcohol until residue is 15 cc., rinse still with a little warm alcohol, which add to residue in a flask, cool, shake thoroughly with purified petroleum benzin 25 cc., again with 15 cc., again with 10 cc., discard benzin layers, transfer residue to dish, rinse flask with a little warm alcohol, which add to dish, evaporate to a thick extract, add dried starch 5 Gm., mix thoroughly, spread on glass plates, dry in current of warm air at 70° C. (158° F.), pulverize; after assay add enough dried starch for extract to contain 1.4 p. c. of colchicine; mix thoroughly, pass through fine sieve; contains 1.25–1.55—1.4 p. c. of colchicine; 1 Gm. represents about 4 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

2. *Fluidextractum Colchici Cormi*, N.F. (67 p. c. alcohol)—100 cc. yields .31–.39—.35 Gm. of colchicine. Dose, mij–8 (.13–.5 cc.).

3. *Tinctura Colchici Cormi Fortis*, *N.F.*, 40 p. c. (33 p. c. alcohol)—100 cc. yields .126–.154—.140 Gm. of colchicine; used instead of the wine. Dose, $\text{m}\times$ –30 (.6–2 cc.).

II. SEED: 1. *Fluidextractum Colchici*. Fluidextract of Colchicum. (Syn., *Fldext. Colch.*, *Fluidextractum Colchici Seminis*, Fluid Extract of Colchicum Seed; Fr. *Extrait fluide de Semence de Colchique*; Ger. *Zeitlosensamenfluidextrakt*.)

Manufacture: Pack, percolate 100 Gm. with purified petroleum benzin until no greasy stain on filter paper, reject benzin solution; dry in air, add 67 p. c. alcohol to moisten, macerate in tightly-covered container 6 hours, repack, add menstruum, when begins to drop from lower orifice, close, macerate 48 hours, percolate until exhausted; reserve first 85 cc., reclaim alcohol from remainder at 60° C. (140° F.), concentrate residue to soft extract; dissolve this in the reserve, assay and add enough menstruum for the 100 cc. to contain .36–.44—.4 Gm. of colchicine. Dose, mj –5 (.06–.3 cc.).

2. *Tinctura Colchici*. Tincture of Colchicum. (Syn., *Tr. Colch.*, *Tinctura Colchici Seminis*; Fr. *Teinture (de Semences) de Colchique*; Ger. *Tinctura Colchici*; *Zeitlosentinktur*.)

Manufacture: 10 p. c. Similar to *Tinctura Veratri Viridis*, page 104, 60 p. c. alcohol—percolate 95 cc., assay and add q. s. menstruum for 100 cc. to contain .036–.044—.04 Gm. of colchicine. Dose, $\text{m}\times$ –30 (.6–2 cc.).

PROPERTIES.—Alterative, cathartic, emetic, sedative, diuretic, diaphoretic, gastro-intestinal irritant. Small doses increase secretions generally (urine, sweat, etc.); normal doses produce only pains and loose bowels, having little or no effect on nervous system, circulation, respiration, or temperature.

USES.—Gout, rheumatism, especially if neuralgic, increases urea and uric acid elimination from blood, prurigo, urticaria, other gouty cutaneous troubles. Should be given with an alkali, pushing it just short of nausea, and before beginning with it the bowels should be moved with magnesium sulphate, oxide, or carbonate. Repeated attacks render larger doses necessary, and it may lose entirely its effect. Colchicum was used by the ancients in gout, etc., but falling into disfavor was revived by Störck as a diuretic, expectorant in dropsy, asthma. Again growing into odium, became reëstablished by Want, who thought it a component of *Eau médicinale d'Husson*, a celebrated gout cure.

Poisoning: Have persistent purging, tenesmus, nausea, vomiting, thirst, pain in throat, esophagus, and stomach, suppressed urine, pinched face, dilated pupils, salivation, cold extremities, weak pulse, prostration, headache, delirium, spasms, stupor, death by gastro-enteritis or cardiac paralysis, conscious until the last. Evacuate stomach, if not already done, give tannin, morphine, demulcent drinks, stimulants, heat to extremities, hot abdominal fomentations, castor oil.

Incompatibles: Alcohol, opium (antagonizes cardiac depression), tannin, vegetable infusions.

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Synergists: Diuretics, purgatives, emetics, alkalies.

Allied Plant:

1. *Colchicum variegatum*, *Oriental Hermodactyls*.—S. Europe, Asia Minor. Corm like official, but surface smooth, whitish to black, bitter, insipid.

ALOE. ALOE, U.S.P.

Aloe { **Perryi**, Baker, { The inspissated juice of the leaves, yielding not
 vera, (Linné), { more than 4 p. c. ash, 10 p. c. moisture, and
 ferox, Miller. { 50 p. c. water-soluble extractive.

Habitat. 1. E. Africa, Island of Socotra; cultivated. 2. W. Indies (N. E. Africa, India); cultivated in Curaçao, Aruba, Bonaire, Italy, Sicily, Malta, naturalized in Barbados Island, etc. 3. Cape of Good Hope (S. Africa).

Syn. 1. Aloe Socotrina, Socotrine (*sucus citrinus*)—, Bombay-, Mocha-, Turkey-, Zanzibar-Aloe; Fr. Aloës; Ger. Aloë, Aloe, Socotra Aloe, Socotrinische Aloe. 2. Aloe Barbadensis, Barbados-, Curaçao-, East Indian-, India-, Bitter-, Hepatic-, Horse-Aloe; Fr. Aloës hépatique des Barbades, ou de la Jamaïque; Ger. Barbados Aloe. 3. Aloe Capensis, Aloe lucida, Shining (Glassy) Aloe; Fr. Aloes du Cap; Ger. Kapaloe.

Al'o-e. L. fr. Ar. *Alloeh*, Gr. ἀλόη, native names for the aloe.

Per'ry-i. L. after Wykeham Perry, who studied the plant natively.

Ve'ra. L. *verus*, true—*i. e.*, the original and true primitive kind.

Fer'ox. L. fr. *ferox* or *ferus*, fierce, coarse, wild—*i. e.*, large plant with leaves prickly on surface as well as margins.

PLANTS.—Perennials; stems 1.5 M. (5°) high, woody, rough from leaf-remnants; leaves glaucous-green, often with darker spots, thick, succulent, bayonet-shaped, margin with reddish spines or serratures; flowers racemose or spicate, tubular, yellowish, orange-red; stamens 6, unequal, 3 longer than corolla. **INSPISSATED JUICE** (aloe—*A. Perryi*): *Socotrine*, yellowish-, blackish-brown, opaque, smooth glistening masses, fracture somewhat conchoidal; odor characteristic; (*A. vera*): *Curaçao*, orange, blackish-brown, opaque masses; fracture uneven, waxy, somewhat resinous; odor characteristic, disagreeable; (*A. ferox*): *Cape*, reddish-brown masses, usually with yellowish powder, or in thin, transparent fragments, reddish-brown; fracture smooth and glassy; odor characteristic, sour, disagreeable. With nitric acid, Socotrine aloe—yellowish, reddish-brown solution; Curaçao—deep red; Cape—reddish-brown, to purplish-brown, finally green; taste of each variety very bitter, nauseous. **POWDER**, yellowish-brown, dark reddish-brown; mounted in a bland expressed oil, appears yellowish to reddish-brown angular or irregular fragments, color depending somewhat on thickness of fragments. *Tests:* 1. Shake 1 Gm. + cold water 25 cc. occasionally during 2 hours, place on filter, dry over sulphuric acid, wash with cold water q. s. 100 cc.; residue not over 50 p. c.; color of filtrate light yellowish-brown (socotrine), reddish-brown (curaçao), yellowish (cape), darkens upon standing. 2. 5 cc. above filtrate, + water 45 cc. + 20 cc. sodium borate solution (1 in 20)—green fluorescence, upon standing brownish liquid. 3. 10 cc. above filtrate, +

water 90 cc., shake + benzene 10 cc., separate benzene layer + ammonia T. S. 5 cc.—permanent deep rose color in lower layer. 4. 1 Gm., + 50 cc. alcohol, heat gently, cool,—nearly clear solution (abs. of gum, inorganic impurities). *Solvents*: alcohol; boiling water; cold water (4); insoluble in ether, chloroform. Dose, gr. $\frac{1}{2}$ –10 (.03–.6 Gm.).



FIG. 44.—*Aloe Perryi*.

FIG. 45.—*Aloe vera (vulgaris)*.

ADULTERATIONS.—ALOE: Chiefly dried juice of inferior allied species, small amount of leaves, wood, sticks, stones, leather, monkey and goat skins, implements, knives, nails, iron, resin, pitch, ochre, burned bones, gum, extract of glycyrrhiza, etc.—5–27 p. c., increasing ash to 26.5 p. c. ALOIN: Resinous and other matter, recognized by imperfect solubility in water.

Commercial.—Plants resemble to some extent *Agave americana*, American Aloe or century plant, and were known to Dioscorides and Celsus. The large, thick leaves have a central insipid, thick, mucilaginous juice as well as a peripheral bitter, watery, colorless juice (aloetic) in distinct, elongated, thin-walled ducts, which varies in activity with age of leaf and season of year. This superficial juice—possibly a plant protection—is collected when not too scanty or watery, March–April, just after the rainy season, by cutting off the leaves near their base, during sunshine, and standing them up for half an hour in skins depressed in the ground, or in a series of 5 V-shaped wooden troughs (1.2 M.; 4° long—.3–.5 M.; 12–18' deep), each with an opening in the lower inclined end to run off juice as it exudes by gravity alone (any pressure serving to expel also the undesirable central juice,

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possessing emmenagogue properties and suitable for poultices) into iron or copper vessels for evaporation, which continues 5 hours, occasionally ladling out the impurities. The colorless juice on exposure soon becomes yellowish-brown, but may be kept in barrels for months, as it does not spoil, and according to demand reduced slowly by sun (socotrine) or rapidly by fire (curaçao, cape), thus imparting a heavier odor without injuring medicinal properties. In Curacao immediate evaporation, below the boiling-point, yields a variety called "Capey," from its luster and yellowish powder, but if evaporation is deferred a year the surface is dull, odor suggestive of fermentation; powder brownish, and less soluble in water (4–13 p. c.). When of proper consistence the evaporated product—commercial aloe—is poured into tin-lined boxes, kegs, casks, tubs, monkey or goat skins and sent via Zanzibar to Bombay (socotrine), or into gourds (2–15–50 pounds; 1–7–23 Kg.), boxes (60–100 pounds; 27–46 Kg.), small calabashes and shipped from Curaçao, Bonaire, Jamaica, Barbados (Curaçao), or into boxes, cases, skins, and shipped from Algoa Bay, Cape Town, Mossel Bay (cape). There are three varieties: 1, *Socotrine* (*A. Perryi*), most expensive, highly esteemed and flavored—the best; 2, *Curaçao* (*Barbados*—*A. vera* (*vulgaris*)), mostly used, and commands a higher price upon keeping; 3. *Cape* (*A. ferox*), production equals all other varieties combined; not used much in this country, but largely in Germany, S. Europe.

CONSTITUENTS.—Aloin (chiefly—barb-aloin), Resin 30–50 p. c., Emodin (Cape and Barbados) .15–2 p. c., volatile oil (to which disagreeable odor is due) .0015 p. c., moisture 5–10 p. c., ash 1–4 p. c.

Aloinum. **Aloin**, *U.S.P.*—A pentoside or mixture of pentosides from aloe, varying in chemical composition, physical and chemical properties according to source. Obtained chiefly by dissolving Curacao aloe (1) in boiling acidulated, HCl or H₂SO₄, water (10), letting stand 24 hours for resin to deposit, decanting, evaporating to 2 parts, setting aside 2 weeks to crystallize—yield 20–25 p. c. It is a microcrystalline powder, minute crystals, lemon-yellow, darker on exposure, odorless, slight odor of aloe, intensely bitter taste; varies in solubility with its composition—soluble in water, alcohol, acetone, ammonia water, solutions of alkali hydroxides, slightly in ether. *Tests*: 1. Aqueous solution—yellow, brown on standing, neutral, faintly acid. 2. Dissolves in alkaline hydroxide solutions—red, yellow becoming red, green fluorescence. 3. Decomposes when added to alkaline solutions, more slowly in acid solutions; alcoholic solution + a drop of ferric chloride T. S.—brownish-green; incinerate—ash .5 p. c.; insoluble residue in water dried —1.5 p. c. 4. Shake 1 Gm. + benzene 10 cc.—filtrate imparts faint pink color to equal volume of 5 p. c. ammonia water (lim. of emodin). Curaçao-aloin, C₁₇H₂₀O₇, identical with barb-aloin, ugand-aloin, cap-aloin, when boiled with nitric acid—chrysammic acid, crimson color; soc-aloin, C₁₅H₁₆O₇, with nitric acid—no color change; nat-aloin dissolved in sulphuric acid in proximity to glass rod

dipped into nitric acid—solution green, blue, violet, orange-red—but no effect on the two preceding. Twice as active as aloe and usually produces no griping. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

Resin.—Obtained by allowing a dilute aloetic infusion to cool, when it precipitates, filtering, drying. Like aloin, varies according to source, the several kinds being esters of various acids (cinnamic, paracumaric, etc.) with aloesino-tannol; soluble in hot water (thus differing from other resins), alcohol, ether, alkaline solutions, brownish-black by ferric salts; equally active as the drug, due possibly to accidental presence of aloin.

Emodin (*Aloe-emodin*).—Believed to be in Cape and Barbados, but not in Natal or Socotrine, and is obtained by dissolving it in ether from aloin, of which, as well as of aloe, it is the purgative principle. In aloin, just as in anthraglucosennin, rhein, frangulin, and purshianin, the alkaline secretions of the upper intestine must produce decomposition, whereby the emodin thus set free may produce peristalsis, hence the cathartic action of the drug.

PREPARATIONS.—I. ALOE: 1. *Pilulæ Aloes*. Pills of Aloe. (Syn., Pil. Aloes; Br. Pilula Aloes, Aloes Pill; Fr. Pilules d'Aloës et de Savon; Ger. Aloepillen.)

Manufacture: Mix aloe 13 Gm., soap 13, water q. s. 100 pills. Dose, 1–4 pills.

2. *Extractum Colocynthis Compositum*, 50 p. c. 3. *Tinctura Benzoini Composita*, 2 p. c. 4. *Pilulæ Aloes et Asafetidæ*, N.F., āā, 1½ gr. (.09 Gm.). 5. *Pilulæ Aloes et Ferri*, N.F., āā, 1 gr. (.06 Gm.). 6. *Pilulæ Aloes et Mastiches*, N.F., 2 gr. (.13 Gm.). 7. *Pilulæ Aloes et Myrrhæ*, N.F., 2 gr. (.13 Gm.). 8. *Pilulæ Aloes et Podophylli Compositæ*, N.F., 1 gr. (.06 Gm.). 9. *Pilulæ Aloes Hydrargyri et Podophylli*, N.F., 2 gr. (.13 Gm.). 10. *Pilulæ Ferri, Quininæ, Aloes et Nucis Vomicae*, N.F., 1 gr. (.06 Gm.). 11. *Pilulæ Rhei Compositæ*, N.F., 1½ gr. (.09 Gm.). 12. *Pilulæ Antiperiodicæ*, N.F., 2 gr. (.13 Gm.). Dose, each, 1–2 pills. 13. *Pulvis Aloes et Canellæ, Hiera Picra*, N.F., 80 p. c. + canella 20. Dose, gr. 15–30 (1–2 Gm.). 14. *Tinctura Aloes*, N.F., 10 p. c. Dose, ʒss–1 (2–4 cc.). 15. *Tinctura Aloes et Myrrhæ*, N.F., āā 10 p. c. Dose, ʒss–1 (2–4 cc.). 16. *Tinctura Antiperiodica*, N.F., 3.5, p. c. II. ALOIN: 1. *Pilulæ Aloini Compositæ*, N.F., ½ gr. (.032 Gm.). 2. *Pilulæ Aloini, Strychninæ et Belladonnæ*, N.F., ⅓ gr. (.013 Gm.). 3. *Pilulæ Aloini, Strychninæ et Belladonnæ Compositæ*, N.F., ⅓ gr. (.013 Gm.). 4. *Pilulæ Laxativæ Compositæ*, N.F., ⅓ gr. (.013 Gm.). Dose, each, 1–2 pills.

Unoff. Preps.: *Compound Decoction* (Br.—1 p. c. of extract). *Extract*, gr. ½–5 (.03–.3 Gm.). *Wine*.

PROPERTIES.—Cathartic, drastic, emmenagogue, vermifuge, stomachic. The action is especially on the colon and lower half of the large intestine, and thus causes irritation to uterus and inflamed hemorrhoids; stimulates the functions of the liver, intestinal secretions generally,

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increases the flow of bile, and acts in about 15 hours. Abnormal doses do not produce proportionately excessive results, but invariably cause tormina, tenesmus with heat, and rectal irritation—the latter (stomach and rectum) being remedied largely by combining with soap or an alkaline carbonate.

USES.—Costiveness (dependent upon weakness of muscular layer of the large intestine), atonic dyspepsia, jaundice, non-active hemorrhoids, amenorrhea, ascarides; for the two last may give by enema.

Poisoning: Have irritation of intestinal canal, causing pain, vomiting, and purging, cold sweats, prostration, sometimes convulsions, collapse. Empty stomach, give demulcents, opium, stimulants, artificial heat to body and extremities, hot fomentations to abdomen.

Allied Products:

1. *Hepatic Aloe*.—This name was applied formerly to a variety of Socotrine aloe from E. Indies, but now the term is given in this country to Barbados, in fact to any opaque liver-colored aloe.

2. *Natal Aloe*.—This has a greenish-slate hue, crystalline, fracture less shining than, but odor of Cape aloe; it is of little value, and is shipped from Port Natal.

3. *Moka Aloe*.—This has brownish-black color, irregular fracture, disagreeable odor, and is from the interior of Arabia.

4. *Caballine* or *Horse Aloe*.—This is inferior, impure, having a dark color, fetid odor, being from irregular sources.

5. *Jafferabad Aloe*.—This has black-pitch color and luster, glassy, porous fracture, and is less agreeable than Socotrine aloe.

Allied Plants:

1. *Allium sativum*, *Allium*, *Garlic*, *N. F.*

—The fresh bulb: C. Asia, S. Europe. Bulbous plant .6 M. (2°) high; leaves long, flat, grass-like; flowers small, white umbels. Bulb, subglobular, 4–6 Cm. ($1\frac{3}{5}$ – $2\frac{2}{5}$ ') broad, compound, with 8–15 bulbels surrounded by whitish membranaceous scales and attached to a flattened circular base having numerous yellowish-white roots; bulbels ovoid, 3–4-sided, apex acute; each bulbel covered by whitish membranaceous scale-like leaves and pinkish layer of epidermis cohering but easily separable from solid portion; odor when bruised powerfully alliaceous; taste intensely pungent, persistent; contains volatile oil .25 p. c., mucilage 35 p. c., albumin, sugar, starch, water 60 p. c. Stimulant, carminative, condiment, diuretic, expecto-



FIG. 46.—*Allium sativum*.

rant, rubefacient; bronchitis, indigestion, infantile catarrh; poultice in catarrhal pneumonia, abscesses, earache, convulsions of children, insect and serpent wounds. Dose, ʒss–1 (2–4 Gm.); 1. *Syrupus Allii*,

20 p. c.—garlic 20 Gm., sucrose 80, diluted acetic acid q. s. 100 cc. (50 cc. +), dose, 5j-4 (4-15 cc.); volatile oil, m̄j-5 (.06-.3 cc.).
A. Ce'pa Onion and *A. Por'rum*, *Leek* are used like garlic.

2. *Al'etris farino'sa*, *Aletris*, *Star Grass*, *Unicorn Root*, *N.F.*—The dried rhizome and roots with not more than 5 p. c. of foreign organic matter, yielding not more than 10 p. c. of acid-insoluble ash; United States—southern pine-barrens. Perennial, .6-1 M. (2-3°) high; leaves radical, star-shaped, 7.5-10 Cm. (3-4') long, 2.5 Cm. (1') broad; flowers white, as though dusted with meal (indumentum—*farinosa*). Rhizome, 2-4 Cm. ($\frac{4}{5}$ -1 $\frac{3}{5}$ ') long, 5-10 Mm. ($\frac{1}{5}$ - $\frac{2}{5}$ ') thick, grayish-brown, circular stem-scars above, numerous tough, wiry, flexuous roots on sides and beneath; fracture short; internally light brown, cortex 1-2 Mm. ($\frac{1}{5}$ - $\frac{1}{3}$ ') thick, twisted fibro-vascular bundles; odor slight, acetous; taste sweetish, bitter. Powder, yellowish-brown—tracheæ, lignified cells, parenchyma with starch grains, numerous calcium oxalate raphides, glandular hairs; contains starch, bitter principle. Uterine tonic, diuretic, emetic, purgative; chronic rheumatism, dropsy, colic. Dose, gr. 5-15 (.3-1 Gm.); 1. *Fluidextractum Aletridis* (diluted alcohol): Preps.: 1. *Elixir Aletridis Compositum*, fldexts.—aletris, mitchella, helonias, caulophyllum, āā, 6.55 p. c. + fldext. viburnum opulus 3.27 p. c.; 2. *Elixir Viburni Opuli Compositum*, 7.5 p. c. Decoction, Tincture.

3. *Erythro'nium america'num*, *Yellow Adder's-tongue*.—The root and herb, U. S. P. 1820-1850; United States. Perennial herb, scape 15-22.5 Cm. (6-9') high, slender, leaves 2, pale green, equal length 12.5 Cm. (5'), one twice as wide as the other, brown-spotted, flowers yellow, 2.5-5 Cm. (1-2') long, root (bulb or corm) solid, brown; inside white. All parts of the plant active; used like colchicum. Dose, gr. 20-30 (1.3-2 Gm.) in infusion. Large doses emetic.

SCILLA. SQUILL, *U.S.P.*

Urginea maritima, { The cut and dried fleshy inner bulb scale of the
 (*Linné*) *Baker*. { white variety.

Habitat. Mediterranean Basin, near the sea; Spain, France, Italy, Greece, Portugal, Morocco, Algeria; in dry, sandy, also hilly localities.

Syn. Scill., Sea Onion, White or Red Squills; Fr. Scille, Squille; Ger. Bulbus Scillæ, Meerzwiebel.

Ur-gin'e-a. L. *urgere*, to press, *urge*—*i. e.*, its flattened, compressed seed, or fr. Algerian Arab tribe *Ben urgin*.

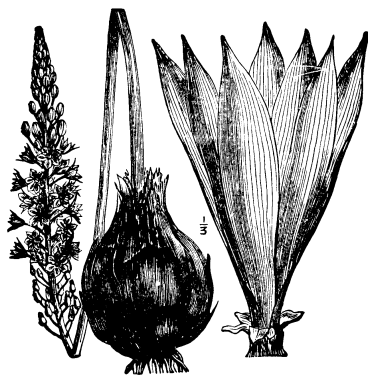
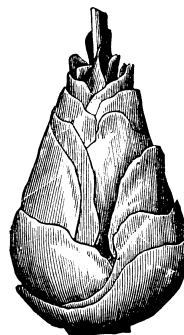
Ma-rit'i-ma. L. *maritimus*, of the sea, maritime—*i. e.*, its habitat near the sea.

Scil'la. L. fr. Gr. *σκέλεω*, to split—*i. e.*, splits into scales; *σκόλλα*, an onion.

PLANT.—Perennial herb; roots fibrous from base of large bulb; leaves appear long after flowers, several, .5-.6 M. (1 $\frac{1}{2}$ -2°) long, shining, deep green; flowers white, on succulent stem, .3-1 M. (1-3°) high, in close spike, no calyx, peduncles purplish; fruit, dry capsule 12 Mm. ($\frac{1}{2}$ ') long, oblong, 3-lobed, yellow, seed 6 in each cell, 6 Mm. ($\frac{1}{4}$ ') long,

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flattened, purplish-brown. BULB SCALE, in irregular, curved, flattened pieces, .5-5 Cm. ($\frac{1}{5}$ -2') long, yellowish-white, somewhat translucent; brittle when dry, tough and flexible when damp; odor slight; taste bitter, mucilaginous, acrid. POWDER, yellowish-brown, very hygroscopic caking in moist atmosphere—numerous calcium oxalate raphides isolated and in bundles imbedded in mucilage, fragments of parenchyma with occasional spiral and reticulate tracheæ, very few starch grains. Should be kept dry, in tightly-closed containers. *Solvents*: 75 p. c. alcohol; diluted acetic acid; vinegar; water. Dose, gr. 1-5 (.06-.3 Gm.), ter die until nauseated; gr. 5-10 (.3-.6 Gm.) usually will cause vomiting.

FIG. 47.—*Urginea maritima*.FIG. 48.—*Scilla* bulb, prepared for slicing.

Commercial.—Plant recognized a valuable medicine from early times, but first cultivated in Europe, 1630; flowers in autumn, while leaves appear in the following spring. Bulb, size of fist to a child's head, often weighing 4 pounds (1.8 Kg.), grows half-immersed in the soil, being collected in August, deprived of dry outer scales and central portion (this latter of youngest growth and deficient activity), cut transversely into thin slices, and, owing to mucilaginous and hygroscopic qualities, dried carefully (negligence here yielding always inferior product), then packed in casks and shipped from Malta. When fresh abounds in viscid, acrid juice, which on handling produces excoriation with intolerable itching—a property lost upon drying without medicinal impairment. There are two varieties: 1, *White* (white scales); 2, *Red* (reddish-brown scales), both possessing identical properties, the former, however, being preferred, as it yields less colored solutions; loses on drying 80 p. c., and on exposure reabsorbs 11 p. c. of moisture, becoming moldy, hence the necessity of dry preservation.

CONSTITUENTS.—Scillitin (scillipicrin, scillitoxin, scillin), Sinistrin, sugar 22 p. c., volatile oil, calcium oxalate 3-8 p. c., ash 3 p. c.

Scillitin.—Bitter principle, upon which activity depends, but it has never been obtained pure. Dose, gr. $\frac{1}{6}$ – $\frac{1}{2}$ (.01–.03 Gm.). Instead of this, Merck gives 3 active principles:

(1) **Scillipicrin.**—Bitter principle, yellowish-white, amorphous, soluble in water, hygroscopic; acts upon the kidneys. Dose, gr. $\frac{1}{3}$ –1 (.02–.06 Gm.).

(2) **Sillitoxin (Scillain).**—Glucoside, brown, bitter, burning taste, amorphous, insoluble in water, ether, soluble in alcohol; acts upon kidneys and heart. Dose, gr. $\frac{1}{100}$ – $\frac{1}{30}$ (.001–.002 Gm.).

(3) **Scillin.**—Crystalline, pale yellow, soluble in alcohol, hot ether; benumbs, induces vomiting. S. Wanizewski has suggested the following names for the active principles: (1) Scillipicine, soluble in water, alcohol; (2) Scillimarine, soluble in chloroform, alcohol; (3) Scillinine, soluble in alcohol, insoluble in water, chloroform.

Sinistrin, C₆H₁₀O₆.—White mucilage, resembles dextrin, levorotatory, easily converted into levulose by boiling with diluted sulphuric acid.

PREPARATIONS.—1. *Acetum Scillæ.* Vinegar of Squill. (Syn., Acet. Scill.; Fr. Vinaigre (Acétolé) de Scille—scillitique; Ger. Meerzwiebeleessig.)

Manufacture: 10 p. c. Macerate for 7 days, 10 Gm. with diluted acetic acid 90 cc., strain, add through strainer diluted acetic acid nearly q. s. 100 cc., heat to boiling, filter hot, cool, add diluted acetic acid q. s. 100 cc. Dose, m_v–30 (.3–2 cc.).

Preps.: 1. *Syrupus Scillæ.* Syrup of Squill. (Syn., Syr. Scill., Syrupus Aceti Scillæ; Fr. Sirop de Scille; Ger. Meerzwiebel-sirup.)

Manufacture: 4.5 p. c. Dissolve, with gentle heat, sucrose 80 Gm. in vinegar of squill 45 cc., strain, cool, add through strainer water q. s. 100 cc., mix thoroughly. Dose, ʒss–1 (2–4 cc.).

2. *Oxymel Scillæ, N. F.*—Vinegar of squill 50 Gm., honey 100, evaporate to 100 Gm. Dose, ʒss–2 (2–8 cc.).

2. *Fluidextractum Scillæ.* Fluidextract of Squill. (Syn., Fldext. Scill., Fluid Extract of Squill, Extractum Scillæ Fluidum; Fr. Extrait fluide de Scille; Ger. Meerzwiebelfluidextrakt.)

Manufacture: Macerate for 2 hours 100 Gm. with a portion of alcohol 200 cc. + water 100 cc., pack, macerate for 48 hours, percolate with menstruum until 100 cc. obtained; close lower orifice, macerate for 12 hours, collect a second 100 cc., again interrupt percolation for 12 hours, and continue percolation until total percolate 500 cc.; reclaim alcohol, evaporate to 80 cc., cool, add slowly, with continuous agitation, alcohol 200 cc., set aside for 12 hours, decant supernatant liquid from the syrupy layer, filter the former, wash the latter twice with 80 p. c. alcohol 30 cc., adding washings through filter to previously collected alcoholic liquid, reclaim combined alcoholic liquid to 80 cc., add diluted alcohol q. s. 100 cc. Dose, m_j–5 (.06–.3 cc.).

Preps.: 1. *Syrupus Scillæ Compositus.* Compound Syrup of

LILIACEÆ

Squill. (Syn., Syr. Scill. Co., Hive Syrup, Croup Syrup; Fr. Sirop de Scille composé; Ger. Zusammengesetzter Meerzwiebel-sirup.)

Manufacture: 8 p. c. Dissolve antimony and potassium tartrate .2 Gm. in distilled water 36 cc., add fluidextract of squill and fluidextract of senega, āā, 8 cc., allow to stand 12 hours, shaking, filter; dissolve sucrose 72 Gm. in clear filtrate by agitation, add water q. s. 100 cc.; mix and strain. Dose, m̄v-60 (.3-4 cc.). Cox's Hive Syrup differs from this preparation only in the use of honey instead of sucrose as the preservative. 2. *Mistura Pectoralis*, N. F., 3.5 p. c.

3. *Tinctura Scillæ*. Tincture of Squill. (Syn., Tr. Scill.; Fr. Teinture de Scille; Ger. Meerzwiebeltinktur.)

Manufacture: 10 p. c. Menstruum 75 p. c. alcohol—moisten squill 10 Gm. with sufficient menstruum, macerate in closed vessel in moderately warm place for 24 hours, stirring occasionally, transfer to percolator, shake down evenly without packing, add menstruum, macerate for 24 hours, proceed slowly, gradually adding menstruum q. s. 95 cc.; adjust biologically. Dose, m̄v-30 (.3-2 cc.).

4. *Pilulæ Digitalis, Scillæ et Hydrargyri*, N. F., 1 gr.

Unoff. Preps.: Acetic Extract, gr. $\frac{1}{6}$ -2 (.01-.13 Gm.). Compound Pill of Squill, (Br.).

PROPERTIES—Resembles digitalis; expectorant, diuretic, emetic, cardiac stimulant, cathartic, irritant. Large doses irritant poison, causing gastro-enteritis, strangury, bloody urine, convulsions, death by heart paralysis.

USES.—Expectorant in croup, irritant coughs, whooping cough, bronchitis, asthma, associated with ipecac, ammonia, asafetida, benzoin, etc. Owing to its irritating properties should not be given in acute stage. Diuretic in dropsies from cardiac disease, when it should be combined with digitalis or saline diuretics. Give to children with croup until nausea and vomiting occur. The Greeks, Romans, and Arabians used it in dropsies, ulcerated gums and throat, weak digestion. Fresh juice applied to abrasions is diuretic; to healthy skin rubefacient, which may be due to calcium oxalate needle-shaped crystals or to contained acrid resinoid—here also get ultimately the diuretic effect.

Poisoning: Similar to digitalis,—may even induce cardiac arrhythmia and heart block. Evacuate stomach, give tannin, demulcents, opiates, stimulants, etc.

Allied Plants:

1. *Convallaria majalis*, *Lily-of-the-Valley*, *Convallariæ Radix*, *Convallaria Root*, *Lily-of-the-Valley Root*, N. F.—The dried rhizome and roots with not more than 5 p. c. of leaves or other foreign organic matter, yielding not more than 6 p. c. of acid-insoluble ash; United States; cultivated in gardens. Stemless perennial; leaves 2-3, radical, smooth, elliptical; flowers campanulate, white, 1-sided raceme. Rhizome, variable length, 1-3 Mm. ($\frac{1}{2}$ - $\frac{1}{8}$ ') thick, brownish, few circular

stem-scars, 3-5 thin, tortuous, branching roots on lower portions of nodes; fracture short, fibrous, internally whitish; odor faint; taste sweetish, bitter, acrid. Powder, brown—cakes on standing, few starch grains and calcium oxalate raphides, endodermal cells with porous walls, tracheæ; solvents: diluted alcohol, boiling water partially; contains convallamarin, convallarin, resin. Heart tonic, diuretic, emetic, purgative, sternutatory, poisonous, similar to digitalis, but non-cumulative; heart greatly slowed; arrhythmia, "cardiac hurry", dropsy. Dose, gr. 2-10 (.13-.6 Gm.); 1. *Fluidextractum Convallariae Radicis* (75 p. c. alcohol), dose, mij-10 (.13-.6 cc.). Extract or convallamarin, gr. $\frac{1}{2}$ -2 (.03-.13 Gm.); Infusion, 25 p. c., \mathfrak{z} ss-1 (15-30 cc.). *Poisoning*: Symptoms and treatment similar to digitalis.

2. *Trillium erectum*, *Trillium*, *Beth (Birth) Root*, N. F.—The dried rhizome with not more than 2 p. c. of foreign organic matter; N. America, Stem 20-40 Cm. (8-16') high, terminated by a whorl of 3 rhombic leaves and a purplish, solitary, unpleasantly scented flower; fruit ovoid, horny. Rhizome, .6-5 Cm. ($\frac{1}{3}$ -2') long, 1-3 Cm. ($\frac{2}{5}$ -1 $\frac{1}{5}$ ') broad, compressed, annulated by leaf-scars and fissured by stem-scars; rootlet scars in concentric rows on under side, yellowish-brown, internally pale yellow; fracture uneven, hard or spongy; odor distinct; taste bitter, acrid, on chewing—warmth in throat and secretion of saliva. Powder, yellowish-white—calcium oxalate raphides, starch grains, epidermal tissue with porous walls, tracheæ with markings; solvent: diluted alcohol; contains saponin-like body (activity) 5 p. c., trilline, fixed oil, volatile oil, resin, tannin, starch, ash 5 p. c. Alterative, expectorant, astringent, oxytocic; uterine stimulant, indolent ulcers, injuries. Dose, gr. 15-30 (1-2 Gm.); 1. *Fluidextractum Trillii* (75 p. c. alcohol): Prep.: 1. *Elixir Viburni Opuli Compositum*, 15 p. c.

3. *Polygonatum* (*Convallaria*) *multiflorum*, *European Solomon's Seal*, and *P. commutatum* (*giganteum*), *American Solomon's Seal*.—Rhizome similar and contains convallarin, asparagin, mucilage, starch.

4. *Vag'nera* (*Smilacina*) *racemosa*, *False Solomon's Seal*.—N. America.



FIG. 49.—*Convallaria majalis*.

9. SMILACEÆ. Smilax Family.

Smi-la'se-e. L. *Smil-ax* + *aceæ*, fr. Gr. *σμίλη*, a scraper—*i. e.*, alluding to the rough, prickly stems. Mostly vines, woody or herbaceous,

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stems often prickly. Distinguished by 3-5-nerved (net-veined) leaves, punctate; flowers 6's, umbels, anthers 2-celled, extrorse, ovary 3-celled; fruit globose-berry containing 1-6 brownish seed; warm and temperate climates; alterative, diuretic, diaphoretic.

Genus: 1. **Smilax**.

SARSAPARILLA. SARSAPARILLA, *U.S.P.*

Smilax	{	medica , <i>Chamisso</i>	{	The dried root (rhizome and crown portion being excluded before grinding or powdering) with not more than 2 p. c. foreign organic matter, yielding not more than 2 p. c. (Mexican 4 p. c.) acid-insoluble ash.
		officinalis , <i>Kunth</i> , ornata , <i>Hooker</i> <i>filius</i> .		

Habitat. Tropical America, Mexico to Brazil; Andes and Chinqui Mountains, 1,200-2,400 M. (4,000-8,000°) elevation; swampy forests.

Syn. Sarsap., 1. Mexican, Vera Cruz, Tampico Sarsaparilla; 2. Honduras, Bearded, Red Sarsaparilla; 3. C. America, Jamaica, Costa Rica, Lima Sarsaparilla; Sarsæ Radix; Fr. Salsepareille du Mexique; Ger. Radix Sarsaparilla; Sarsaparille.

Smi'lax. L. Bindweed, Gr. *σμίλαξ*, the yew, fr. *σμίλη* (Eng. smile), a scraper—*i. e.*, stems rough with prickles.

Med'i-ca. L. *medicus*, medical, curative—*i. e.*, its healing properties.

Of-fi-ci-na'lis. L. *officina*, a work shop, = *opus*, work, + *facere*, to do, to make—*i. e.*, used in or belonging to the shop or store.

Or-na'ta. L. *ornatus*, fr. *ornare*, to adorn—adorned, decorated, ornamented—*i. e.*, beautiful fruit and foliage.

Sar-sa-pa-ril'la. L. fr. Sp. *zarzaparilla*—*zarza*, a bramble, + *parra*, a vine, or from *Parillo*, a physician said to have discovered and employed it.

PLANTS.—Large perennial, thorny climbers; rhizomes short, thick, knotted, nodes thick, from which spring purplish-white roots 2-2.5 M. (6-8°) long, and a few rootlets; stems many, stiff, woody, angular, ridged, subterete or quadrangular, prickles at nodes; leaves 10-30 Cm. (4-12') long, 7.5-15 Cm. (3-6') wide, petioles 5 Cm. (2') long, quadrangular, cordate, rounded lobes at base, entire, glabrous, leathery, dark glossy green; flowers diœcious, 10-20 together in umbels; fruit small berry, 8 Mm. ($\frac{1}{3}$ ') thick, red, 2-3-seeded. Root (*S. medica*): Mexican, in loose bundles, or pressed bales, single bundles, 30-60 Cm. (12-24') long, composed of 20-35 folded roots attached to a crown with one or more stout stems; roots 3.5-6 Mm. ($\frac{1}{4}$ - $\frac{1}{4}$ ') thick, usually shrunken forming sharp longitudinal ridges and broad furrows, often containing some blackish earth, grayish-brown, dark brown, finely hairy; nearly devoid of branches or fibrous rootlets; fracture brittle (cortex), tough and fibrous (central cylinder); cortex mealy, whitish, brownish, horny; woody zone yellow, porous; pith whitish, distinct; nearly odorless; taste mucilaginous, sweetish, acrid; (*S. officinalis*): Honduras, in compact, cylindrical bundles, 30-55 Cm. (12-22') long, 8-15 Cm. (3-6') thick, composed of long, folded roots bound together by a number of circular turns; roots 2-5 Mm. ($\frac{1}{2}$ - $\frac{1}{5}$)

thick; dark-, reddish-brown, longitudinally wrinkled or finely furrowed, usually without earth, with occasional fibrous rootlets: fracture short, sometimes tough and fibrous (central cylinder); internally reddish-brown, dark brown, occasionally light gray cortex, a light yellow porous woody zone and a whitish pith; (*S. ornata*): *Central American, Jamaica*, in more or less compact, somewhat flattened bundles, 30–45 Cm. 12–18' long, 10–15 Cm. (4–6') broad, composed of folded roots loosely

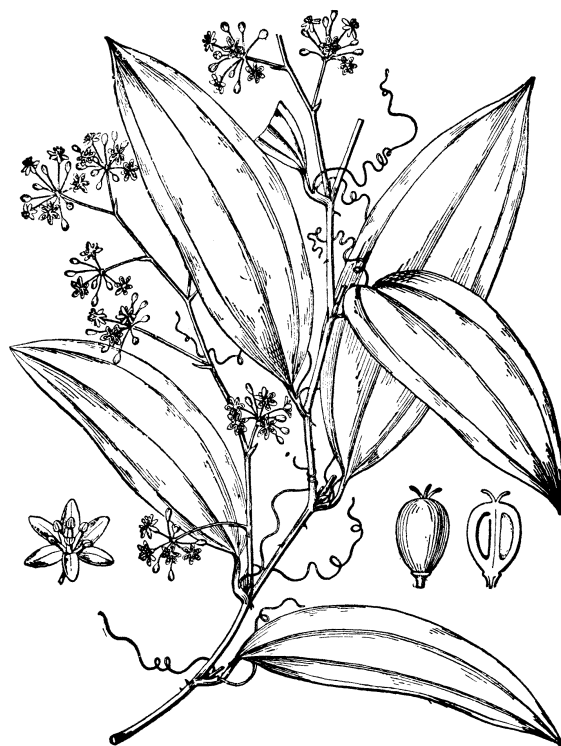


FIG. 50.—*Smilax*: branch with flowers and fruit.

bound together by a few circular turns; roots 2–5 Mm. ($\frac{1}{2}$ – $\frac{1}{3}$ ') thick, grayish-, reddish-brown, longitudinally wrinkled, occasionally nearly smooth, rarely furrowed, without earth, bearing numerous coarse fibrous rootlets; fracture short or tough and fibrous in central cylinder, internally white or dark brown cortex, and porous wood zone, a yellow or white pith. POWDER, grayish-brown—numerous starch grains, .003–.023 Mm. ($\frac{1}{800}$ – $\frac{1}{1000}$ ') broad, spherical, biconvex calcium oxalate raphides, singly or in groups up to .15 Mm. ($\frac{1}{75}$ ') long; cells of hypo-

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dermis and endodermis with lemon-yellow, reddish-yellow porous walls (Mexican—uneven or irregular thickening), cells being .08–.5 Mm. ($\frac{1}{1250}$ – $\frac{1}{500}$) long; fragments of tracheæ with thickenings, fibers with thin lignified or porous walls. *Solvents*: diluted alcohol; boiling water, injured by continued boiling. Dose, ζ_{ss} –2 (2–8 Gm.).

Commercial.—Sarsaparilla was carried to Europe from Peru, St. Domingo, Brazil, by the Spaniards in 1550, and has been in general use ever since. Plants occur in very thick undergrowth that renders careful collection quite troublesome, which is effected by grubbing,



FIG. 51.—Mexican sarsaparilla.

pulling, etc., so as to avoid extermination; those fully grown often yield at first cutting 30–60 pounds (13.6–27 Kg.), and every 2 years thereafter smaller quantities of more slender, less starchy roots. Collectors accept as best that having many roots from stem, persistent acrid taste, closely set prickles and thin leaves, and according to physical properties recognize two kinds (*a*) *Non-mealy*: Mexican, Jamaica, thin, not cracked, red, brown, little or no starch, usually pasty, rarely in granules, somewhat horny with longitudinal and irregular folds; thought best as bark and pith are relatively small, roots have more rootlets, greater acidity, and yield most extract,

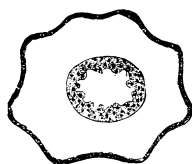


FIG. 52.—Mexican sarsaparilla: cross-section; magnified 3 diam.

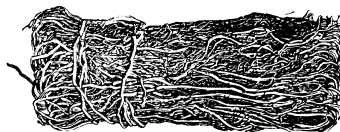


FIG. 53.—Central American, Jamaica sarsaparilla.

dissolving clearly in cold water; (*b*) *Mealy*: Honduras, Para, more or less swollen, pale yellow, transversely cracked, considerable starch, usually in fine granules, seldom pasty. There are four varieties: 1, *Mexican*, once thought valueless, but now, owing to acidity, most valuable; grows in Mexican Andes, around Orizaba, Vera Cruz, etc., being considered a variety of *S. officinalis*, with slender branches, and often without prickles; 2, *Central American, Jamaica*, grown chiefly in Costa Rica, some in the Amazon Valley, and called “Jamaica” as it is exported through that province; resembles Honduras, but redder,

less wrinkled and amylaceous, and yields more extract; 3, *Honduras*, most popular, grown in Honduras, Guatemala, Peru, Colombia, C. America; enters market in bales, skins, 100 pounds (45.3 Kg.); 4, *Para* (Brazilian, Rio Negro, Lisbon—*S. papyracea*), in compact cylindrical bundles, 30–90 Cm. (12–36') long, 15–20 Cm. (6–8') thick, closely and neatly bound, by a stem of a vine, and ends evenly trimmed; rootlets few, dark, amylaceous, acrid, resembling Honduras, and growing in N. Brazil, Guiana (Para, Maranhão); considered a variety of *S. officinalis*, with older stems and lower branches remaining square, angles with flattened prickles and much more membranous leaves; rather rare, and the only one of the four varieties not recognized in U. S. P.



FIG. 54.—Honduras sarsaparilla.

The *Guayaquil* (*S. officinalis*), growing in W. Andes valleys, occasionally enters market, usually loose and carelessly packed in bales, rhizome and stem portions often included; roots dark with much fiber, bark furrowed, thick, somewhat amylaceous, internally pale yellow. Roots are taken also from *S. syphilitica* (Colombia), *S. glauca* (Mexico) *S. utilis* (Jamaica), etc.

CONSTITUENTS.—Saponin-like substance (separable into 3 glucosides—Sarsasaponin, Parillin, Smilasaponin) 3 p. c., volatile oil, resin, starch 10–15 p. c., pectin, coloring matter, calcium oxalate and other salts, ash 7–10 p. c.

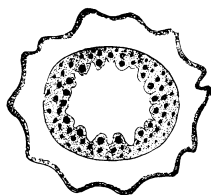


FIG. 55.—Honduras sarsaparilla: cross-section; magnified 3 diam.

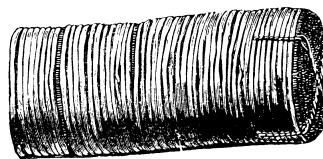


FIG. 56.—Para sarsaparilla.

Sarsasaponin, $C_{22}H_{36}O_{10}$, is the most important component, being 3–4 times more active than the other two; it is crystallizable, soluble in water, alcohol, more so with heat.

Parillin (Smilacin), $C_{26}H_{44}O_{10}$, crystallizable, soluble in water, alcohol, frothing with agitation, aqueous solution precipitated by lead acetates, tannin; boiled with diluted acids splits into sugar and parigenin.

Smilasaponin, $C_{20}H_{32}O_{10}$, non-crystallizable, soluble in water, alcohol.

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PREPARATIONS.—1. *Fluidextractum Sarsaparillæ*. Fluidextract of Sarsaparilla. (Syn., Fldext. Sarsap., Fluid Extract of Sarsaparilla; Extractum Sarsæ Liquidum; Fr. Extrait fluide de Salsepareille; Ger. Sarsaparillafluidextrakt.)

Manufacture: Moisten, macerate for 6 hours in tightly-covered containers 100 Gm. with enough diluted alcohol, pack, percolate with same menstruum until exhausted, reserve first 85 cc., reclaim alcohol, evaporate to soft extract, which dissolve in the reserve, mix thoroughly, add menstruum q. s. 100 cc. Dose, ʒss–1 (2–4 cc.).

Preps.: 1. *Syrupus Sarsaparillæ Compositus*. Compound Syrup of Sarsaparilla. (Syn., Syr. Sarsap. Co., Syrupus Sudorificus; Fr. Sirop de Salsepareille composé, Sirop sudorifique; Ger. Zusammengesetzter Sarsaparillsirup.)

Manufacture: Fluidextract of sarsaparilla 20 cc., fluidextract of glycyrrhiza 1.5, oil of sassafras .02, oil of anise .02, methyl salicylate .02, alcohol 1.94, add this solution to syrup 76.5 cc. Dose, ʒj–4 (4–15 cc.). *Prep.*: 1. *Syrupus Bromidorum*, N.F., 45 p. c.

2. *Fluidextractum Sarsaparillæ Compositum*, N.F., 75 p. c. + glycyrrhiza 12, sassafras 10, mezereum 3. Dose, ʒss–1 (2–4 cc.).

Unoff. Preps.: *Compound Decoction* 10 p. c. (+ sassafras 2, guaiacum wood 2, glycyrrhiza 2, mezereum 1), ʒj–4 (30–120 cc.). *Decoction. Extract*, gr. 5–10 (.3–.6 Gm.). *Extract Comp.*; *Syrup*.

PROPERTIES.—Alterative, diuretic, diaphoretic, tonic. Mostly believed to be of little service unless associated with other drugs, such as potassium iodide, guaiac, sassafras, mezereum, etc.

USES.—As a blood purifier in scrofula, cutaneous diseases, abscesses, ulcers, tertiary syphilis with mercuric chloride or potassium iodide or both; gout, rheumatism.

Incompatibles: Alkalies, iodine, and corrosive sublimate is claimed to be converted into calomel by the compound syrup. *Smilax chi'na*, *S. pseudo-china*, *S. tamnoi'des*, *S. as'pera* and *Ca'rex arenaria*, German Sarsaparilla, are used like official.

Allied Plants:

1. *Dioscore'a villosa*, *Dioscorea*, Wild Yam Root, Colic (Rheumatism) Root, N.F.—Dioscoreaceæ. The dried rhizome with not more than 2 p. c. of foreign organic matter; United States; moist thickets. Slender twining climber, diœcious; leaves ovate, cordate, acute; flowers greenish, panicles; fruit triangular winged capsule. Rhizome, knotted, woody, elongated, 6–20 Mm. ($\frac{1}{4}$ – $\frac{1}{2}$ ') thick, often compressed, bent, branched, nodular, stem-scars above, slender tough roots beneath, pale brown, scaly; fracture short, tough, yellowish, scattered wood-bundles; odorless; taste starchy, insipid, acrid. Powder, whitish—parenchyma cells, starch grains, few calcium oxalate raphides, fibrovascular bundles with tracheæ and tracheids, epidermal tissue; contains resin, saponin body, starch (dioscorein—"Eclectic" resinoid), ash 2–7 p. c. Diaphoretic, expectorant, emetic; rheumatism, bilious colic.

Dose, $\overline{5}$ ss-1 (2-4 Gm.); 1. *Fluidextractum Dioscoreæ* (diluted alcohol). 2. *Tinctura Viburni Opuli Composita*, 3.5 p. c. Decoction, Tincture, Dioscorein, gr. 1-4 (.06-.25 Gm.).

2. *Iris versicolor*, *Blue Flag*, *N.F.*—Iridaceæ. The dried rhizome with not more than 5 p. c. of roots and leaf bases or other foreign organic matter; N. America; swampy places. Perennial herb, .6-1 M.

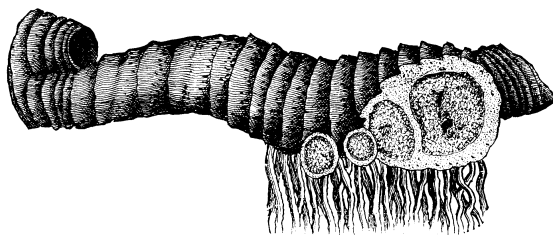


FIG. 57.—*Iris versicolor*: joint of rhizome and section of branches.

2-3°) high; stem angled on one side, branched; leaves narrow, equitant, sword-shaped; flowers lily-like, beautiful purplish-blue, with yellowish and whitish markings at base of sepals. Rhizome, often branched, 5-20 Cm. (2-8') long, 3 Cm. ($1\frac{1}{2}$ ') thick at nodes, usually cut pieces, grayish-brown, annulate, markings of leaf bases above, root-scars and remnants below; fracture short, yellowish, exhibiting central stele, whitish fibro-vascular bundles, distinct endodermis and cortex; odor slight, not distinctive; taste acrid, nauseous. Powder, brownish—resin cells filled with amorphous substance, starch grains, calcium oxalate prisms, tracheæ with markings, pores, few fibers; contains extract (resin) 25 p. c., volatile oil .025 p. c., isophthalic acid, sugar, phytosterol, myricyl alcohol, heptatosane, ipuranol, cerotic acid, ash 7 p. c. Cholagogue, emetic, diuretic, alterative; costiveness, malarial jaundice, bilious remittent fever, dropsy; very nauseating and prostrating; hepatic stimulant equal to podophyllum and less irritating, more pungent than euonymus. Dose, gr. 5-20 (.3-1.3 Gm.); 1. *Fluidextractum Iridis Versicoloris* (alcohol), dose, \overline{m} v-20 (.3-1.3 cc.): Prep.: 1. *Elixir Corydalis Compositum*, 9 p. c.; 2. *Fluidextractum Stillingiæ Compositum*, 12.5 p. c.: Prep.: 1. *Syrupus Stillingiæ Compositus*, 25 p. c. Extract, gr. 1-4 (.06-.26 Gm.); Irisin, iridin ("Eclectic" oleoresin or resinoid), gr. 1-4 (.06-.26 Gm.).

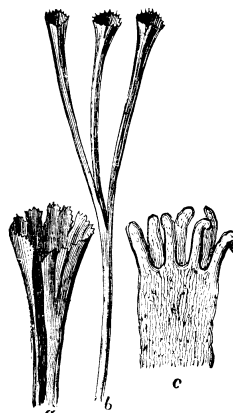


FIG. 58.—Iris in bloom.

4. *Iris florentina* or *I. germanica*, or *I. pal'lida*, *Orris* (*Florentine*), *Orris Root*, *N.F.*—The rhizome with not more than 1 p. c. of foreign

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organic matter. N. Italy (near Florence), Germany, France. Perennial plant, leaves radical, sword-shape, shorter than stem, which rises in their midst (.3-.6 M.; 1-2°) high, bearing 2 large white or bluish flowers; fruit capsule, 3-celled, many-seeded. Rhizome, various formed and sized pieces, usually jointed, branched, 5-10 Cm. (2-4') long, 1.5-3 Cm. ($\frac{3}{5}$ -1 $\frac{1}{5}$ ') wide, knotty enlargements; leaf-scars above, numerous root-scars below, yellowish-white; fracture hard, rough, mealy, narrow cortex, distinct endodermis, large stele, many vascular bundles; odor fragrant, resembling violet; taste aromatic, bitterish. Powder, light yellow—parenchyma cells filled with characteristic starch grains, tracheæ with markings, calcium oxalate prisms; solvent: alcohol; contains volatile oil (orris butter), iridin, starch, resin, tannin, ash 5 p. c. Stimulant, diuretic, emetic, cathartic; fresh root irritant;

FIG. 59.—*Crocus sativus*.FIG. 60.—*Crocus*; a, stigma, upper part magnified 4 diam.; b, style with stigmas; c, papillose margin of stigma, magnified 120 diam.

diarrhea, bronchitis, dropsy, tooth powder, masticatory for perfuming breath and teething infants; for this latter the more slender pieces are peeled smoothly and whitened with chalk or magnesium oxide; 1. *Species Pectorales*, 5 p. c. *Adulterations*: Rhizomes of *I. pseudac'orus* and *I. fatidis'sima*, both being somewhat darker, more astringent and acrid.

5. *Crocus sativus*, *Crocus*, *Saffron*, *N.F.*—The stigma with not more than 10 p. c. of yellow styles and 2 p. c. of other foreign organic matter, yielding not more than 7.5 p. c. of total ash; W. Asia, Spain, France. Low perennial bulbiferous herb with depressed globular corm (bulb), 2.5 Cm. (1') thick; leaves grass-like; flowers lilac, bluish-purple. Stigmas 3, united or separate, attached to apex of style, 25 Mm. (1') long, cornucopia-shaped, dark, rich red (developed by toast-

ing after being collected), margin dentate or fimbriate, styles 10 Mm. ($\frac{2}{5}$ ') long, solid, yellowish, odor strong, peculiarly aromatic; taste bitterish, aromatic, colors saliva orange-yellow; with sulphuric acid—blue, gradually changing to violet, deep red-wine; macerated in water—yellow solution, in methyl alcohol—deep orange; contains picrocrocin (saffron-bitter—by hydrolysis yielding volatile oil and fructose), crocin (impure—amorphous), fixed oil, ash 7.5 p. c. *Adulterations*—common: florets, dyed stamens, petals, moisture 12 p. c., mineral matter (sodium bicarbonate, baborate, sulphate, potassium nitrate, Rochelle salt, lactose, etc.), increasing ash 17–32 p. c. There are three varieties: 1. Austrian (best); 2. French (Gatinais); 3. Spanish (inferior from presence of style bases and stigmas); known as *hay saffron*, as distinguished from *cake saffron*, which is no longer in commerce. Diaphoretic, carminative, emmenagogue, anodyne; to promote exanthematous eruptions in measles, etc., dysmenorrhea, conjunctivitis. Should be kept dark, in tightly closed containers. Dose, gr. 5–30 (.3–2 Gm.); 1. *Tinctura Croci*, 10 p. c. (diluted alcohol), dose, $\bar{5}j$ –2 (4–8 cc.); 2. *Tinctura Opii Crocata*, 2.5 p. c.; 3. *Pilula Antiperiodica*, $\frac{1}{4}$ gr.; 4. *Tinctura Antiperiodica*, $\frac{2}{5}$ p. c. *Infusion* (tea), 2 p. c., $\bar{3}ij$ –4 (60–120 cc.).

10. ZINGIBERACEÆ. Ginger Family.

Zin-ji-be-ra'se-e. L. *Zingiber* + aceæ, fr. Gr. ζιγγιβερος, ginger. Herbs. Distinguished by being aromatic, with creeping rhizomes, leaves stalked, broad, sheathing, parallel veins from midrib. Perianth superior, irregular. Each whorl 3, stamens 6, in 2 whorls, outer whorl staminodial or absent; ovary 3-celled, inferior; fruit 1–3-celled, capsule or berry; seeds many, arillate; tropics; stimulant; aromatic, stomachic (resin + vol. oil), starch, food.

Genera: 1. **Zingiber.** 2. **Elettaria.**

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Zingiber officinale, *Roscoe.* { The dried rhizome, with outer cortical layers often partially or completely removed, yielding not less than 2 p. c. non-volatile ether-soluble extractive nor 12 p. c. cold water extractive.

Habitat. India, Hindustan (cultivated in W. Indies, Africa).

Syn. Zingib., Jamaica, Black, African or Race Ginger; Fr. Gingembre (gris et blanc); Ger. Rhizoma (Radix) Zingiberis, Ingwer.

Zin'gi-ber. L. fr. Skt. *gringavera*—*gringa*, horn, + *vera*, body, horn-shaped—*i. e.*, shape of roots; Ar., Pers. *zanjabil zenjebil*; Eng. *ginger*.

Of-fi-ci-na'le. L. *officina*, workshop; *opus*, work, + *facere*, to do—*i. e.*, used in the shop or store.

PLANT.—Perennial herb; stem barren, leafy, 1–1.3 M. (3–4°) high, entirely covered with the leaf-sheaths, solid; round; leaves 15–30 Cm.

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(6–12') long, 2.5–4 Cm. ($1-1\frac{3}{5}'$) wide; flowering stalk from stem 15–30 Cm. (6–12') long, terminating in a spike; flowers dingy yellow, 2–3 at a time. RHIZOME: *Jamaica*, horizontal, cork wholly removed, laterally compressed, irregularly branched, 4–16 Cm. ($1\frac{2}{3}-6\frac{2}{3}'$) long, 4–20 Mm. ($\frac{1}{6}-\frac{4}{5}'$) thick, light brown, longitudinally striate, ends of branches with depressed stem-scars; fracture short-fibrous; starchy, resinous; internally yellowish, light brown; odor agreeably aromatic; taste aromatic, pungent; *Cochin*, most of corky layer removed on flattened sides, light brown, grayish-yellow; fracture shorter, less fibrous more starchy than other varieties; internally yellowish-white, oil and resin cells, yellowish,



FIG. 61.—Zingiber: A, entire plant ($\frac{1}{4}$ nat. size); B, flower; C, labellum; D, transverse section of ovary.

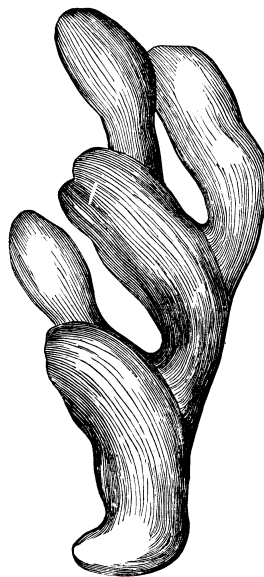


FIG. 62.—Jamaica ginger; uncoated.

brownish-red; odor aromatic; taste pungent; *African*, cork partly removed on flattened sides, areas without cork smooth, light brown, portions with cork longitudinally or reticulately wrinkled and grayish-brown; fracture short-fibrous; internally light yellow, brown; odor strongly aromatic; taste aromatic, strongly pungent, otherwise resembling Jamaica. POWDER, light yellow (Jamaica), light brown (Cochin), light brown, (African)—numerous starch grains .005–.04 Mm. ($\frac{1}{5000}-\frac{1}{6250}$) broad, nearly spherical, ovoid, elliptical, pyriform, hilum eccentric near smaller end, fibers long, non-lignified, oblique pores, occasional cells with brownish resin-like contents; tracheæ; yellowish, brownish cork cells, thin-walled, occasional in Jamaica, fairly numerous

in Cochin and African. *Solvents*: alcohol; acetone; ether; boiling water partially. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—RHIZOME: Fibrous, light, friable, worm-eaten pieces (all discarded); **POWDER**: Rice starch, flour, curcuma, brick-dust, chalk, capsicum, mustard (detected by microscope, iodine T. S., ash), “spent ginger”—that partially or wholly exhausted.

Commercial.—Plant reed-like, is propagated by rhizome segments, thrives best on new forest soil, and yields when one or more years old (the younger the better) very acceptable rhizomes, which are dug after the stems have withered, Jan.–Feb., cleaned carefully to avoid bruising, hence discoloration, washed in boiling water to hydrate starch and prevent germination, and then rapidly dried, constituting as such *black, coated, unpeeled, unscraped ginger*, in contradistinction to the further prepared *white, uncoated, peeled, scraped, race, hand ginger*—the former, owing to most oil and resin residing in the periderm, being richer and stronger. May bleach artificially by sulphur fumes (SO_2), chlorinated lime (Cl), milk of lime, or gypsum. There are several varieties, three being given pharmacopœial prominence: 1, *Jamaica*, sometimes steeped in milk of lime, and covered with calcium carbonate, thereby preventing insect attack; least pungent, most delicate and handsome; reaches us via England, or direct from W. Indies; 2, *Cochin (Chinese)*, resembles somewhat the Jamaica, but seldom enters our market commercially; 3, *African*, generally recognized as possessing greater pungency but less acceptable aroma than the preceding, with shorter rhizome and broadly linear or oblong lobes; yields 8–10 p. c. of oleoresin; 4, *Calcutta (E. India)*, resembles closely the African; reaches us via Calcutta; yields 8 p. c. of oleoresin; 5, *Calicut (E. India)*, resembles closely the African; reaches us from Calicut; yields 8 p. c. of oleoresin; 6, *Japanese*, resembles closely the Cochin, and seldom becomes a commercial article with us. The *green* (lobed branches recently dug and marketed without drying), and *preserved* (fresh rhizome steeped in hot syrup, becoming soft, brownish, translucent, efflorescent) are popular trade forms.

CONSTITUENTS.—Volatile oil 1–3 p. c., Gingerol .5–1.5 p. c., Resin (2), starch 20 p. c., mucilage, ash 4–8 p. c.

Volatile Oil.—Mostly phellandrene, $\text{C}_{15}\text{H}_{24}$, and *d*-camphene $\text{C}_{10}\text{H}_{16}$; thickish, greenish-yellow; sp. gr. 0.885; gives aromatic odor and flavor, but not the pungency.

Gingerol.—Not a glucoside, but a straw-colored, viscid, inodorous, non-volatile, pungent liquid, imparting the hot taste; soluble in fat, benzene, carbon disulphide, volatile oils, alcohol, ether.



FIG. 63.—Calcutta ginger; coated.

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PREPARATIONS.—*Fluidextractum Zingiberis*. Fluidextract of Ginger. (Syn., Fldext. Zingib., Fluid Extract of Ginger; Fr. Extrait fluide de Gingembre; Ger. Ingwerfluidextrakt.)

Manufacture: Similar to Fluidextractum Sarsaparillæ, page 126; menstruum: alcohol. Dose, m̄v–20 (.3–1.3 cc.).

Preps.: 1. *Syrupus Zingiberis*. Syrup of Ginger. (Syn., Syr. Zingib.; Fr. Sirop de Gingembre; Ger. Ingwersirup.)

Manufacture: 3 p. c. Mix fluidextract of ginger 3 cc. and alcohol 2, triturate liquid with magnesium carbonate 1 Gm., sucrose 6, gradually add, constantly triturating, water 43 cc., filter, dissolve in clear filtrate, gently heating, sucrose 76 Gm., strain syrup (hot), when cold add through strainer water q. s. 100 cc. Dose, 5ss–2 (2–8 cc.).

2. *Elixir Hydrastis Compositum*, N. F., .875 p. c.

2. *Tinctura Zingiberis*. Tincture of Ginger. (Syn., Tr. Zingib., Tincture of Jamaica Ginger; Fr. Teinture de Gingembre; Ger. Ingwertinktur.)

Manufacture: 20 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: 85 p. c. alcohol. *Impurities*: Capsicum, similar pungent substitutes. Dose, m̄xx–60 (1.3–4 cc.).

Prep.: 1. *Acidum Sulphuricum Aromaticum*, 5 p. c.

3. *Pulvis Rhei Compositus*, 10 p. c. 4. *Pulvis Aromaticus*, N. F., 35 p. c. 5. *Pulvis Aromaticus Rubefaciens*, N. F., 20 p. c. 6. *Pulvis Myricæ Compositus*, N. F., 30 p. c. 7. *Tinctura Antiperiodica*, N. F., $\frac{1}{13}$ p. c. 8. *Tinctura Aromatica*, N. F., 4 p. c.

Unoff. Preps.: *Infusion*, 5 p. c., 3j–2 (30–60 cc.). *Oleoresin* (ether)—yield 5–10 p. c., m̄ss–2 (.03–.13 cc.).



FIG. 64.—Ginger starch granules: magnified 250 diam.

PROPERTIES.—Like other aromatics, carminative, stimulant, sternutatory, rubefacient, anodyne, sialogogue. This was introduced from Asia, through Arabia into Greece and Europe. The Arabian and Greek physicians used it as a condiment, carminative, stimulant, aphrodisiac.

USES.—Atonic dyspepsia, flatulent colic, atonic gout, diarrhea, cholera, chronic bronchitis, alcoholic gastritis, corrective to nauseous medicines. Externally—colic, rheumatism, neuralgia, toothache, headache; in cataplasms, fomentations. The infusion for relaxed uvula, masticated for paralysis of tongue. *Zingiber Zerum'bet*, Java (rhizome fleshy, spongy, ginger odor and taste), and *Z. Cassumu'nar*, India (root 5 Cm. (2') long, fleshy radicles, white tubers, scaly, brown; odor and taste camphoraceous)—both used in their respective countries. *Z. Mio'ga*, cultivated in China, Japan—bergamot taste, slightly pungent.

Allied Plants:

1. *Alpin'ia officina'rum*, *Galanga*, *Galangel*, N. F.—The dried rhizome with not more than 2 p. c. of foreign organic matter, yielding not more than 3 p. c. of acid-insoluble ash; China, cultivated. Per-

ennial flag-like herb; flowers terminal racemes, white, red-veined. Rhizome, irregularly branched, 2–10 Cm. ($\frac{4}{5}$ –4') long, 1–2 Cm. ($\frac{3}{5}$ – $\frac{4}{5}$ ') thick, branches with annuli of lighter-colored leaf bases, 3–10 Mm. ($\frac{1}{8}$ – $\frac{2}{5}$ ') apart, rusty brown, internally orange-brown, cut end of branches circular and expanded; fracture fibrous; odor aromatic, agreeable; taste hot, spicy, ginger-like. Powder, reddish-brown—numerous starch grains, oil cells and reddish resin cells, tracheæ with thickenings, pores, thick-walled fibers, no lignified tissue; contains volatile oil .5 p. c., resin, gum, bassorin, fat, galangol, galangin, kæmpferid, alpinin, starch 23 p. c. Stimulant, aromatic, carminative; improve digestion, relieve flatulence. Dose, gr. 5–20 (.3–1.3 Gm.); 1. *Tinctura Aromatica*, 2 p. c.



FIG. 65.—Galanga.



FIG. 66.—Turmeric rhizome and stem.

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2. *Curcuma Zedoaria*, *Zedoaria*, *Zedoary*, *N. F.*—The dried rhizome with not more than 2 p. c. of foreign organic matter; India, largely cultivated. Perennial reed-like plant. Rhizome (tuber) occurs as *long* and *round*, varying in size, 12–37.5 Mm. ($\frac{1}{2}$ – $1\frac{1}{2}$ ') long, usually cut into transverse rounded sections, twisted, wrinkled, 1–4 Cm. ($\frac{2}{5}$ – $1\frac{3}{5}$ ') broad, 5–10 Mm. ($\frac{1}{5}$ – $\frac{2}{5}$ ') thick, grayish-brown, hairy, rough, few root-scars, transverse surface brownish, dark circular endodermis separates cortex from central cylinder; stele with yellowish resin cells, lighter fibro-vascular bundles, fewer in cortex; fracture short, mealy, waxy; odor aromatic, camphor-like; taste aromatic, warm, bitter. Powder, brownish—numerous starch grains and thick-walled hairs, parenchyma, few bast-fibers; no calcium oxalate crystals or stone cells; contains



FIG. 67.—Curcuma starch.

volatile oil .5–1 p. c., resin (pungent taste), starch, mucilage, ash 7 p. c. Stomachic, aromatic, stimulant; dyspepsia, flatulence—*weaker than ginger*. Dose, gr. 10–30 (.6–2 Gm.); 1. *Pilulæ Antiperiodicæ*, $\frac{1}{8}$ gr.; 2. *Tinctura Amara*, 2 p. c. 3. *Tinctura Antiperiodica*, $\frac{1}{5}$ p. c.

2. *Curcuma lon'ga*, *Turmeric*.—The rhizome, U. S. P. 1820–1870; S. Asia, Indian Ocean Islands. Plant is a perennial; leaves radical, 1 M. (3°) long, lanceolate; flower-scape short, spike 15 Cm. (6') long, flowers orange-yellow, in pairs; rhizome 2.5–5 Cm. (1–2') long, 12 Mm. ($\frac{1}{2}$ ') thick (long turmeric) to 18–25 Mm. ($\frac{3}{4}$ –1') thick (round turmeric), sometimes in sections, yellowish-gray, annulate, inside orange-yellow, fracture resinous; odor ginger-like; taste warm, aromatic; contains volatile oil 1 p. c., viscid oil 11 p. c., pungent resin, curcumin (coloring matter) .3 p. c., starch, ash 5–7 p. c. Powder deep yellow, brownish-red by alkalies or borax. There are several varieties: 1, Madras (best, bright yellow, often in cut pieces—Pubna preferred); 2, Bengal (reddish, mostly round); 3, Java (reddish-gray); 4, Chinese (often branched); 5, Cochin (possibly from *C. viridiflora*). Used as stimulant, tonic, aromatic, condiment, for jaundice, and as ginger; Tincture, 15 p. c., (diluted alcohol) for coloring ointments, solutions, etc.

CARDAMOMI SEMEN. CARDAMOM SEED, *U.S.P.*

Elettaria Cardamomum,
Maton.

{ The dried ripe seed, recently removed from the capsules, yielding not more than 5 p. c. acid-insoluble ash.

Habitat. Malabar, cultivated. India, Mountains, 750–1,500 M. (2,500–5,000°) elevation; Ceylon, Annam, Siam.

Syn. Cardam. Sem., Cardamomum, U.S.P. 1900, Malabar, Ceylon or Bastard Cardamom; Br. Cardamomi Semina, Cardamom Seeds, Cardamomum (Minus) Malabari (am)-cum; Fr. Cardamomes, Petit Cardamome; Ger. Fructus (Semen) Cardamomi (Minoris), Malabar-(Malabarische) Kardamomen, Kleine Kardamomen.

El-et-ta'ri-a. L. fr. *Elettari*—*i. e.*, native name of plant in Malabar.

Car-da-mo'mum. L. fr. Gr. *κάρδος*, thistle, + *ἄμωμος*, blameless, classic name.

PLANT.—Perennial herb; stems green, 2–4 M. ($6-12^{\circ}$) high, tapering, shining, covered with leaf-sheaths; leaves .3–.8 M. ($1-2\frac{1}{2}^{\circ}$) long,



FIG. 68.—*Elettaria Cardamomum*: A, leaf with ligule, b; B, bracts; C, flower, natural size; D, flower with calyx and corolla-tube partially removed; E, F, G, capsule form; H, seed with arillus, a; J, cross-section of seed 8 times enlarged; K, longitudinal section 5 times enlarged; p, perisperm; em, embryo; e, endosperm.

2.5–12.5 Cm. (1–5') broad, lanceolate, flower stalk from stem base lies on the ground; flowers, in rainy season, Jan.–May, greenish-

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white; rhizome tuberous, woody, fibrous roots below, scars above; fruit capsule, ellipsoidal, triangular, 10–20 Mm. ($\frac{2}{3}$ – $\frac{4}{5}$) long, 6 Mm. ($\frac{1}{4}$) broad, pale buff, striate, 3-locular, pericarp thin, leathery, nearly tasteless. SEED, 10–20, mostly agglutinated into groups of 2–7 by adhering membranous aril, oblong-ovoid, irregularly 3–4-sided, 3–4 Mm. ($\frac{1}{8}$ – $\frac{1}{6}$) long; convex on dorsal surface, strongly longitudinally grooved on ventral side, coarsely tuberculated, reddish-gray brown; odor aromatic; taste aromatic, pungent. POWDER, brownish—endosperm and perisperm cells filled with starch grains .001–.004 Mm. ($\frac{1}{25000}$ – $\frac{1}{62500}$) broad, or with 1–more calcium oxalate prisms, fragments of seed-coat and spiral tracheæ, few bast-fibers. Seed constitute 75 p. c. of the fruit, keep best in the pericarp, from which they should only be removed just prior to using. *Solvents*: diluted alcohol; boiling water. Dose, gr 5–15 (.3–1 Gm.).

ADULTERATIONS.—SEED: Rare—those of various varieties and allied species taken from the pericarp; ENTIRE FRUIT—with orange seed, green coffee, etc.; POWDER: Starch, sodium carbonate, ginger (recognized by its larger starch grains), etc.



FIG. 69.—Malabar cardamom: *a*, short; *b*, medium; *c*, long.

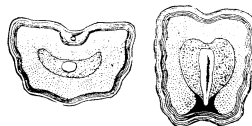


FIG. 70.—Cardamom seed: transverse and longitudinal section, magnified 5 diam.

Commercial.—Plant grows wild but mostly by cultivation in Malabar (W. Mysore) and Ceylon, on spaces cleared in mountain forests affording shade, or on betel-nut plantations, and yields the fourth year and many thereafter. Fruit is gathered mostly in dry weather, Oct.–Dec., preferably prior to maturity to minimize splitting, then dried artificially on tiers of trays in curing houses (brownish), or better in the sun, guarding against rain and excessive heat exposure, that cause the moist seed to swell and rupture pericarp (yellowish); the slower the drying, the less the splitting. Bleaching is effected by exposing to sulphur fumes, or to dew and sunlight, the finest by washing with alternating solutions of lathery soap-berry and astringent acacia pods, finally drying in the sun. Value is determined by size, color, plumpness, smoothness (the best being creamy white, smooth, silky) and are assorted through sieves into 4 kinds: (*a*) *Shorts*, 12 Mm. ($\frac{1}{2}$) long, 6 Mm. ($\frac{1}{4}$) broad, plump, heavy; (*b*) *Mediums*, 18–25 Mm. ($\frac{3}{4}$ –1) long, 6 Mm. ($\frac{1}{4}$) broad, paler buff, finer ribbed; (*c*) *Longs*, 25–31 Mm. (1–1 $\frac{1}{4}$) long, 4 Mm. ($\frac{1}{6}$) broad, rarely imported; (*d*) *Tiny*, least desirable. There are several varieties: 1, *Mysore* (*Ceylon-Mysore*, *Alleppi*), shorts, best, bleached and unbleached (greenish), exported from Alleppi,

Calicut; 2, *Malabar*, shorts, mediums, high grade, preferred by some, exported from Ceylon, India (Bombay), brown, striated; 3, *Madras*, usually mediums, pale buff, exported from Madras, Pondicherry; 4, *Mangalore*; 5, *Ceylon Mangalores*, round, valuable. The *Ceylons* are the wild-grown fruits of Ceylon, and the *Siam* of Cochin, Annam, Tonquin (Tonking) combined; the shorts of all varieties are best and most desired; imported in chests, 60–100–200 pounds (27–46–91 Kg.). The shelled seed, deteriorating rapidly, should never be used.

CONSTITUENTS.—Volatile oil 5 p. c., fixed oil 10 p. c., potassium salts 2.5 p. c., starch 3 p. c., nitrogenous mucilage 1.8 p. c., yellow coloring matter .4 p. c., ligneous fiber 77.3 p. c., manganese .8 p. c., ash 6–8–15 p. c.

Oleum Cardamomi, *N.F.*—This volatile oil (mostly in the testa) distilled from the seed, is a colorless, pale yellow liquid, characteristic, aromatic, penetrating, somewhat camphoraceous odor of cardamom, and persistent, pungent, strongly aromatic taste; soluble in alcohol, 70 p. c. alcohol (4), sp. gr. 0.935, dextrorotatory; contains terpinene, $C_{10}H_{16}$, possibly dipentene, a body of the composition $C_{10}H_{18}O$ (terpineol?), acetic and formic acids; also extracted by ether, giving a more durable oil mixed with fixed oil, this latter being easily separated. The distilled oil readily deteriorates, and should be kept cool, dark, in small well-stoppered, amber-colored bottles.

PREPARATIONS. — SEED: 1. *Tinctura Cardamomi*. Tincture of Cardamom. (Syn., Tr. Cardam.; Fr. Teinture de Cardamome; Ger. Kardamomentinktur.)

Manufacture: 15 p. c. Similar to *Tinctura Veratri Viridis*, page 104; menstruum: diluted alcohol. Dose, $\mathfrak{z}\text{j}$ –2 (4–8 cc.).

2. *Tinctura Cardamomi Composita*. Compound Tincture of Cardamom. (Syn., Tr. Cardam. Co.; Fr. Teinture de Cardamome composée; Ger. Zusammengesetzte Kardamomentinktur.)

Manufacture: 2 p. c. Macerate, for 3 or more days, with frequent agitation, in a stoppered container, in a moderately warm place, cardamom seed 2 Gm., cinnamon 2.5, caraway 1.2, cochineal .5, with 75 cc. of mixture of glycerin 5 cc. + diluted alcohol 95, finishing with diluted alcohol q. s. 100 cc. Dose, $\mathfrak{z}\text{j}$ –2 (4–8 cc.).

Preps.: 1. *Elix. Euphorb. Co.*, *N.F.*, 5 p. c. 2. *Elix. Gentian. Glycerin.*, *N.F.*, 6 p. c. 3. *Elix. Tarax. Co.*, *N.F.*, 3 p. c. 4. *Elix. Viburn. Prun.*, *N.F.*, 7.5 p. c. 5. *Syr. Eriodict. Arom.*, *N.F.*, 6.5 p. c.

3. *Extractum Colocynthis Compositum*, 5 p. c. 4. *Tinctura Gentianæ Composita*, 1 p. c. 5. *Tinctura Rhei*, 3 p. c. 6. *Pulvis Aromaticus*,

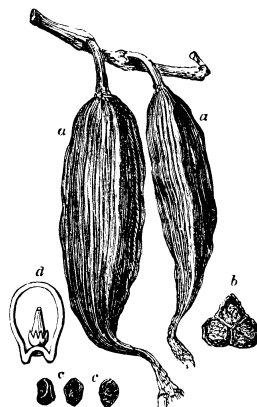


FIG. 71.—Ceylon cardamom: a, capsules; b, transverse section of capsule; c, seed; d, section of seed with embryo; magnified.

ZINGIBERACEÆ

N.F., 15 p. c. 7. *Pulvis Cretæ Aromaticus*, *N.F.*, 2 p. c. 8. *Tinctura Aromatica*, *N.F.*, 2 p. c. 9. *Tinctura Rhei Dulcis*, *N.F.*, 1 p. c. OIL:

1. *Spiritus Cardamomi Compositus*, *N.F.*, 10 p. c.

Preps.: 1. *Elixir Cardamomi Compositum*, *N.F.*, 1 p. c. 2. *Elixir Gentianæ*, *N.F.*, 1.5 p. c. 3. *Elixir Glycerophosphatum Compositum*, *N.F.*, $\frac{1}{5}$ p. c. 4. *Elixir Glycyrrhizæ Aquosum*, *N.F.*, $\frac{1}{2}$ p. c. 5. *Liquor Pancreatini*, *N.F.*, .35 p. c.

2. *Spiritus Vanillini Compositus*, *N.F.*, 1 p. c.

Unoff. Preps.: Fluidextract. Infusion, 5 p. c., \mathfrak{z} j-2 (30-60 cc.).

PROPERTIES.—Carminative, stomachic, stimulant, aromatic, condiment.

USES.—Adjuvant or corrective to cordials, tonics, purgatives, flavoring liquors, cakes, breath, etc.

Allied Plants:

1. *Elettaria ma'jor*, *Ceylon Cardamom*.—About 40 Mm. ($1\frac{3}{5}'$) long, triangular, prolonged into a beak 15 Mm. ($\frac{3}{5}'$) long, brownish-gray color.

2. *Amo'mum Cardamo'mum*, *A. ve'rum* and *A. globo'sum*, *Round Cardamom*.—Siam, Java, China, globular-ovate. *A. aromat'icum*, *Bengal Cardamom*, 9-winged at apex. *A. xanthoi'des*, *Wild or Bastard Cardamom*, *A. max'imum*, *Java Winged Cardamom*, 9-12-winged from base to apex, and *A. Gra'nium-paradi'si*, *Grain of Paradise*. Fruit resemble cardamom seed, several varieties, used for ginger.



FIG. 72.—Maranta starch.



FIG. 73.—Canna starch.

3. *Maran'ta arundina'cea*, *Arrow-root*.—The fecula of the rhizome, U. S. P. 1820-1870; W. Indies, Bermudas, Brazil. Plant slender, 1-2 M. (3-6°) high, leaves 7.5-12.5 Cm. (3-5') long, lanceolate, flowers white, rhizome perennial, tuberous, fleshy, scaly, 15-30 Cm. (6-12') long. Arrow-root in powder or lumps 4 Mm. ($\frac{1}{6}'$) thick, white, opaque; under microscope consists of oval granules of fine-lined layers, nucleus at broad end. The rhizome when 1-2 years old is dug, washed, deprived of scales, ground under water, kneaded, strained, and the fecula allowed to subside; fresh rhizome yields starch 13-20 p. c.; root contains starch 27 p. c., fat .2 p. c. Used as demulcent, nutritive food for infants, convalescents, bowel or urinary troubles; in 5 p. c. solution

with water or milk by boiling and flavoring with vanilla, lemon juice, etc.; also used in puddings. The jelly is more tenacious than that of all other starches, except Canna.

4. *Can'na ed'ulis*, *Canna* (*Tous-les-mois*).—The fecula of rhizome, U.S.P. 1860–1870; Peru, Brazil. Perennial herb 2.5 M. (8°) high; stem green; leaves parallel-veined, bluish-green; flowers few, in pairs, red; yellow, purple, bract; fruit round capsule, 12 Mm. ($\frac{1}{2}$ ') thick; rhizome creeping, fleshy, thick joints. Canna starch white powder, satiny; under microscope granules largest of all, potato coming next, $\frac{1}{12}$ – $\frac{1}{8}$ Mm. ($\frac{1}{30}$ – $\frac{1}{20}$ ') long, flat, ovate, hilum at narrow end, encircled by many unequally distant rings. Grind rhizome under water, knead, strain, allow to subside. Used as demulcent, nutritive food for urinary and bowel affections, infants, invalids in convalescence.

11. ORCHIDACEÆ. Orchid Family.

Or-ki-da'se-e. L. *Orchi(s)d* + aceæ, fr. Gr. *ὄρχις*, a testicle—*i. e.*, ancient name from shape of roots. Herbs, shrubs, terrestrial or epiphytical. Distinguished by flowers being perfect, irregular, reptile-shape, perianth 6, in 2 whorls, petaloid, superior; leaves sheathing, entire; anthers 1–2, sessile, united to style (gynandrous); pollen cohering in masses; ovary 1-celled, inferior, long, 3-angled; capsule 3-valved; universal; aromatic, antispasmodic, nutrient, aphrodisiac, flavoring, beautiful flowers.

Genus: 1. **Vanilla**.

VANILLA. VANILLA, *N.F.*

Vanillinum. **Vanillin**, $C_8H_8O_3$, *U.S.P.*

Vanilla planifolia, *Andrews*, { Methylprotocatechuic aldehyde occurring naturally in vanilla (cured fruit), or prepared synthetically.

Habitat. E. Mexico, hot, damp woods, forests; cultivated in tropics.

Syn. Vanilla Aromatica, Vaniglia; Fr. Vanille, Vanilline; Ger. Fructus (Siliqua) Vanillæ, Vanillin.

Vanil'la. L. fr. Sp. *vainilla*, formerly *vaynilla*, dim. of *vaina* (*vayna*), scabbard, sheath, pod, lit. "little pod"—*i. e.*, pod resembling the sheath of a knife.

Pla-ni-fo'li-a. L. *planus*, flat, + *folium*, leaf, flat-leaved—*i. e.*, leaves plain or flat, without prominent veins.

PLANT.—Succulent, dark green, epiphytic, terrestrial or parasitic, perennial climber; stem long, 1–2 Cm. ($\frac{2}{3}$ – $\frac{4}{5}$ ') thick, smooth, much branched, nodes with aerial roots and rootlets, 12.5–15 Cm. (5–6') long, for clinging to trees, frame-work, etc., leaves 10–15 Cm. (4–6') long, oval, tough, fleshy, veinless, dark green, paler beneath; flowers 5 Cm. (2') broad, pale yellowish-green, loose axillary racemes of 8–10. Fruit (pod). *Vanilla*, *Vanilla Bean*, *N.F.*—The cured full-grown,

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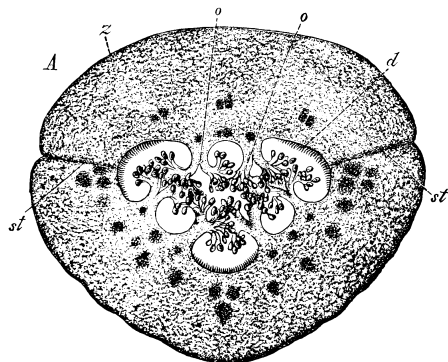
unripe fruit, preserved in a cool place where it will not become brittle, when it should not be used. It is linear, flattened, tapering, 12-35 Cm. (5-14') long, 5-9 Mm. ($\frac{1}{5}$ - $\frac{1}{3}$ ') broad, in clusters of 3-15, flat circular

FIG. 74.—*Vanilla planifolia*.

scar at summit, curved (hooked) at base (Tahiti variety — middle broad, tapering similarly towards either end), blackish-brown, longitudinally wrinkled, moist-glossy, occasionally with efflorescence of vanillin acicular crystals, and 3-divided near tip; frequently cork patches; flexible, tough, 1-celled, blackish-brown pulp and many triangular, reticulate seed, .25-.30 Mm. ($\frac{1}{100}$ - $\frac{1}{75}$ ') broad; odor and taste characteristic, very agreeable. *Test*: 1. Efflorescent crystal on slide, + 1 drop of phloroglucinol T. S. and hydrochloric acid—carmine-red (dist. from benzoic acid); solvent: 75 p. c. alcohol. Dose, gr. 5-30 (.3-2 Gm.).

Commercial: Plant mostly cultivated, since 1850, from cuttings, sometimes seed, in Papantla, Misantla, Vera Cruz, Oaxaca provinces,

where moisture is abundant and temperature never below 18° C. (65° F.); it climbs by rhizoids (non-absorbing roots), pollinates by

FIG. 75.—Vanilla fruit, cross-section magnified: *z*, fruit flesh; *st*, opening suture; *o*, seed placenta; *d*, papillae.

insects, hand; bears fruit 3d year, continues 30-40; fruit (cured, full-grown, unripe) develops in 2-3 months, but a longer time is required

for maturing, and when collected (late autumn before quite ripe, as green begins disappearing into yellow, to avoid splitting) is placed in heaps, sheltered from sun and rain, to undergo partial fermentation and shriveling, then followed by the process of "sweating"—exposure to sun or stove heat (60°C. ; 140°F.) until a fine chestnut-brown color is acquired, and the odorous principle, vanillin, has been developed from the normal coniferin (secreted by the internal hair-like fibrillæ), which is converted by hydrolization into glucose and coniferic alcohol, then this latter by an oxydase into vanillin—the object being to drive moisture out upon the surface and finally drying the latter; the process may be aided by the sweating-box, steaming, wrapping in blankets, etc.; they now are dried by a 2-months' exposure to the sun, then coated with oil (that which exudes, also cocoa and cashew nut), tied in small bundles of 50–75, wrapped in foil, and marketed; by insufficient drying, to retain weight, the interior of beans and wherever tied sometimes become moldy. There are several varieties: 1, *Mexican* (*Vera Cruz*), best, but beans vary much in value; 2, *Bourbon*, from Isle of Réunion, resembles Mexican, but beans blacker, tapering portion shorter, less firm and fleshy, surface smooth, waxy, soon becoming coated with acicular crystals (frost); odor more like Tonka bean; 3, *Mauritius* (*Seychelles*), often sold as inferior Bourbon; beans only 15 Cm. ($6'$) long, 6 Mm. ($\frac{1}{4}'$) broad, pale color, smooth, not waxy, faint odor; 4, *South American* (*Guadeloupe*), resembles Mexican, but broader, flatter, often 12 Mm. ($\frac{1}{2}'$) broad, reddish-brown, odor of fermented molasses, pulpy, resinous, few crystals on surface, beans often open and seed on the surface; 5, *Tahiti*, transplanted Mexican; beans 15 Cm. ($6'$) long, 12 Mm. ($\frac{1}{2}'$) broad, reddish-brown, heliotrope odor; 6, *Java*, mostly consumed in Holland, beans 10–15 Cm. (4 – $6'$) long, fine flavor of Mexican but odor much more powerful; 7, *Vanillons* (*Brazilian*—*V. Pompo'na*), larger, thicker than S. American, inferior vanilla odor (heliotrope), used by perfumers, tobaccoists; contains vanillin .5 p. c. Beans also are imported from Honduras, Madagascar, Martinique, etc., while some occur on the market deprived by a solvent of vanillin, and others to which benzoic acid, etc., have been added; all may be purchased as "splits" and "cuts."

CONSTITUENTS.—FRUIT: Vanillin (Mexican 1.7 p. c., Bourbon 2 p. c., Java 2.75 p. c., in the 2 last associated with odorous oil), fixed oil 11 p. c., balsam, resin, sugar, mucilage, tannin, oxalic acid, ash 4–6 p. c.

Vanillinum. Vanillin.—This is obtained (1) by crushing the pods (fruit) with sand, extracting with ether in a Soxhlet tube, shaking out ethereal extract with sodium sulphite solution, liberating vanillin from this by treating with sulphuric acid, expelling sulphurous acid generated, extracting with ether; (2) by slowly adding a concentrated solution of coniferin, $\text{C}_{16}\text{H}_{22}\text{O}_8$, from cambium sap of pines, to a warm solution of potassium dichromate in water and sulphuric acid, finally heating to boiling for 3 hours—coniferin, by hydrolysis from action

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of acid, is converted into dextrose and coniferyl alcohol, and this latter oxidizes into vanillin and aldehyde: $C_{16}H_{22}O_8 + H_2O = C_6H_{12}O_6 + C_{10}H_{12}O_3$; $C_{10}H_{12}O_3 + O = C_8H_8O_3 + C_2H_4O$ —passing steam through mixture, or adding successive portions of ether, filtering, reclaiming ether, when vanillin crystallizes; (3) by boiling eugenol, $C_{10}H_{12}O_2$, with acetic anhydride, forming acetyl-isoeugenol, $C_{10}H_{11}-(C_2H_3O)O_3$, which is oxidized with potassium dichromate into acetyl-vanillin—the latter upon treating with potassium hydroxide solution and concentrating being converted into vanillin, which may be removed by acidulating filtrate with sulphuric acid and shaking out with ether; this method, owing to economic reasons, is used chiefly. It is in fine, white, slightly yellowish, needle-like crystals, odor and taste of vanilla, 400 times stronger than the pod, soluble in alcohol, chloroform, ether, glycerin (20), water (100), hot water (16), aqueous solutions of alkali hydroxides, from which it is precipitated by acids; melts at $81^\circ C.$ ($178^\circ F.$); incinerate—ash .05 p. c.; aqueous solution acid, optically inactive. *Tests*: 1. Aqueous solution with ferric chloride T. S.—blue color, changed to brown on boiling, and on cooling—white precipitate (dihydrodivanillin). 2. Shake ethereal solution with saturated aqueous solution of sodium bisulphite, add sulphuric acid—vanillin precipitated. 3. Cold aqueous solution with lead acetate T. S.—white precipitate (lead compound of vanillin), soluble in hot water. 4. Warm .1 Gm. with concentrated alcoholic solution of sodium hydroxide, + a drop of chloroform, warm—no odor of phenylisocyanide (abs. of acetanilid). *Impurities*: Acetanilid, benzoic acid, boric acid, terpin hydrate, coumarin, 50–90 p. c. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{6}$ – $\frac{1}{2}$ (.01–.03 Gm.).

PREPARATIONS.—1. FRUIT: 1. *Tinctura Vanillæ*, N.F., 10 p. c. + sucrose 20 (1st menstruum alcohol, 2d diluted alcohol): Preps.: 1. *Elixir Ammonii Valeratis*, N.F., 1.6 p. c. 2. *Emulsum Olei Ricini*, N.F., 2.5 p. c. 3. *Syrupus Bromidorum*, N.F., 3.2 p. c. 4. *Syrupus Cacao*, N.F., $\frac{1}{5}$ p. c. 5. *Tabellæ Santonini*, N.F., $\frac{1}{4}$ m. 6. *Tabellæ Santonini Compositæ*, N.F., $\frac{1}{4}$ m. II. VANILLIN: 1. *Spiritus Vanillini Compositus*, N.F., 20 p. c.: Prep.: 1. *Elixir Vanillini Compositum*, N.F., 20 p. c. 2. *Elixir Amygdalæ Compositum*, N.F., $\frac{1}{10}$ p. c. 3. *Liquor Ferri Peptonati*, N.F., $\frac{1}{500}$ p. c. 4. *Liquor Ferri Peptonati et Mangani*, N.F., $\frac{1}{500}$ p. c. 5. *Oleum Ricini Aromaticum*, N.F., $\frac{1}{10}$ p. c.

PROPERTIES.—Carminative, stimulant, aphrodisiac, antihysteria, irritant. Those working in it have itching hands, face, neck (the skin being covered with pruriginous eruptions), dizziness, weariness, muscular pains; eruptions due to an *acarus* which does not enter the skin.

USES.—The Spanish conquerors found vanilla in use in Mexico for flavoring chocolate, etc., and while now recommended for hysteria, it is employed chiefly as a flavoring agent, being the most general of all substances; large quantities may produce poisonous symptoms. *Vanilla Pompo'na*, Guadeloupe variety, *V. Gardne'ri*, Brazilian and Bahia, *V. odora'ta*, *V. phæan'tha*, Jamaica, Trinidad—used similarly.

Allied Plants:

1. *Cypripedium bulbosum*, *C. pubescens*, *C. parviflorum*, *Cypripedium*, *Lady Slipper Root*, N. F.—The dried rhizome and roots with

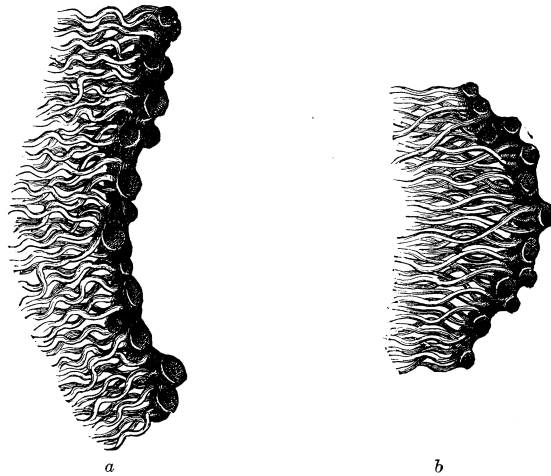


FIG. 76.—a, *Cypripedium hirsutum* (*pubescens*): rhizome and roots, natural size.
b, *Cypripedium parviflorum*: rhizome and roots, natural size.

not more than 3 p. c. of other parts, or other foreign organic matter, yielding not more than 6 p. c. of acid-insoluble ash; N. America, woods, swampy places. Perennial hairy herbs, .3–.6 M. (1–2°) high; leaves ovate, 10–12.5 Cm. (4–5') long; flowers bright yellow, showy, 4-divided, moccasin-shaped; hairs irritant—cutaneous eruptions. Rhizome curved, 3–10 Cm. (1½–4') long, 2–6 Mm. (¼–¼') thick, orange-brown, brownish, many cup-shape scars above, and wavy roots below, 3–15 Cm. (1½–6') long, fracture short (roots fibrous); odor distinct, heavy; taste sweetish, bitter, pungent. Powder, yellowish-brown—numerous starch grains, calcium oxalate raphides, tracheæ, few tracheids, thin-walled and thick-walled fibers, epidermal tissue, parenchyma cells with starch, resin, or calcium oxalate; solvents: boiling water, diluted alcohol; contains volatile oil, resin (2), fixed oil, volatile acid, tannin. Antiperiodic, nervous stimulant, diaphoretic; cholera, hysteria, epilepsy, nervousness, hypochondriasis, neuralgia, insomnia—substitute for valerian. Dose, gr.



FIG. 77.—*Orchis mascula*.

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15–30 (1–2 Gm.); 1. *Fluidextractum Cypripedii* (diluted alcohol), dose, ℥xv–30 (1–2 cc.); “Eclectic” resinoid, cypripedin, gr. 1–2 (.06–.13 Gm.).

2. *Orchis mas'cula* (+ other species), *Salep*.—The fecula of the root, U.S.P. 1820; C. and S. Europe; rich woods. Small herb 15–45 Cm. (6–18') high, leaves parallel-veined, sheathing; flowers pinkish, showy, nectariferous spur underneath, root (tubers) consists of 2 fleshy tubers 2.5 Cm. (1') long, deprived of epidermis by scalding in water; yellowish-brown, hard, translucent, horny, insipid; contains starch 27 p. c., mucilage 48 p. c.; starch obtained by grinding root under water, straining, subsiding. Demulcent, nutritive diet for infants, children, chronic diarrhea, cholera infantum, tuberculous diarrhea, in mucilage (1 part + water 50) *Adulterations*.—TUBERS: Colchicum corm, this latter being recognized by its side groove and sweet, bitter, acrid taste; POWDER: Starch, flour, which can readily be distinguished by microscope. Dose, *ad libitum*.

SUB-CLASS 2. **DICOTYLEDONES (Embryo with 2 cotyledons, stem exogenous (with pith, wood, bark), leaves net-veined).**

SERIES 1: **CHORIPETALÆ. Petals separate and distinct, or wanting.**

12. PIPERACEÆ. Pepper Family.

Pip-e-ra'se-e. L. *Piper* + aceæ, Gr. *πιπερι*, Skt. *pipala*, Bengalese *pippul*, fr. Gr. *πέπτω*, to digest—*i. e.*, it aids digestion. Herbs, shrubs. Distinguished by jointed stems; leaves entire; flowers perfect, without floral envelopes, spikes; ovary 3–5, somewhat united, 1-celled; ovule 1, stigma 2–4; fruit somewhat fleshy, 1-celled, 1-seeded; tropics; acrid, pungent, aromatic, stimulant (volatile oil + resin).

Genus: 1. **Piper.**

CUBEBA. CUBEB, U.S.P.

Piper Cubeba, *Linné filius*,
(Cubeba Cubeba), (*Linné*
filius) *Lyons*).

{ The dried, nearly full-grown, unripe fruit,
with not more than 5 p. c. shriveled
fruits or stems nor 2 p. c. foreign or-
ganic matter, yielding not less than 10
p. c. volatile ether-soluble extractive.

Habitat. Java, Sumatra, Borneo; cultivated in two former islands, and in W. Indies, Ceylon.

Syn. Cubeb, Cubebs. Tailed Cubebs, Cubeb-, Java-, or Tailed-Pepper; Br. Cubebæ Fructus (Bacca), Piper Caudatum; Fr. Cubèche, Poivre à Queue; Ger. Cubebæ, Kubeben.

Pi'per. L. see etymology. above, of Piperaceæ.

Cu-be'ba. L. fr. Gr. *κουβέβα*, of Actuarius; name used since the 10th century; Pers. *kababa*, their native name of the plant.

PLANT.—Climbing woody perennial; stem jointed, flexuous, 6 M. (20°) high; leaves 15 Cm. (6') long, lanceolate, leathery, shining,

nerved, petiolate; flowers dioecious, spikes, 2.5–5 Cm. (1–2') long. FRUIT, upper portion globular, 3–6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') broad, abruptly contracted into a slender, stem-like portion (stipe, thecaphore—not a true pedicel, but stigma remnant), 5–7 Mm. ($\frac{1}{5}$ – $\frac{1}{4}$ ') long; pericarp brown, dark brown, rarely gray, coarsely reticulate, .3 Mm. ($\frac{1}{75}$ ') thick; 1-locular, 1-seeded, the seed attached at base of pericarp, usually not completely filling loculus; odor aromatic, characteristic; taste strongly aromatic, pungent. POWDER, brown—numerous starch grains, .002–



FIG. 78.—*Piper Cubeba*.

.012 Mm. ($\frac{1}{125000}$ – $\frac{1}{20000}$ ') broad, and stone cells with yellowish porous walls; few wood bundles with spiral tracheæ and fibers; with sulphuric acid against white background—crimson-red. *Solvents*: ether; alcohol. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—FRUIT: Rachis or stalks (inodorous, increasing fibro-vascular tissue and ash), partially grown fruit, siftings (darker and without starch masses), black pepper and other piperaceous fruits (*P. caninum*, *P. crassipes*, *P. Lo'uong*, *P. mollissimum*, *P. ribesoides*, *P. Clu'sii*, *Sit'sea citrata*, etc.), all distinguished by character-

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istic shape, odor, and taste. *Rhamnus cathartica* fruit (pedicellate and contains 4 seed), allspice (much larger, 2-seeded, no pedicel). *Juniperus communis* fruit (much larger, different taste); POWDER: Deteriorates unless kept in tight containers, hence best to powder only when needed, sometimes mixed with powdered allspice, flour, or starch.

Commercial.—Plant grows extensively in coffee plantations or on grounds reserved for the purpose, being supported usually on shade trees; fruit is gathered when full-grown, but before ripe—still of a green color—dried carefully in the sun, and exported from Java to Singapore, whence it enters market.

CONSTITUENTS.—Volatile oil 5–15 p. c., Resin 2.5–3.5 p. c., Cubebin .4–3 p. c., Cubebic acid 1–3.5 p. c., fixed oil 1 p. c., gum 8 p. c., starch, ash 5–8 p. c. (cubeb stalks 10 p. c.).

Oleum Cubebæ. Oil of Cubeb.—This volatile oil, distilled with water or steam from the unripe fruit, is a colorless, pale green, yellowish-green liquid, characteristic odor and taste of cubeb, sp. gr. 0.915, levorotatory, soluble in equal volume of alcohol, neutral reaction; contains a little dipentene, $C_{10}H_{16}$, but mostly sesquiterpene, cadinene, $C_{15}H_{24}$. If old, or distilled from old fruit, has additionally an inodorous stearoptene, cubeb camphor, $C_{15}H_{24} \cdot H_2O$, which soon deposits. Dose, $\text{m}\nu$ -20 (.3–1.3 cc.).

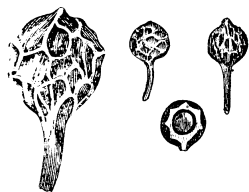


FIG. 79.—Cubeb: fruit, natural size, and magnified.

Resin.—Extracted by ether, which also takes up volatile oil, fixed oil, cubebin, chlorophyll, and wax; evaporate off volatile oil, when cold cubebin and wax deposit; decant from these, separate fat and have left the resin, which is amorphous, soluble in alkalies, alcohol, not precipitated by alcoholic solution of lead acetate.

Cubebin, $C_{10}H_{10}O_8$.—This constitutes the precipitate from oleoresin upon standing; it is white, crystalline, inodorous, inert; alcoholic solution bitter.

Cubebic Acid, $C_{14}H_{16}O_4$.—Brownish, resin-like mass, soluble in alkalies, alcohol, ether, chloroform, precipitated by lead acetate; diuretic. Dose, gr. 5–10 (.3–.6 Gm.). Last three are red with sulphuric acid.

PREPARATIONS.—1. *Fluidextractum Cubebæ*, *N.F.* (alcohol), dose, mxv –60 (1–4 cc.). 2. *Oleoresina Cubebæ*, *N.F.* (alcohol); on standing deposits waxy crystalline precipitate—must use only liquid portion, dose, $\text{m}\nu$ –30 (.3–2 cc.). 3. *Tinctura Cubebæ*, *N.F.*, 20 p. c. (alcohol), dose, ss –2 (2–8 cc.). 4. *Fluidextractum Buchu Compositum*, *N.F.*, 12.5 p. c. 5. *Pilula Antiperiodicæ*, *N.F.*, $\frac{1}{8}$ gr. 6. *Tinctura Antiperiodica*, *N.F.*, $\frac{1}{5}$ p. c.

Unoff. Preps.: *Extract*, gr. 2–10 (.13–.6 Gm.). *Infusion*, 5 p. c., ss –2 (30–60 cc.). *Troches* (each $\frac{1}{3}$ gr. oleoresin).

PROPERTIES.—Diuretic (resin + cubebic acid), stimulant, carminative, expectorant, disinfectant, local irritant (volatile oil), may cause

headache, giddiness, nausea, purging, paralysis; it is eliminated by bronchial mucous membrane, skin, and kidneys, all being stimulated and the increased secretions disinfected; imparts to urine a peculiar odor.

USES.—Gonorrhea, urethritis, vesical irritability, cystitis, abscess of prostate gland, piles, chronic bronchitis, catarrh. Arabians used it similarly to black pepper, and were the first to introduce it into Europe.

Allied Products:

1. *Piper Lo'wong* (*Cubeba Lowong*) and *P. ribesoides* (*C. Wallich'ii*), fruit of both much like the official.

2. *P. cani'num* (*C. canina*), fruit smaller than official, contracted below into a stalk half the length of the globular portion, and *P. cras'sipes* (*C. crassipes*), fruit larger than the official.

3. *False Cubeb*.—Origin unknown, fruit wrinkled, brownish-gray, size of the official, stalk 5 Mm. ($\frac{1}{5}$ ') long, odor mace-like.

Allied Plants:

1. *Piper ni'grum*, *Piper*, *Pepper*, *Black Pepper*, *N. F.*—The dried, unripe fruit with not more than 2 p. c. of stems or other foreign matter, yielding not less than 6 p. c. of non-volatile extract, soluble in ether; S. Asia; cultivated. Perennial woody, evergreen climber; leaves 10–15 Cm. (4–6') long, ovate, entire, smooth, leathery, dark green, 5–7-nerved; flowers, spikes, whitish. Fruit, berry-like—green, red, yellow (ripe), nearly globular, 3.5–6 Mm. ($\frac{1}{4}$ – $\frac{1}{4}$ ') broad, epicarp thin, easily separable from sarcocarp, grayish-black, coarsely reticulate, unilocular, 1-seeded, seed nearly white, hollow, adhering to pericarp; odor aromatic, slightly empyreumatic; taste aromatic, very pungent. Powder, grayish-black—fragments of pericarp—blackish-brown, of perisperm and embryo—whitish, starch grains, stone cells (epicarp) with reddish-brown pigment, or (endocarp) with reddish-brown substance; oil cells with yellowish oil that may separate piperine prisms; solvents: ether, acetone, alcohol, water partially; contains piperine 5–8 p. c., piperidine .56 p. c., volatile oil 1–2 p. c., resin (pungent), chavicin, piperic acid, starch 25–45 p. c., fixed oil 7 p. c. The commercial oil of black pepper (*Oleum Piperis*), a by-product in making piperine, consists of the volatile oil, fixed oil, and pungent



FIG. 80.—*Piper nigrum*.

PIPERACEÆ

resin—practically the oleoresin. Stimulant, tonic, antiperiodic, carminative, rubefacient; intermittents, colic, indigestion, flatulence; gargle for throat; gums; plaster for rheumatism; universal condiment. There are several varieties: 1, Malabar—heaviest; 2, Penang—strongest; 3, Singapore—darkest; 4, Straits Settlements—chief and

best; the first three suitably mixed furnish popular trade brands. *Adulterations*.—FRUIT: That of allied species, stalks, siftings, grape seeds, ivory nut, cinnamon, mace. POWDER: starch, flour, mustard, husks, flaxseed, capsicum—all recognized by microscope. Dose, gr. 5–20 (.3–1.3 Gm.); 1. *Tinctura Antiperiodica*, $\frac{1}{3}$ p. c. *Oleoresin*, 5–6.5 p. c., \mathfrak{mss} –2 (.03–.13 cc.). *Fluidextract*, \mathfrak{m} v–20 (.3–1.3 cc.).

2. *P. angustifolium*, *Matico*, *N. F.*—The dried leaf with not more than 5 p. c. of stems, flower spikes or other foreign organic matter, yielding not more than 6 p. c. of acid-insoluble ash; S. America—Andes of Peru, Bolivia. Large soft-wooded shrub or small tree; branches quadrangular, the younger hairy; flowers small, yellowish; fruit small, hard, black, 1-seeded; leaves, usually broken in compressed, matted masses, 10–20 Cm. (4–8') long, 2–5 Cm. ($\frac{1}{2}$ –2') broad, lanceolate, acute, unequal cordate, crenulate, dark green above, tessellated, pale green below, reticulate with prominent midrib and veins, quadrangular-meshed, pubescent; odor distinct, aromatic; taste pungent, pepper-like. Powder, greenish-yellow—non-glandular hairs, epidermal cells with stomata, secretion cells; solvents: alcohol (50–75 p. c.), boiling water; contains volatile oil 2–3 p. c., artanthic acid, pungent resin, bitter principle, tannin, mucilage—maticin is only a potassium salt. Stimulant, tonic, diuretic, styptic, vulnerary, aphrodisiac (similar to cubeb—mostly due to volatile oil); bronchitis, gonorrhea, menorrhagia, hemorrhoids, diarrhea, dysentery, hematuria, hemorrhage, vesical catarrh, incontinence of urine; locally to bleeding surfaces, owing to the many hairs promoting blood-clot. *Adulterations*: Leaves of allied species of its own genus,

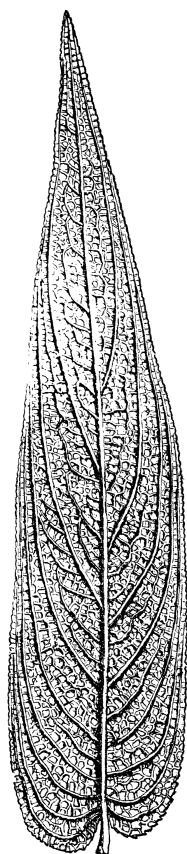


FIG. 81.—Matico:
natural size.

and those of *Eupatorium* and *Waltheria* genera—none being tessellated above or rough and hairy beneath. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Matico* (75 p. c. alcohol), dose, \mathfrak{m} xv–60 (1–4 cc.). *Infusion*, 5 p. c., \mathfrak{z} j–2 (30–60 cc.); *Tincture*, 10 p. c., \mathfrak{z} j–2 (4–8 cc.).

3. *P. methys'ticum*, *Kava*, *Methysticum*, *Kava Kava*, *N. F.*—The dried rhizome and roots with not more than 1 p. c. of foreign organic matter; Sandwich Islands; cultivated. Tall, soft-wooded herb. Rhizome, irregular knotty crown, 12 Cm. (5') thick, from which radiate many tough roots with ends separating fibro-vascular bundles, sometimes cut into angular pieces; crown soft, light, spongy, granular, starchy, dark brown—crown, lighter where scraped, internally white; odor faint, characteristic; taste aromatic, pungent, bitter—more or less anesthesia. Powder, whitish—starch grains, yellow resin and oil cells, sclerenchymatous fibers, tracheæ with markings, parenchyma cells (stem); solvent: diluted alcohol; contains resins (alpha-, beta-) 2 p. c., yanonin, kavaine, methysticin (kavahin—resembles piperine), volatile oil, starch 50 p. c., ash 8 p. c. Local anesthetic—lasts several days, but too irritating for general use; on mucous membranes—tingling sensation then anesthesia; natives prepare a beverage *kava*, by fermenting infusion which produces drowsiness, mutterings, weakness of limbs, without impairing intelligence. Diuretic; cystitis, vaginitis, acute and chronic diarrhea, leucorrhea. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Kavæ* (60 p. c. alcohol).

4. *P. officina'rum* (*lon'gum*), *Long Pepper*.—The immature fruit dried in the sun, U.S.P. 1830; Java, India, Ceylon, Philippine Islands, Bengal. Shrub like *P. nigrum*; leaves cordate; flowers spikes; fruit spike-like cone 2.5–4 Cm. (1–1½') long, 5 Mm. (¼') thick, cylindrical, uneven, dusty, blackish-gray, the many coalesced fruits spirally arranged, each crowned with style remnant; odor, taste, properties, and composition like that of *P. nigrum*. The Bengal long pepper is darker and shorter (2.5 Cm.; 1' long) than that from elsewhere.

5. *P. al'bum*, *White Pepper*.—The ripe fruit of *P. nigrum* deprived of the pericarp from which it separates easily, and may be facilitated by gathering spikes, cleaning, immersing in water, and rubbing with the hands in baskets. It is somewhat larger than the *black*, smooth, yellowish, hard, horny, mealy within, odor and taste similar but less powerful. There are four varieties: 1, Tellicherry; 2, Penang; 3, Batavia; 4, Singapore. Largely used in China. Still another variety is made by soaking off (or using mechanical means) the outer portion (pericarp) of black pepper, or simply drying the very young and immature fruit, but this is smaller and inferior. *Adulterations*: Same as in *black*.

6. *P. Famecho'ni*, *Kissi*, *Kissine*, *Guinea Pepper*; Upper Guinea. Fruit in cylindrical clusters—small blackish-brown, ovoid berries, each with cubeb-like pedicle at base; aromatic odor, agreeable taste; contains volatile oil 4.5–11.5 p. c., piperine 3.5–5 p. c. Used like pepper.

7. *P. Be'tel*.—India. Climbing plant; leaves chewed by the Malays with lime and areca-nut shavings. *P. Carpun'ya*, Chile, Peru; small tree. *P. pelta'tum*, *P. umbella'tum*; Tropical America. Diuretic; skin diseases, tumors.

[NOTE: Pages 150-151 are missing from the original text in both copies of the manuscript that I have obtained. The missing pages appear to be a publishing defect rather than damage to the books. DM]

SALICACEÆ

13. SALICACEÆ. Willow Family.

Sal-i-ka'se-e. L. *Salix*(x)c + aceæ, willow, from Celtic *sal*, near, + *lis*, water—*i. e.*, its favored place of growth; or L. *salire*, to leap—its rapid growing. Trees, shrubs. Distinguished by light wood, bitter bark, alternate, stipulate leaves, dioecious flowers, both kinds in catkins, 1 to each bract, no perianth; fruit 1-celled, 2-4-valved pod, many-seeded, each with long silky hairs at one end, but covering it; ovary 1-celled, superior; stamens 2 or more; temperate climates; tonic, astringent, febrifuge, stimulant; timber, basket-making, seed hair for cushions.

Genera: 1. **Salix.** 2. **Populus.**

SALIX. SALIX (WILLOW).

Salicinum. **Salicin**, $C_{13}H_{18}O_7$, U.S.P.

Salix and **Populus**, } A glucoside.
several species.

Habitat. Europe, N. America; cultivated.

Syn. White Willow, Common European-, Duck-, Huntington-, Salicin Willow, Withe, Withy; Fr. Saule blanc, Salicine; Ger. Weidenrinde, Salicin.

Salix. L. see etymology, above, of Salicaceæ.

Populus. L. poplar, fr. *populus*, the people—being often planted along the public ways in Rome, where it was called *arbor populi*, tree of the people.

PLANTS.—These two juxta-positioned genera are composed mostly of large trees 15–18 M. (50–60°) high, with flexible branches: *Salix* leaves, long pointed, entire or glandularly toothed; *Populus* leaves, broad, more or less heart-shaped, ovate, toothed; flowers May, both in catkins appearing before the leaves, dioecious, buds covered with scales, or a varnish; barks of both genera resemble; that of *Salix* slips from the wood more readily.

CONSTITUENTS.—Salicin 1–3 p. c., tannin 12 p. c., extractive matter.

Salicinum. **Salicin.**—Obtained by several methods: 1. Add litharge or basic lead acetate to hot concentrated decoction of young bark to remove tannin, gum, extractive; the filtrate contains salicin and some absorbed lead, the latter is separated by adding sulphuric acid and barium sulphide, while salicin, upon concentration of the filtrate, crystallizes out. When basic lead acetate is used, the free acid should be neutralized with calcium carbonate, and then the filtrate evaporated. 2. Boil bark with milk of lime to remove tannin, evaporate filtrate to soft extract, digest this with alcohol, from which salicin will crystallize after distilling off the alcohol. It is in colorless, silky, shining, needles or prisms, white, crystalline powder, odorless, very bitter taste, soluble in water (23.5), hot water (3.3), alcohol (88.5), hot alcohol (30), insoluble in chloroform, ether; aqueous solution (1 in 30) neutral, levorotatory, melts at 200° C. (392° F.). *Tests:* 1. Heat small portion in test-tube until brown, add distilled water (few cc.), + a drop of ferric chloride T. S.—violet color. 2. With sulphuric acid—red color, disappearing on adding distilled water; incinerate—ash .05 p. c.

3. Heat gently .1 Gm. with potassium dichromate .2 Gm. + diluted sulphuric acid 2 cc.—fragrant odor of salicylic aldehyde. 4. Aqueous solution (1 in 50) 10 cc., + 1 cc. tannic acid T. S., picric acid T. S., or mercuric potassium iodide T. S.—no precipitate (abs. of alkaloids; another 10 cc., + a drop of ferric chloride T. S.—not violet (abs. of salicylic acid). *Impurities*: Heavy metals, alkaloids, salicylic acid. Should be kept in well-closed containers. Dose, gr. 10-30 (.6-2 Gm.).

Commercial.—The *White Willow* (*Salix al'ba*) and *Crack Willow* (*S. frag'ilis*) contain most tannin, the *Purple Willow* (*S. purpu'rea*) most salicin, it being even in the leaves, although largest quantity in bark of young wood. *Populus al'ba*, *P. angustifo'lia*, *P. acumina'ta*, *P. trem'ula*, all yield salicin to a considerable extent.

PREPARATIONS.—(Unoff.): May give in powder, pill, syrup, water, or with glycyrrhiza extract, in small and frequent doses.

PROPERTIES.—Tonic, antiperiodic, antipyretic, antiseptic, antiferment, non-toxic; slower, weaker, less depressing to heart than salicylic acid, like it—circulates in the blood as sodium salicylate; converted in stomach into glucose and saligenin, eliminated by urine as saligenin, salicylic, salicyluric, salicylous acids.

USES.—Acute rheumatism, fevers; relieves pain, arterial swellings, intermittents (inferior to quinine), coryza, hay fever, influenza, neuralgia, diabetes. Externally—gangrenous wounds, eczema, cancer, burns, fetid perspiration—applied in solution with borax.

Allied Plants:

1. *Populus ni'gra*, *P. can'dicans*, or *P. balsamif'era*, *Populi Gemmæ*, *Balsam Poplar Buds*, *Balm of Gilead Buds*, *N. F.* The air dried, closed, winter leaf-buds with not more than 10 p. c. of flower buds, yielding not more than 1 p. c. of acid-insoluble ash; United States, Canada. Large tree. Buds conical, pointed, up to 2 Cm. ($\frac{4}{5}$ ') long, 2-5 Mm. ($\frac{1}{12}$ - $\frac{1}{5}$ ') thick, consisting of closely imbricated scales, brown, glossy, glutinous with fragrant resin; internally with abundant oleoresin and salicin crystals; odor pleasant, balsamic; taste aromatic, bitter; contains volatile oil, resin. Stimulating expectorant, antinephritic, anti-rheumatic, tonic; bronchitis, nephritis, catarrh, rheumatism; ulcers—ointment. Dose, gr. 15-30 (1-2 Gm.); 1. *Syrupus Pini Albæ Compositus*, 1 p. c.: Prep.: 1. *Syrupus Pini Albæ Compositus cum Morphina*.

2. *Myri'ca cerif'era*, or *M. carolinen'sis*, *Myrica*, *Bayberry Bark*, *Wax Myrtle Bark*, *N. F.*—Myricaceæ. The dried bark of the root with not more than 5 p. c. of adhering wood or other foreign organic matter; S. United States; dry woods, fields. Dense evergreen shrub, 1.5-3 M. (4.5-9°) high, grayish; leaves oblong, entire, fragrant, dark green; flowers, staminate—yellow catkins, pistillate—greenish aments; fruit, bluish-white drupes, waxy. Bark (root) in transversely

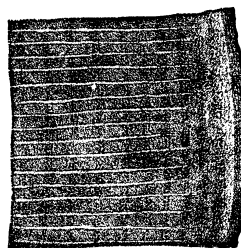


FIG. 82. — Willow bark: transverse section, magnified 15 diam.

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curved pieces, strips, quills, varying length, up to 20 Mm. ($\frac{1}{3}$ ') broad, 1-2.5 Mm. ($\frac{1}{25}$ — $\frac{1}{10}$ ') thick, rarely 5 Mm. ($\frac{1}{5}$ '—aërial stem), grayish, brownish, scaly, occasional warts, lenticels, inner surface brownish, striated; fracture short, weak, uneven; odor characteristic; taste astringent, bitter, acrid. Powder, reddish-brown—numerous starch grains, calcium oxalate crystals, lignified fibers, stone cells, gummy lignin, few tracheæ; contains resins, myricinic acid, tannin, red coloring, fat, gum, starch. Alterative, cholagogue, diuretic, sialagogue, astringent, tonic; diarrhea, scrofula, jaundice. Dose, gr. 5-30 (.3-2 Gm.); 1. *Pulvis Myricæ Compositus*, *Composition Powder*, 60 p. c. + ginger 30, capsicum 5, clove 5—stimulant, carminative. Dose, gr. 10-20 (.6-1.3 Gm.). *Extract*, gr. 5 (.3 Gm.).



FIG. 83.—*Juglans*: flowering branch; cross-section of fruit.

3. *Ju'glans cine'rea*, *Juglans*, *Butternut Bark*, *N.F.*—Juglandaceæ. The dried inner bark of the root, with not more than 2 p. c. of adhering wood or other foreign organic matter; United States, Canada. Handsome spreading tree, 9-15 M. (30-50°) high, light gray bark, durable brown wood; leaves imparipinnate; flowers—staminate and pistillate; fruit large, oblong drupe, 6 Cm. ($2\frac{2}{5}$ ') long, hairy, viscid, green then brown; seed thick, oily, edible. Root-bark (liber) in quills, curved strips, chips, 3-10 Mm. ($\frac{1}{8}$ — $\frac{2}{5}$ ') thick, deep brown throughout, outer surface smooth, warty, inner surface smooth, striate; fracture short, weak; odor faintly aromatic; taste bitter, astringent, acrid. Powder, dark brown—calcium oxalate rosette crystals, starch grains, stone cells, sometimes with reddish content, crystal-fibers, tannin, oily drops;

contains juglandic acid (juglone, nucin—oxynaphtoquinone), fixed oil 14 p. c., volatile oil, resin, tannin, ash 8 p. c. Cathartic (resembling rhubarb), mild hepatic stimulant; malaria, chronic constipation, dysentery. Dose, \mathfrak{z} j-2 (4-8 Gm.); 1. *Fluidextractum Juglandis* (1st menstruum: glycerin 10, alcohol 50, water 40; 2d diluted alcohol): Prep.: 1. *Elixir Cascaræ Sagradæ Compositum*, 6.5 p. c. Juglandin ("Eclectic" resinoid), gr. 3-10 (.2-.6 Gm.).

J. re'gia, *English Walnut*.—Persia, Himalayas, China, cultivated, Europe. Decoction of leaves used in leucorrhea, meningitis; decoction of leaves, rind, or bark in checking mammary secretion, ulcers, diarrhea, sore mouth, tonsils, uterine hemorrhages, carbuncles. *J. ni'gra*, *Black Walnut*.—Bark styptic, acrid; used mostly in dyeing. The rind of green fruit removes ringworms, tetter, diphtheria. Decoction used as a vermifuge; spirit made by distilling fresh walnuts with alcohol; used in hysteric, cerebral, and pregnant vomiting. All of these fruits contain much fixed oil, which turns red with nitric acid, but brown with nitric and sulphuric acids.

4. *Bet'ula al'ba*, *White Birch*.—Betulaceæ; *Oleum Betulæ Empyreumaticum Rectificatum*, *Rectified Oil of Birch Tar*, *N.F.* The pyroligneous oil obtained by dry distillation of the bark and wood, rectified by steam distillation; Europe, Asia, N. America. Large handsome tree. Oil is a limpid, dark brown liquid; odor penetrating, empyreumatic—resembling Russia leather; soluble in ether, chloroform, glacial acetic acid, amyl alcohol, oil of turpentine, benzene, carbon disulphide, dehydrated alcohol (3); mixed with alcohol (3) or purified petroleum benzene (3)—slight turbidity, but with methyl alcohol—decided turbidity, sp. gr. 0.918; aqueous filtrate 4 cc., + a drop of dilute ferric chloride solution (1 in 100)—green coloration, then brown, turbid (dist. from oil of cade); contains guaiacol, creosol, cresol, xylecrol, phenol. Antiseptic, counter-irritant; sore and stiffened muscles, joints; 1. *Unquentum Resorcinolis Compositum*, 6 p. c. *B. len'ta*, *Sweet Birch*—is one of the sources (bark) of U.S.P. Methyl Salicylate, see page 460; *B. papyrif'era*, *Paper (Canoe) Birch*, *White Birch*; Canada, New York, has cordate leaves, tough white bark which separates into papery layers, and was used by the Indians in making canoes.

14. FAGACEÆ (CUPULIFERÆ). Beech Family.

Fa-ga'se-e. L. *Fag-us* + aceæ, fr. Gr. φαγεῖν, to eat, φαγός, the beech—*i. e.*, in allusion to the esculent nuts once used as food. Trees, shrubs. Distinguished by alternate irregular leaves; fruit in a bur or cupule—pistillate involucre; flowers monœcious, staminate, aments, stamens 5–20, pistillate, spikes 1–3, or scaly catkins, involucre; petals none; ovary inferior, 2–6-celled, ovules 1–2 in each cell; fruit 1-seeded nut; temperate climates, tropics; astringent, seeds edible, valuable timber.

Genus: 1. **Quercus**.

GALLA. NUTGALL, *U.S.P.*

Quercus infectoria, *Olivier*, } The gall from the young twigs.
and other allied species.

Habitat. Mediterranean Basin, eastward; Greece, Persia, Asia Minor, Syria.

Syn. Gall, Aleppo Galls, Smyrna Galls, Turkey or Mecca Galls, Galls, Oak Warts, Mad-, Oak-, or Dead Sea-Apple, Apple of Sodom, Dyers' Oak, Galla Halepense-, Turcica-, Levantica-, Tinctoria-, Quercina; Fr. Galle d'Alep—de Chêne, Noix de Galle; Ger. Gallæ, Galläpfel, Gallen.

Quer'cus. L. oak, fr. Celtic *quer*, fine + *cuez*, a tree—fine, stately tree; or fr. Gr. χοῖρος, a pig—*i. e.*, pigs love and feed on the acorns.

In-fec-to'ri-a. L. *infectorius*, dyeing, staining; *in*, in + *facere*, to do, make, taint—*i. e.*, species easily infected or stung, thereby yielding dyeing product.

Gal'la. L. for *gall*, fr. Eng. *gallen*, galled = chafed, as a horse, or from its gallish taste.

PLANT.—Polymorphous shrub, 1.3–2 M. (4–6°) high; leaves obovate, shallow rounded lobed, 5–7.5 Cm. (2–3') long; flowers May, catkins;

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fruit Sept., acorn, 2.5–4 Cm. ($1-1\frac{3}{5}'$) long. NUTGALL (excrecence) nearly globular, .8–2.5 Cm. ($\frac{2}{5}-1'$) broad, heavy, mostly sinking in water, olive-green, dark grayish, tuberculated above; basal portion smooth, contracted to short stalk; fracture short, horny; internally grayish, dark brown, with a central radiate portion, occasionally a central cavity connected by narrow radial canal to exterior, odor slight taste strongly and persistently astringent. POWDER, brownish-yellow—starch grains up to .03 Mm. ($\frac{1}{800}$), few stone cells with narrow cavities and branched pore-canals; occasionally reticulate tracheæ, tannin masses, calcium oxalate prisms and rosettes. *Solvents*: alcohol; water. Dose, gr. 5–30 (.3–2 Gm.).

Commercial.—Plant differs from *Q. alba*, *N.F.*, in seldom being tree-like, in having less indented leaves, larger acorns, and dissimilar cupules. The leaf-buds and tender bark of shoots are stung (punctured) easily by the horny ovipositors of the female hymenopterous insects (*Cynips tinctoria*) which deposit one or more eggs in such galled places (wounds), and thereby establishes morbid growth that quickly leads



FIG. 84.—Galla: *a*, entire; *b*, vertical section.

to the formation of a small tumor of hypertrophied tissue enclosing the egg; upon the gall reaching full development the egg hatches into a larva or grub that at once begins feeding on juices of the central cavity, which, never larger than the larva, soon becomes lined with a wall of hard cells that gradually extend to the periphery, causing the gall to harden. The grub when grown passes into the pupa (chrysalis) stage, thence into a 4-winged fly, 6 Mm. ($\frac{1}{4}'$) long, that must either die or cut itself out with its mandibles, thus making a small round opening midway the gall; should this not be accomplished the insect remains will be revealed upon cracking open the unpunctured gall. Color is the guide to quality—the whitish, light, and spongy being rejected. There are several varieties: 1, *Aleppo* (*Syrian*), best, bluish, usually collected before the fly escapes; 2, *Smyrna*, grayish-olive, intermixed with white galls (least valuable, generally with large perforation); 3, *Sorian*, blackish, size of a pea; all three varieties exported from Trebizond, Smyrna, Bassora, Calcutta, Bombay; 4, *European*, light-color, more spongy, produced by a different cynips; much tannin; 5, *American*: (*a*) *Q. alba*, light, spongy; little tannin; (*b*) *Q. virginiana* (*virens*), Texas—

resembles Aleppo but not tuberculated; tannin 40 p. c.; (c) *Q. lobata*, California, 5 Cm. (2') broad, orange-brown, glossy, soft, spongy interior; much tannin.

CONSTITUENTS.—Tannin 50–60 p. c. (white galls 20–30 p. c.), Gallic acid 2–3 p. c., mucilage, sugar, fat, resin; in the nucleus starch.

Acidum Tannicum. Tannic Acid, $\text{HC}_{14}\text{H}_9\text{O}_6$, *U.S.P.*—(Syn., Acid. Tan., Gallo-tannic Acid, Tannin, Digallic Acid; Fr. Tannin officinal, Acide tannique; Ger. Gerbsäure.) Obtained by exhausting powdered nutgall with warm water, cooling, agitating the filtrate with one-fourth volume of ether; the emulsion separates in 10 days, yielding an upper ethereal layer (coloring matter, fat, resin, gallic and ellagic acids), which is discarded, and a lower aqueous fluid, containing tannin, which under reduced pressure, is concentrated in a still to syrupy consistence, cooled, and spread on thin glass plates to dry—these being placed on a steam table and covered over to produce puffy, spongy character. It is a yellowish-white, light brown amorphous powder, glistening scales, spongy masses, darker on exposure to air and light, odorless, faint characteristic odor; strongly astringent taste, acid reaction; soluble in water, acetone, alcohol, diluted alcohol, slightly in dehydrated alcohol, glycerin (1) heated, almost insoluble in ether, chloroform, benzene, petroleum benzin; owing to weak combination with variable proportions of glucose once considered a glucoside. *Tests:* 1. Aqueous solution + ferric chloride T. S.—bluish-black color or precipitate. 2. Aqueous solution precipitates nearly all alkaloids, glucosides, solutions of gelatin, albumin, starch (dist. from gallic acid). 3. On drying—loses 12 p. c.; incinerate—ash .5 p. c. *Impurities:* Gum, dextrin, resinous substances. *Incompatibles:* Alkalies, alkaloids, emulsions, gelatin, ferric salts, mineral acids, salts of antimony, lead and silver. Should be kept cool, dark, in well-closed containers. Dose, gr. 1–20 (.06–1.3 Gm.).

Acidum Gallicum. Gallic Acid, $\text{HC}_7\text{H}_5\text{O}_5 \cdot \text{H}_2\text{O}$.—This organic acid is prepared usually from tannic acid by boiling 15 minutes 1 part (or 2 parts nutgall) with sulphuric acid (1) and water (5); strain while hot, set aside for crystallization; a once popular method consisted in exposing to the air a mixture of nutgall and distilled water in a thin paste for a month, adding water occasionally to keep semi-fluid, expressing, rejecting liquid, boiling residue with distilled water, filtering hot through animal charcoal, setting aside to crystallize. It is in white, pale fawn-colored, silky, interlaced needles or triclinic prisms; odorless; astringent, slightly acidulous taste; permanent, soluble in water (87), boiling water (3), alcohol (4.6), glycerin (10), ether (100), almost insoluble in chloroform; on drying loses 12 p. c.; saturated aqueous solution—acid; incinerate—ash .1 p. c. *Tests:* 1. Neutralize saturated aqueous solution with few drops of sodium hydroxide T. S.—gradually a deep green, changing to reddish by acids. 2. With ferrous solutions—neither colors nor precipitates; with ferric solutions—bluish-black precipitate. 3. Cold, saturated aqueous solution with

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alkaloids, glucosides, albumin, gelatin T. S., starch T. S.—no precipitate (abs. of tannic acid). It is the hydride of tannic acid, the latter being the anhydride of gallic acid, a relationship and convertibility shown by the equations: (1) $2\text{HC}_7\text{H}_5\text{O}_5 - \text{H}_2\text{O} = \text{HC}_{14}\text{H}_9\text{O}_9$. (2) $\text{HC}_{14}\text{H}_9\text{O}_9 + \text{H}_2\text{O} = 2\text{HC}_7\text{H}_5\text{O}_5$. *Impurities*: Tannic acid, etc. *Incompatibles*: Ferric and other heavy metallic salts, spirit of ethyl nitrite. Dose, gr. 5–20 (.3–1.3 Gm.).

PREPARATIONS.—1. NUTGALL. 1. *Unguentum Gallæ*. Nutgall Ointment. (Syn., Ung. Gall., Ointment of Galls; Fr. Pommade de Noix de Galle; Ger. Gällapfelsalbe.)

Manufacture: 20 p. c. Rub nutgall 20 Gm. with ointment 80 Gm., gradually added, until thoroughly mixed, avoiding iron utensils; externally.

2. *Tinctura Gallæ, N.F.*, 20 p. c. (alcohol 9 + glycerin 1. Dose, 5ss–2 (2–8 cc.).

Unoff. Preps.: *Fluidextract*, m̄v–30 (.3–2 cc.). *Infusion*, 5 p. c., 3j–2 (30–60 cc.). *Unguentum Gallæ cum Opio* (Br., nutgall 18 p. c., + opium 7.5 p. c.).

II. TANNIC ACID.—1. *Glyceritum Acidi Tannici*. Glycerite of Tannic Acid. (Syn., Glycer. Acid. Tan., Glycerite of Tannin; Fr. Glycéré de Tannin, Glycérine tannique; Ger. Tanninglycerit (glycerol).)

Manufacture: 20 p. c. Weigh glycerin 79 Gm. into tared, wide-mouthed bottle, suspend tannic acid 20, + sodium citrate 1, in gauze bag, in the glycerin; heat in water-bath until dissolved, stirring mixture occasionally. Dose, m̄x–30 (.6–2 cc.); externally.

2. *Trochisci Acidi Tannici*. Troches of Tannic Acid. (Syn., Troch. Acid. Tan.; Fr. Tablettes (Pastilles) de Tannin; Ger. Tanninpastillen.)

Manufacture: Rub together until thoroughly mixed tannic acid 6 Gm., sucrose 65, tragacanth 2, form mass with orange flower water q. s., divide into 100 troches. Dose, 1–3 troches.

3. *Unguentum Acidi Tannici*. Ointment of Tannic Acid. (Syn., Ung. Acid. Tan.; Fr. Pommade de Tannin; Ger. Tanninsalbe.)

Manufacture: 20 p. c. Dissolve tannic acid 20 Gm. in glycerin 20 Gm., with gentle heat, mix solution thoroughly with ointment 60 Gm., avoiding iron utensils.

4. *Collodium Stypticum, N.F.*, 16 p. c., + flexible collodion q. s. 100.

5. *Syrupus Iodotannicus, N.F.*, .54 p. c., + iodine .27 p. c.

Unoff. Prep.: *Suppositoria Acidi Tannici* (Br., each 3 gr. (.2 Gm.)).

III. GALLIC ACID.—1. *Pyrogallol*. *Pyrogallol*, $\text{C}_6\text{H}_3(\text{OH})_3$, *U.S.P.* (Syn., Pyrogall., Pyrogallic Acid, Acidum Pyrogallicum; Fr. Acide pyrogallique; Ger. Pyrogallolum, Pyrogallussäure.) This trihydroxybenzene (triatomic phenol) is obtained by heating gallic acid for half an hour under pressure with water (3), boiling with animal charcoal, filtering, evaporating— $\text{HC}_7\text{H}_5\text{O}_5 + \text{heat} = \text{C}_6\text{H}_3(\text{OH})_3 + \text{CO}_2$; yield 75 p. c. It is in light, white, nearly white leaflets, fine needles, odorless, bitter taste, acquiring grayish tint on exposure, soluble in water (1.7), alcohol

(1.3), ether (1.6), melts at 131° C. (268° F.). *Tests:* 1. Aqueous solution (1 in 10) reduces solutions of silver, gold and mercury salts, even in the cold; incinerate—ash .1 p. c. 2. Aqueous solution (1 in 20) neutral, slightly acid, colorless, yellowish, brown on exposure from absorbing oxygen; with a few drops of ferric chloride T. S.—brownish-red; with fresh ferrous sulphate T. S.—blue color. Should be kept dark, in well-closed containers.

PROPERTIES.—1. **NUTGALL:** Astringent, tonic; constricts muscular tissue, thus checking secretions, hemorrhages, local inflammations, etc.

II. TANNIC ACID: Local astringent. Internally—contracts blood-vessels, restrains peristalsis (constipates), coagulates mucous secretions, prevents secretion of gastric and intestinal juices, precipitates pepsin, etc.; it is converted into gallic acid in the intestines, and until this change is effected it cannot become absorbed to act as a remote or systemic astringent, simply being able to control locally gastric and intestinal bleeding. Externally—astrigent, coagulates blood (forming a clot), albumin, and gelatin (tans tissues), is hemostatic, antiseptic, depressant, irritant; the salts have no astringency.

III. GALLIC ACID: Mild astringent, does not coagulate blood, hence recognized only as remote astringent, but not to raw and bleeding surfaces; internally—controls systemic hemorrhages (contracts blood-vessels), decreases secretion of urine and sweat; does not constipate like tannic acid, and is eliminated by the kidneys unchanged.

IV. PYROGALLOL: Violent irritant, depressing poison (large quantities); causes vomiting, purging, abdominal pain, quick pulse, low temperature, cyanosis (lips), convulsions, coma, death; urine dark (albumin, methemoglobin), blood chocolate colored, red corpuscles disorganized, liver changed as by phosphorus.

USES.—I. **NUTGALL:** Chronic diarrhea, dysentery, gleet, leucorrhea, antidote to tartar emetic and alkaloids (emetine, morphine, colchicine, strychnine, etc.), constricts the stomach, thus delaying absorption, forming of the alkaloids insoluble tannates. In cases of poisoning give infusion freely. Locally infusion as gargle for relaxed mucous membrane of mouth, throat, vagina, rectum: ointment with 5-10 p. c. opium, good in hemorrhoids after inflammatory stage. Chiefly used for obtaining tannic and gallic acids, for ink, dyeing, tanning.

II. TANNIC ACID: Hemorrhages (epistaxis, uterine, etc.), diarrhea, dyspepsia, cholera, relaxed uvula, coryza, inflamed fauces, diphtheria, toothache, aphtha, excessive salivation, leucorrhea, chapped nipples, gleet, gonorrhea, ulcers, piles, chilblains, chronic bronchitis, whooping-cough, phthisis, influenza, ozena, fissures, hemorrhoids, prolapsus ani and uteri, vesical catarrh, hemorrhage after extracting teeth, spongy gums (contracts vessels, checks absorption, hence loosening of teeth), obtunds sensitive dentine, either alone or combined with morphine and creosote, to toughen mucous membranes, skin around nipples, conjunctivitis, erectile tumors, ingrowing toe-nails; aqueous solutions (1 to 50)

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may be injected into urethra and bladder, but should never be used hypodermically.

III. GALLIC ACID: Menorrhagia, purpura, epistaxis, hemoptysis, hematemesis, hemorrhage of stomach, intestines, lungs, kidneys, night-sweats, polyuria, Bright's disease, dyspepsia, bronchitis, hemorrhoids, chronic ulcers, pyrosis, alopecia.

IV. PYROGALLOL: Psoriasis, syphilitic ulcers, lupus, epithelioma, parasiticide for ringworm. Should not be applied over extensive surface, as absorption may poison; not used internally; ointment 1-5-10 p. c.

Allied Products:

1. *Chinese Nutgalls* (*Rhus semialata*) by sting of *A'phis s(ch)inen'sis*.—Galls 4-5 Cm. ($1\frac{3}{8}$ -2') long, ovate, irregular, tuberculate, grayish-downy, hollow; shell thin, fragile, containing many insect-remains.

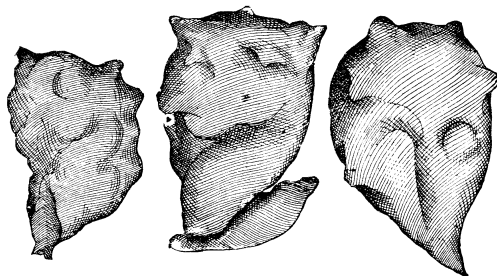


FIG. 85.—Chinese nutgalls.

2. *Japanese Nutgalls* (*R. semialata* or *R. japonica*) resemble Chinese.—The tannic acid of these differs from that of official galls.

3. *Vallonea*, *Acorn Cups* of many *Quercus* species (*Q. Robur*, *Q. Vallo'nea*, *Q. Ægilops*), 2.5 Cm. (1') in diameter, with thick, spreading scales, strongly astringent taste, largely used in tanning.

4. *Tamarisk Galls* (*Tam'arix articula'ta (orienta'lis)*, *T. africa'na*, *T. gal'lica*).—Asia, Africa, 3-12 Mm. ($\frac{1}{8}$ - $\frac{1}{2}$ ') thick, subglobular, knotty, contain tannin 40-50 p. c.

5. *American Nutgalls* (*Q. alba*, *Q. virginiana (virens)*, *Q. lobata*), first poor in tannin; second (Texas) like Aleppo, but not tuberculate, tannin 40 p. c.; third (California), 5 Cm. (2') thick, glossy, orange-brown, rich in tannin.

Allied Plants:

1. *Quercus al'ba*, *Quercus*, *White (Tanner's) Oak Bark*, N.F.—The dried inner bark of the trunk and branches with not more than 2 p. c. of outer bark or wood or other foreign organic matter; N. America. Stately tree 18-25 M. (60-80°) high, 1-2.5 M. (3-8°) thick, branched; leaves large, 4-6-lobed, petiolate, smooth, light green, glaucous with prominent veins beneath, brownish when dry; flowers monœcious—

staminate, catkins; pistillate, followed by 1-seeded ovoid fruit (nut, acorn), base in cupule. Bark, flat pieces, 2–10 Mm. ($\frac{1}{12}$ – $\frac{2}{5}$ ') thick, light brown, rough-fibrous, fracture uneven, coarsely fibrous; odor distinct; taste strongly astringent; does not tinge saliva yellow when



FIG. 86.—*Quercus alba*: a, staminate catkins; b, magnified staminate flower; c, pistillate flower with stigmas magnified; d, acorn in embryo; e, section of young acorn; f, cotyledon with radicle.

chewed; solvents: alcohol, water; contains tannin 6–11 p. c., oak-red, quercin, resin, fat, quercite. Astringent, tonic, hemostatic, similar to tannin; diarrhea, dysentery, cholera infantum, hemoptysis, hemorrhages, leucorrhea, gonorrhea, intermittents, phthisis, relaxed parts, ulcers; gargle — prolapsed uvula, etc.; poultice—gangrene, etc.; powder—tooth powders and washes; tanning leather; wood durable, valuable. Dose, gr. 15–60 (1–4 Gm.); decoction, 5 p. c., 3 ss–1 (15–30 cc.); extract, gr. 2–10 (.13–.6 Gm.); fluidextract (alcohol 50, water 40, glycerin 10), ʒxv–60 (1–4 cc.).

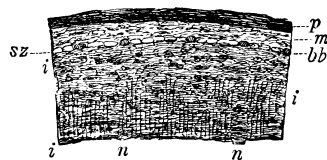


FIG. 87.—*Quercus alba*: bark, cross-section, magnified 10 diam.; p, cork; m, outer bark; i, inner bark; sz, group of stone cells; bb, bast-fiber; n, longitudinal fiber.

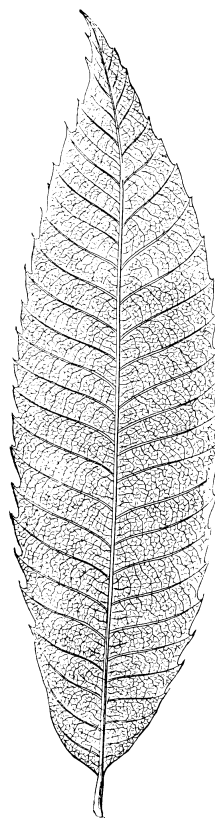
2. *Q. veluti'na* (*coccin'ea* var. *tincto'ria*), *Black (Scarlet) Oak* (*Quercitron*).—The (inner) bark, U.S.P. 1820–1870. Trees 24–30 M. (80–100°) high, 1–1.2 M. (3–4°) thick, leaves oblong, lobed, 15–20 Cm. (6–8') long, mucronate; fruit, acorns, 12–18 Mm. ($\frac{1}{2}$ – $\frac{3}{4}$ ') long, 12 Mm. ($\frac{1}{2}$ ') thick, cupule thick, shallow; bark resembles the preced-

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ing, only reddish-brown, gives saliva brownish-yellow color; contains tannin 6-12 p. c., quercitrin (red-brown coloring matter, dyeing yellow wool, silks, etc.), $C_{36}H_{38}O_{20}$, with diluted acids yields isodulcitol, $C_6H_{14}O_6$, and yellow quercetin, $C_{24}H_{16}O_{11}$. In the South barks of *Q. nigra* and *Q. digitata* (*falcata*), used for this, although these have a much coarser texture and a deep reddish-brown color.

3. *Q. Ro'bur*, *Common European or English Oak*.—Tall tree, 24-30 M. (80-100°) high, having 3 forms: (a) *Q. pubes'cens* (old leaves hairy); (b) *Q. peduncula'ta* (leaves smooth, pistillate flowers, and fruit on peduncles; (c) *Q. sessiliflo'ra* (leaves smooth, flowers and fruit sessile, petioles long). These have many varieties, all resembling *Q. alba*.

4. *Q. digita'ta* (*falca'ta*, L. *falcatus*—*i. e.*, leaf-lobes scythe-shaped), *Spanish or Red Spanish Oak*.—Maryland-Florida. Tree 18-21 M. (60-70°) high, leaves grayish, 3-5-lobed, finger- or scythe-shaped. Bark rich in tannin, wood reddish, coarse-grained; used in tanning, sometimes called quercitron.

FIG. 88.—*Castanea dentata*.FIG. 89.—*Castanea*: leaf, one-half natural size.

5. *Q. marylan'dica* (*ni'gra*, *ferrugin'ea*), *Black, Barren, or Iron Oak* (*Black Jack*).—Southern States. Tree 9-12 M. (30-40°) high, leaves cuneate, 3-5-lobed, rusty, pubescent beneath, shining above. Of little value.

6. *Q. virginia'na* (*vi'rens*, L. *vireo*, green, fresh, flourishing), *Live Oak*.—Maryland-Florida. Tree 12-18 M. (40-60°) high. Bark rich in tannin, wood fine-grained; used in shipbuilding.

7. *Q. su'ber*, *Cork Oak*, *Alcornoque* (*Savanna Bark*).—Mediterranean Basin, S. United States. Small tree, 9–15 M. (30–50°) high, leaves toothed, ovate; bark with an elastic suberous layer 2.5–5 Cm. (1–2') thick, collected every 8–10 years, and constitutes our cork of commerce. When finely powdered, sold as suberin for absorbent purposes, which name is applied to one of its constituents (fat). There are about 80 species of *Quercus*, ranging from shrubs to trees; one-half of these grow in the United States, and may, with their acorns, be used similarly. Acorns sometimes are roasted = *semen quercus tostum*, and used as a substitute for coffee; contain fixed oil, starch, citric acid, uncrystallized and quercite sugars.

8. *Castanea denta'ta*, *Castanea*, *Chestnut Leaves*, *N. F.*—The dried leaves with not more than 5 p. c. of stems or other foreign organic matter; N. America, W. Asia, S. Europe. Stately tree, 24–30 M. (80–100°) high; wood light, durable; flowers in 3's, monœcious—staminate and pistillate, involucre 4-lobed, becoming prickly; fruit, 4-valved involucre enclosing 1–3 1-seeded nuts. Leaves entire, slightly broken, folded or matted together, 15–25 Cm. (6–10') long, 5 Cm. (2') wide, oblong-lanceolate, acuminate, sharply serrate, coriaceous, dark green above, lighter beneath, pinnately veined, petiole stout; odor slight; taste astringent; Powder, greenish—non-glandular hairs, numerous calcium oxalate crystals in rosettes, prisms, parenchyma cells with brown tannin masses which + ammonio-ferric alum T. S.—blue; contains tannin 9 p. c., resin, fat, gum, albumin, ash 6 p. c.; fruit contains starch 35 p. c., fat 2 p. c., proteins 3–4 p. c., sugar 1–2 p. c.; solvents: boiling water, alcohol partially. Tonic, mild sedative, astringent; whooping cough, controlling paroxysms, dysentery; wood resists exposure greatly, nuts a delicacy, thoroughly edible. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Castaneæ* (100 Gm., + boiling water to exhaust, evap. to 200 cc., add alcohol 60 cc., lastly glycerin 10, dose, mxxv–60 (1–4 cc.). *Infusion*.

9. *C. (Fagus) pu'mila*, *Castanea* (*Chinquapin*).—The bark, U. S. P. 1820–1850; Delaware–Mississippi. Shrub or small tree, 6–15 M. (20–50°) high, 25–27.5 Cm. (10–15') thick, largest being South; leaves differ from chestnut in having underside white, downy; bark grayish, brownish inside; fruit rounded, conical, 12 Mm. ($\frac{1}{2}$ ') long, 9 Mm. ($\frac{3}{8}$ ') broad at base, same constituents and taste as chestnuts; bark contains tannin, resin, extractive. Tonic, astringent; intermittents.

10. *Fagus america'na* (*ferrugin'ea*), *American Beech*.—Tree, 22.5–30 M. (75–100°) high; bark and leaves used, the latter oblong-ovate, taper pointed, dentate, petioles and midrib soon (nearly) naked, prickles of fruit recurved or spreading; astringent, tonic.

15. ULMACEÆ. Elm Family.

Ul-ma'se-e. *Ulm-us* + aceæ, fr. Saxon *elm* or *ulm*—*i. e.*, its original name in all Celtic dialects. Trees, shrubs. Distinguished by leaves

ULMACEÆ

alternate, serrate, stipulate; sap not milky; flowers small, 3-9-parted or sepals; petals none, stamens 3-9; ovary 1-celled, superior; fruit 1-seeded, samara, drupe or nut; universal; demulcent, nutritive, astringent, tonic, timber.

Genus: **1. Ulmus.**

ULMUS. ELM, *U.S.P.*

Ulmus fulva, } The dried inner bark.
Michaux.

Habitat. N. America, New England, S. Carolina, west to Louisiana, Nebraska.
Syn. Elm Bark, Slippery Elm, Moose-, Red-, Indian-, Sweet-, Rock or American Elm; British Tea (the leaves), Cortex Ulmi Interior; Fr. Écorce d'Orme (fauve); Ger. Ulmenrinde, Rüsterrinde.

Ulmus. L. see etymology, page 163, of Ulmaceæ.

Ful'va. L. *fulvus*, deep yellow, tawny—*i. e.*, the color of the liber bark.

PLANT.—Large tree, 15-18 M. (50-60°) high, .3-.6 M. (1-2°) thick; bark and wood reddish-brown, branches rough, whitish; leaves large 10-20 Cm. (4-8') long, 5-7.5 Cm. (2-3') broad, oblong, acuminate, unequal at subcordate base, unequally serrate, pubescent; rough on both sides, petiolate, buds covered with dense russet down; flowers April, small, appearing before leaves, sessile, in clusters, calyx downy, corolla wanting; fruit samara, 12-18 Mm. ($\frac{1}{2}$ - $\frac{3}{4}$ ') long, flat, broadly oblong, entire, notched, 1-celled, wing yellow, silky with short fulvous hairs. **BARK**, usually broad, flat, oblong pieces, 1-4 Mm. ($\frac{1}{2}$ - $\frac{1}{6}$ ') thick; outer surface pale brown, roughened by longitudinal striæ and partially detached bundles of bast-fibers, occasionally patches of thin dark brown cork; inner surface light yellowish-brown, finely striate; fracture fibrous, projections of fine bast bundles; odor distinctive; taste mucilaginous. **POWDER**, light brown (fawn)—numerous bast-fibers, calcium oxalate prisms, starch grains, .003-.015 Mm. ($\frac{1}{8}$ - $\frac{1}{16}$ ') broad, numerous mucilage fragments, cork cells few or absent. *Test:* 1. Macerate for 1 hour 1 Gm. in water 40 cc.—light brown mixture of thick mucilaginous consistence. Dose, ʒij-4 (8-15 Gm.).

ADULTERATIONS.—**BARK:** Barks that are more brittle, less fibrous and mucilaginous; **POWDER:** Corn meal, flour, starches.

Commercial: Tree flourishes in open high places, firm dry soil, being distinguished from *U. americana* by character of branches (rougher), leaves, buds, flowers, seed. Bark should be collected in spring, deprived of epidermis, and dried, for which trees are felled in Michigan and other Western States, peeled and wood burnt or allowed to decay.

CONSTITUENTS.—Mucilage, starch and tannin (slight), ash 8-10 p. c.; European bark also contains tannin (considerable) and bitter principle, but no starch.

Mucilage.—Resembles that of flaxseed—precipitated by lead acetate, but alcohol separates from its solution a gelatinous liquid.

PREPARATIONS.—1. *Trochisci Ulmi*, N. F., gr. 3 (.18 Gm.). *Mucilage*, 6 p. c. (if to be free from starch must use cold water); dose, *ad libitum*. *Poultice*. *Uterine tents*.

PROPERTIES.—Demulcent, emollient, nutritive.

USES.—Dysentery, diarrhea, diseases of urinary passages, bronchitis. Externally—finely ground or powdered bark mixed with hot water into pasty mass and used as a poultice for inflammations, boils, etc.; in shape of tents to dilate fistulæ, strictures, os uteri, also in form of vaginal and rectal suppositories.

Allied Plants:

1. *Ulmus campestris*.—Europe. Bark thinner than official, cinnamon color, mucilaginous, bitterish, astringent. *U. effusa*, *Black Elm*, bark very similar; *U. americana*, *White Elm*, New England, chiefly shade tree; *U. alata*, *Wahoo*, S. United States. Bark used in making ropes.

16. MORACEÆ. Mulberry Family.

Mo-ra'se-e. L. *Morus* + aceæ, fr. Celtic *mor*, black—*i. e.*, alluding to the fruit's color. Trees, shrubs, herbs. Distinguished by leaves alternate or opposite, stipulate; sap milky; flowers monœcious or diœcious; calyx 4–5-parted, petals none, staminate paniced, pistillate capitate, cymose; ovary superior, 1-celled, ovule solitary; fruit various; universal; narcotic, sedative, tonic, astringent, fibers.

Genus: 1. **Cannabis**.

CANNABIS. CANNABIS, U.S.P.

Cannabis sativa,
Linne. { The dried flowering tops of pistillate plants with
not more than 10 p. c. fruits, large foliage leaves,
stems over 3 Mm. ($\frac{1}{8}$) thick, nor 2 p. c. other
foreign organic matter, yielding not more than
5 p. c. acid-insoluble ash.

Habitat. Asia, Persia, hills of N. India; cultivated in India, Europe, C. and S. Russia, Brazil, W. and S. United States.

Syn. Cannab., Cannabis Indica, U. S. P. 1900, Guaza, Ganjah, Indian Hemp, Black Indian Hemp, Tristram's Knot, Bangue, Hashish, Halish, Gallow Grass Hemp, Neck or Nick Weed, St. Andrew's-lace, Welsh Parsley, Bang, Bhang, Gunjah Churru, Charas, Ganja (dried flowers); Fr. Chanvre (Indien); Ger. Hanf, Indischer Hanf.

Can'na-bis. L. Gr. *κάνναβις*, hemp, fr. *ganeh*, its Arabic name. Celtic *can*, reed + *ab*, small—*i. e.*, its slender stems.

Sa-ti'va. L. *sativus*, that which is sown or planted—*i. e.*, in the gardens and fields for use.

In'di-ca. L. *Indicus*. Gr. *Ἰνδικός*, pertaining to India—*i. e.*, its habitat.

PLANT.—Annual herb; stem 1–3 M. (3–10°) high, angular, tomentose; leaves palmate-compound; leaflets 5–7 linear-lanceolate, serrate; flowers diœcious, yellow spikes. FLOWERING TOPS, separate, or in

MORACEÆ

more or less agglutinated masses, fragments consisting of short stems with leaf-like bracts, pistillate flowers or somewhat developed fruits, greenish-brown; odor agreeable, heavy, narcotic; taste acrid, pungent. **POWDER**, dark green—leaf epidermis with oval stomata beneath, numerous non-glandular hairs usually with calcium carbonate masses, glandular hairs 2 kinds, yellowish-brown laticiferous vessels, calcium oxalate rosette aggregates, tracheæ and phlœm, embryo and endosperm tissues with numerous oil globules, aleurone grains (crystalloids, globoids); on slide—effervesces with diluted hydrochloric acid; alcoholic solution bright green; alcoholic extractive 8 p. c. Should not be kept longer than 1 year, when it usually is only one-fourth as strong as the fresh, and in 2 years it practically is inert. *Solvent*: alcohol. Dose, gr. 1–5 (.06–.3 Gm.).

Commercial.—Plant was known to the Romans, but not to the Egyptians, and has been cultivated universally many centuries for fiber, seed, and medicine—that for the latter at present being grown mostly



FIG. 90.—*Cannabis sativa*.

in the two districts, Bogra and Rajshahi, north of Calcutta, in rows, the richest in resin at 1,800–2,400 M. (6,000–8,000°) elevation. When mature (indicated by brown color and falling of leaves) the flowering branches are cut off, May–June, cured by wilting, pressing, rolling, and shaking out of leaves and fruits (if any of the latter have developed), and as such is recognized natively by the Hindustani names, *ganja*, *gunjah*; the rolling and treading are performed by human feet, an art demanding training, the object being possibly to work resinous matter from stems into inflorescence tips. There are

two kinds: 1, *Round ganja*, requiring 4 days for kneading each branch into a cylindrical or terete mass; 2, *Flat ganja*, requiring 2 days for working into a flat form; the Bengal (Calcutta) ganja (best) is brownish or dusty, the Bombay bright green. Variability in the drug may be due to the presence of staminate flowers, leaves, fruits, cold weather, inopportune collecting (not later than 4 days after maturing), intentional removal of resin, excessive age (losing most of its properties within a year). Great care is taken to prevent the flowering tops becoming fertilized by suppressing the male plants, as a single one is claimed to spoil an entire field; however, when for fiber or seed both male and female plants are cultivated together. Our plant, often called *Cannabis americana*, having escaped from native country, may possess slight variations owing to colder climate, but under proper cultivation and care may be as active as the India product, in spite of which it is regarded generally as being about one-fourth weaker.

CONSTITUENTS.—Cannabinol, Cannabin 15–20 p. c., choline (bilineurine—trimethylamine), volatile oil (chiefly sesquiterpene—cannabene), $C_{10}H_{16}$, .3 p. c., bitter principle, paraffin, $C_{29}H_{60}$, chlorophyll, gum, sugar, potassium nitrate, ash 5–15 p. c.

Cannabinol, $C_{21}H_{36}O_2$.—This, to which the activity of the drug is due, may be obtained by exhausting cannabis with petroleum benzin, reclaiming latter, evaporating residue to dryness, and subjecting it, under pressure to fractional distillation at 210–240° C. (410–464° F.), when the distillate contains cannabinol and paraffin, the latter being removed with alcohol. It is a poisonous, yellow or brownish syrupy liquid, darkening on exposure to air into inert, brittle, pitchy mass, consequently must be kept, as well as preparations of the drug, in sealed containers; possibly same as Kobert's cannabindon.

Cannabin.—Resin constituent (resinoid), to which formerly was attributed all of the drug's activity, that now known to be due solely to its contained cannabinol; it may be obtained by treating cannabis with water and a solution of sodium carbonate, washing residue with water, drying, exhausting with alcohol, treating tincture with milk of lime, precipitating lime with sulphuric acid, adding animal charcoal to filtrate, filtering, concentrating, and precipitating with water; it is a brown, amorphous resin, burning without ash, soluble in alcohol, ether, from the former being precipitated white by water.

PREPARATIONS.—1. *Extractum Cannabis*. Extract of Cannabis. (Syn., Ext. Cannab., Extract of (Indian) Cannabis (Hemp); Fr. Extrait de Chanvre (Indien); Ger. (Indisch) Hanfextrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol until exhausted, reclaim alcohol, evaporate residue at 70° C. (158° F.), stirring frequently, to pilular consistence, mix thoroughly; after assay add enough storax or substandard extract of cannabis for biological standard; yield 12–14 p. c. Dose, gr. $\frac{1}{8}$ –1 (.01–.06 Gm.): Prep.: 1. *Mistura Chloralis et Potassii Bromidi Composita*, N.F., $\frac{1}{5}$ p. c.

2. *Fluidextractum Cannabis*. Fluidextract of Cannabis. (Syn., Fldext. Cannab., Fluid Extract of Cannabis; Fr. Extrait fluide de Chanvre (Indien); Ger. (Indisch) Hanffluidextrakt.)

Manufacture: Similar to Fluidextractum Colchici, page 111; menstruum: alcohol; after dissolving soft extract in the reserve, assay and adjust finished volume to its biological standard—amount producing incoördination in a dog; .1 cc. for every 2 pounds (1 Kg.) of body weight. Dose, mij–5 (.13–.3 cc.): Preps.: 1. *Collodium Salicylicum Compositum*, N.F., 10 p. c. 2. *Mistura Chloroformi et Morphinæ Composita*, N.F., 1.85 p. c.

Unoff. Prep.: *Tincture*, 10 p. c. (alcohol), mv–30 (.3–2 cc.).

These preparations give varying results, but usually their value can be recognized by the color of the precipitate formed when added to water; if olive-green, it is active; if yellowish-brown, it is inert; thus, whatever there is that destroys chlorophyll injures the active principle.

MORACEÆ

PROPERTIES.—Anodyne, nervine, sudorific, narcotic, aphrodisiac, increases appetite. It excels even belladonna in perverting perception, condition, and relation of objects; some subjects become pugnacious, others have delightful intoxicating dreams, in which time, distance, and sound are magnified—a few minutes' dream extends over weeks, near objects as in infinite space, whispering as cannonading. Large habitual doses bloat the face, inject eyes, make limbs tremulous, weak, mind imbecilic, death by marasmus.

USES.—Neuralgia, distressing cough, quiets tickling in throat, does not constipate or depress like opium; gout, delirium tremens, tetanus convulsions, chorea, hysteria, mental depression, epilepsy, morphine and chloral habits, softening of the brain, nervous vomiting.

Poisoning: Have pleasurable intoxication, double consciousness followed by drowsiness, unconsciousness, collapse, insensibility, dilated pupils, rapid pulse, slow respiration, debility, pale, clammy, insensitive skin, catalepsy, excited passion; effects usually last 24 hours, and closely resemble those of opium, differing, however, in not constipating and in not lessening secretions; increases appetite. Give emetics, lemon juice to neutralize its effects, tannin, coffee, ammonia, strychnine, atropine, electricity, spirit of nitrous ether, artificial respiration; similar to chloral hydrate and opium.

Incompatibles: Strychnine, caustic alkalies, acids.

Synergists: Alcohol, ether, bromides, cocaine, narcotics.

Allied Native Products:

These are mostly used for smoking, beverages, or electuaries, etc.

1. *Bhang* (*Sidhee, Subjee, Siddhi*).—Consists of the dried coarsely broken leaves and fruit (dark green), resembles *ganja* in odor and taste; used by natives in their sweet-meat (*majoon*), also smoked with or without tobacco; its cold infusion (tea) as an intoxicant.

2. *Churru, Churras, Charas*.—This is the resin (practically the active constituent) which exudes spontaneously from the entire plant in minute drops. It is collected in several different ways: 1. By men, wearing leather suits, brushing forcibly against growing plants, whereby resin adheres and afterward is scraped off. 2. By rubbing green portions between the hands and then scraping off adhering resin. 3. By frequent stirring around that put away in barns to cure, thus causing the resin to rise in the form of dust, and to deposit upon the roof and sides of the building, from which it can afterward be collected. Owing to this being more or less impure it is not used in medicine, but solely smoked in pipes; contains usually cannabinol 33 p. c.

3. *Hashish* (*Hasish, Haschisch, Hasash, Hasheesh*—*Majoon*.—The Arabic name for hemp, signifying "green intoxicating liquor" fr. Heb. *shesh*, to be joyous. This may consist of the dried tops collected before seed ripen, thereby resembling *ganja, gunjah*, but usually is more complex, being prepared by heating tender leaves and tops 4 parts, butter 3, water 4, until latter is dissipated, straining, washing twice the greenish extract with water, adding this to syrup (sugar 16, water 32, little

milk, boil), heating, mystifying by incorporating stramonium or nuxvomica; in Bengal a small amount of rose oil, musk, cardamom seed, cantharides, or opium (to which mostly is due the deliriums, manias, dreams, sensualism), boiling half an hour, allowing to solidify, cutting into cakes; the Russians prefer it formed into cakes with the resinous extract.

4. *Hemp Seed (Cannabis Semen)*.—These are achenes 3 Mm. ($\frac{1}{8}$ ') long, roundish, smooth, greenish, taste sweet, oily. Used for birds chiefly, but, owing to the fixed oil, an emulsion becomes a valuable demulcent and anodyne; contain protein 22–24 p. c., fixed oil 28–36 p. c., suitable for painting, varnishing, etc.

5. *Hemp Oil*.—A greenish fixed oil, lighter and brownish on exposure; odor hemp-like, taste mild. Demulcent, protective; chiefly extracted for its possible use in the domestic arts; neither this nor seed possess narcotic properties.

6. *Hemp Fiber*.—Used for cordage, sacking, sail cloths, clothing, etc. The colder climates produce the best fibers, and the tropics that which is most medicinal and intoxicating. Russia produces most of the hemp fiber, but Italy the best; that grown in the United States and India is inferior to that of the other two countries.

Allied Plants:

1. *Humulus Lu'pulus, Humulus, Hop, N.F.*—The carefully dried strobile bearing its glandular trichomes with not more than 2 p. c. of stems, leaves, or other foreign matter, yielding not more than 5 p. c. of acid-insoluble ash; N. Temperate Zone—N. America, C. Asia, cultivated. Perennial herbaceous twiner (left to right), stems several, 6 M. (20°) long, flexible, flowers diœcious, pistillate greenish, cone-like spikes producing the fruit. Strobile (fruit) ovoid-cylindrical, 3 Cm. ($1\frac{1}{2}$ ') long, flexuous rachis, numerous yellowish-green membranous scales, the base of each with numerous brownish glandular hairs (lupulin) and enclosing a glandular achene; odor strong, characteristic—disagreeable, valerian-like on aging; taste aromatic, bitter; should be kept dark, in tightly closed containers. Powder, yellowish-green—parenchyma cells with calcium oxalate rosettes, branching tracheæ, non-lignified hairs, glandular hairs with yellowish oil, few pollen grains, large cells with calcium carbonate cystoliths; solvents: diluted alcohol, boiling water; contains volatile oil .8 p. c., choline (lupuline), resin (3) 9–18 p. c., trimethylamine, tannin (lupulo-) humulo-tannic acid, sugar, salts. Tonic, stimulant, nervous, sedative, anodyne, hypnotic; nervous insomnia, dyspepsia, delirium tremens, hysteria, irritable bladder, rheumatism, abscesses (poultice). Dose, \mathfrak{ss} –1 (2–4 Gm.); 1. *Fluidextractum Humuli* (alcohol 5 vols., water 3), dose, \mathfrak{m}_{XV} –60 (1–4 cc.); 2. *Tinctura Humuli*, 20 p. c. (diluted alcohol), dose, $\mathfrak{5j}$ –2 (4–8 cc.). *Infusion*, 5 p. c.; extract, elixir, poultice.

Lupulinum, Lupulin, N.F.—The glandular trichomes separated from the strobiles, yielding not less than 60 p. c. of ether-soluble extractive nor more than 10 p. c. of acid-insoluble ash. It is a yellowish-

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brown, granular powder, characteristic odor and taste of hop, being obtained therefrom by removing scales, shaking, and rubbing glands through fine sieve—yield 8–16 p. c.; trichomes globular, ellipsoidal,



FIG. 91.—*Humulus Lupulus*: a, staminate flower; b, pistillate flower; c, sepal; d, bract; e, embryo; f, lupulinic gland (lupulin).

.1–.3 Mm. ($\frac{1}{250}$ – $\frac{1}{800}$) broad, layer of secreting cells in form of shallow cup, the cuticle on inner surface being separated by secreted yellowish oleoresin; should be kept dark in tightly closed containers and when dark reddish and of disagreeable valerian-like odor from aging must not be used. Dose, gr. 5–15 (.3–1 Gm.); 1. *Fluidextractum Lupulini*

(alcohol), dose, m̄v–30 (.3–2 cc.). *Oleoresin* (acetone, ether) gr. 5–15 (.3–1 Gm.); *Tincture*, 12 p. c. (alcohol); Pills (excipient—little ether, or heat, or brisk rubbing with spatula.



FIG. 92.—Lupulin (fresh).

2. *Ficus Car'ica*, *Ficus*, *Fig*, N.F.—The clean, sound, partially dried fruit; W. Asia, cult. in S. Europe, California. Tree, 4.5–7.5 M. (15–25°) high, 10–20 Cm. (4–8') thick, many spreading branches; bark reddish, gray; leaves 10–12.5 Cm. (4–5') long, 3–5-palmately bluntly lobed, dentate, pubescent beneath; flowers monœcious, borne on the

inside of the thick, fleshy-walled receptacle, which becomes the fruit. Fruit, irregular rounded shape, compressed, fleshy 2.5–5 Cm. (1–2') broad, brownish-yellow, frequently with an efflorescence of sugar, apex with small scaly orifice, base with scar or short stalk; internally



FIG. 93.—*Ficus Carica*: *a*, vertical section of fruit; *b*, staminate flower; *c*, pistillate flower.

hollow, with many small brownish-yellow, glossy, hard achenes; odor distinct, fruity; taste sweet, pleasant; pear-shape when softened in water 5–7.5 Cm. (2–3') long. They occur as *natural* and *pulled*, the largest and best being—Smyrna (Turkey, Elemi), the smaller and less

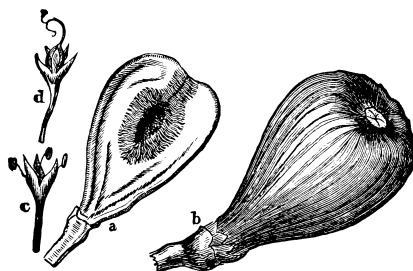


FIG. 94.—*Ficus Carica*: *a*, vertical section of common receptacle; *b*, ripened fruit; *c*, staminate flower; *d*, pistillate flower.

pulpy—the Greek; contain grape-sugar 62 p. c., gum, fat, phosphates, chlorides, achenes and cellular tissue 15 p. c., water 16 p. c. Nutritive, demulcent, dietetic; habitual constipation—fresh juice, indigestible skin and seed causing intestinal irritation, the latter acting mechan-

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ically; roasted and split open as a poultice. Dose, *ad libitum*; 1. *Syrupus Ficus Compositus*, 30 p. c., + fldext. senna 20, arom. fldglycer. casc. sagr. 10, dose, ʒj-2 (4-8 cc.); 2. *Confectio Sennæ*, 7 p. c.

3. *Dorstenia Contrayer'va*, *Contrayer'va*.—The root, U. S. P. 1820-1850; W. Indies, C. and S. America. Acaulescent perennial; leaves lobed, radical, 10 Cm. (4') long; flowers staminate and pistillate, fruit capsule, disperses seed by hygrosopism; root (rhizome) fusiform, 1-2-headed, 5-7.5 Cm. (2-3') long, 12 Mm. ($\frac{1}{2}$ ') thick, reddish; odor unpleasant; taste acrid, bitter; contains contrayerbine, cajapine, volatile oil, resin, bitter principle, starch. Stimulant, tonic, aromatic, stomachic; low fevers, typhoid, diarrhea, dysentery, serpent bites; in decoction, tincture. Dose, gr. 30 (2 Gm.).

4. *Mo'rus ru'bra*, *Red Mulberry*.—N. America. Fruit in dense spikes with coalesced perianths, 2.5 Cm. (1') long, dark purple, fleshy; contains sugar 10 p. c., pectin, citrates, malates; refrigerant, flavoring.

5. *Urti'ca dioi'ca*, *Nettle (Stinging Nettle)*.—Urticaceæ; N. America, Europe. Plant .6-1 M. (2-3°) high, very bristly, stinging, leaves ovate, heart-shaped, pointed, serrate, downy beneath, upper stem downy, spike much branched. Tonic, astringent, uterine hemorrhage. Dose, gr. 15-30 (1-2 Gm.).

17. SANTALACEÆ. Sandalwood Family.

San-ta-la'se-e. L. *Santal-um* + aceæ. Pers. name *sandul*, useful, or fr. L. *sandal*, Gr. *σάνταλον*, the classic name for Skt. *chandana*—*chand*, shine; L. *candere*, to shine—*i. e.*, polished woody surface shines. Herbs, shrubs, trees. Distinguished by leaves entire, exstipulate; calyx 3-6-lobed, coherent with 1-celled ovary, superior, valvate; flowers perfect, greenish, petals none, stamens 3-9, ovules 1-4, suspended; fruit 1-seeded, drupe or nut; temperate climates, tropics; astringent, seeds oily, fruit edible.

Genus: 1. **Santalum**.

SANTALUM ALBUM. SANDALWOOD, *N.F.*

Oleum Santali. Oil of Santal, *U.S.P.*

Santalum album, *Linné*, { A volatile oil distilled from the dried heart-wood, yielding not less than 90 p. c. of alcohols, calculated as santalol.

Habitat. S. India, E. Indian Islands, Malabar, Macassar (mountains); cultivated.

Syn. White Sandal Wood (young wood), White Saunders, Saunders, Yellow Sandal (old wood), Almug; Ol. Santal., Santalwood Oil, Oil of Sandalwood, Oleum Ligni Santali, Oleum Santali Flavi; Fr. Santal Citrin; Essence de Santal, Oleum Santali æthereum; Ger. Gelber Sandel; Sandelöl, Santelöl, Ostendisches Sandelholzöl.

San'ta-lum. L. see etymology, above, of Santalaceæ.

Al'bum. L. *albus*, white or light—*i. e.*, the color of the sapwood.

PLANT.—Small tree 6–9 M. (20–30°) high, bark grayish-brown; leaves oval, smooth, glaucous beneath; flowers small, numerous cymes; odorless, color variable, violet-pink, red, yellow. Wood—Santalum Album, Sandalwood, *N. F.* The heart-wood with not more than 1 p. c. of foreign organic matter, yielding not less than 3.5 p. c. of volatile oil. It is in billets, pieces, chips, varying shapes and sizes, heavy, hard, splitting easily, yellow inside (heart-wood), whitish (sapwood); odor characteristic, aromatic, persistent; taste peculiar, aromatic. The heart-wood only should be used, which natively is obtained by



FIG. 95.—*Santalum album*: flowering branch; also flower and fruit, enlarged.

felling trees of .3 M. (12') diameter, hacking off sapwood, or allowing these trunks to remain on the ground until sapwood is eaten away by ants, thereby becoming 10–20 Cm. (4–8') thick. This, when rubbed, rasped, or heated, gives pleasant roseate odor.

CONSTITUENTS.—Volatile oil 2–5 p. c., resin, tannin.

Oleum Santali. **Oil of Santal.**—This volatile oil, distilled from the wood, is a pale yellow, somewhat viscid, oily liquid, characteristic odor and taste of sandalwood, soluble in 70 p. c. alcohol (5), solution being slightly acid, sp. gr. 0.972, levorotatory; contains alcohols, calculated as santalol (most important constituent), $C_{15}H_{26}O$, 90 p. c., and santalal,

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$C_{15}H_{24}O$, both being decomposed by distillation over P_2O_5 —santalol yielding santalene, $C_{15}H_{24}$, and santalal giving $C_{15}H_{22}$; also present sesquiterpene, possibly acids. *Tests*: 1. Australian oil, sp. gr. 0.953, and W. Indian oil, sp. gr. 0.965, are both dextrorotatory. 2. Should be clear in 10 vols. of 70 p. c. alcohol (abs. of cedar-wood oil, castor oil, other fatty oils). Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, m ν —20 (.3–1.3 cc.).

ADULTERATIONS.—Castor oil, other fixed oils, chloroform, gurjun balsam oil, volatile oil of copaiba and of cedar-wood, made from lead-pencil chips by distillation, etc. While that distilled in India and Germany is a good article, that made in England is considered the best and purest, hence is more expensive.

PREPARATIONS.—I. WOOD: 1. *Fluidextractum Santali Albi*, N.F. (alcohol), dose, ʒss–2 (2–8 cc.): Prep.: 1. *Elixir Sabal et Santali Compositum*, N.F., 6.5 p. c. 2. *Tinctura Sabal et Santali*, N.F., 6.5 p. c.; II. OIL (Unoff.): *Capsules, Emulsion, Mass, Pills, Wafers*.

PROPERTIES.—Astringent, stimulant, diuretic, disinfectant, expectorant. Excreted by bronchial and genito-urinary mucous membranes, stimulating and disinfecting secretions of both.

USES.—Bronchitis, gonorrhea, chronic and subacute inflammations of mucous membranes, cystitis, pyelitis, chronic diarrhea. Very much like copaiba and cubeb in action, and should be continued some time after discharges have ceased. Extensively employed in perfumery. The wood is used natively for fevers, indigestion, palpitation, inflammations, skin diseases; also as incense in Chinese temples, and by cabinet-makers for caskets, jewel boxes, and as a perfume. There are three varieties: 1, Malabar; 2, Macassar; 3, W. Indian.

Allied Plants:

1. *Santalum Freycinetia'num* and *S. pyrula'rium* of the Sandwich Islands. *S. Ya'si* of the Feejee Islands. *S. austro-caledon'icum* of New Caledonia. All 3 furnish oil of good quality.

2. *Venezuela Sandal Wood*.—Rutaceæ. This supplies the market with W. Indian sandalwood oil.

18. ARISTOLOCHIACEÆ. Birthwort Family.

Ar-is-to-lo-ki-a'se-e. L. *Aristolochi-a* + aceæ, fr. Gr. ἄριστος, best, + λοχεία, childbirth—i. e., once thought to ease labor. Low herbs, climbing shrubs. Distinguished by abounding in bitter principles and volatile oils; flowers perfect, dull color; calyx conspicuous, lurid, tubular, coherent with 6-celled ovary, forming a many-seeded, 6-celled capsule or berry fruit; petals none; stamens 6–12, epigynous; leaves cordate, entire, petioled; temperate climates; tonic, stimulant, acrid, cures snake bites.

Genus: 1. **Aristolochia**.

SERPENTARIA. SERPENTARIA, U.S.P.

Aristolochia	Serpentaria,	{ The dried rhizome and roots, with not more than 10 p. c. over-ground stems nor 2 p. c. other foreign organic matter, yielding not more than 10 p. c. acid-insoluble ash.
	<i>Linne,</i>	
	reticulata,	
	<i>Nuttall.</i>	

Habitat. United States, in hilly woods: 1. W. Pennsylvania, Virginia, Ohio, Indiana, Kentucky. 2. S. W. States, Louisiana to Texas.

Syn. Serpent., Virginia Snakeroot, Texas Snakeroot, Snakeroot (-weed), Serpentry, Sangrel, Snagrel, Sangree Root, Pelican Flower, Birthwort, Thick Birthwort; Br. *Serpentaria Rhizoma* (radix), Serpentry Rhizome; Fr. Couleuvre de Virginie, Serpentaire (Vipérine) de Virginie; Ger. Virginische Schlangenzwurzel.

Ar-is-to-lo'chi-a. L. see etymology, page 174, of Aristolochiaceae.

Ser-pen-ta'ri-a. L. *serpen(t)s*, serpent—*i. e.*, having power of rendering harmless serpent bites.

Re-tic-u-la'ta. L. *reticulatus*, fr. *rete*, a net—*i. e.*, leaves strongly netted.

Virginia Snakeroot. Root from Virginia, once thought a valuable antidote for snake bites.

PLANTS.—Perennial herbs; stems sometimes several, slender, erect, zigzag, jointed .3 M. (1°) high, purple below; leaves cordate, ovate, 5–7.5 Cm. (2–3') long, pale green, entire; flowers June–July, few, purple, due to the calyx, which is tubular, inflated at both ends and bent like letter S; corolla absent; leaves (*A. Serpentina*)—petiolate, pointed, thin, pubescent; leaves (*A. reticulata*)—sessile, obtuse, thickish, reticulate, hairy. **RHIZOME**, oblique, subcylindrical, more or less curved, 10–30 Mm. ($\frac{2}{3}$ –1½') long, 1–2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') thick, dark brown, upper portion with short stem-bases, lower and lateral portions with many long, thin, nearly straight, yellowish-brown roots having 4–6-rayed stele (stem 6–10 fibro-vascular bundles); fracture short; internally yellowish-white, wood with broad, eccentric wedges; odor camphoraceous, terebinthinate; taste bitter, aromatic. **POWDER**, grayish-brown—numerous starch grains, .003–.018 Mm. ($\frac{1}{8300}$ – $\frac{1}{1385}$ ') broad, tracheæ, wood-fibers, medullary ray cells, pith cells, occasionally few non-glandular hairs of the stem. *Solvents*: alcohol; diluted alcohol; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Rhizomes of: 1, *Spigelia marylandica*—only slightly aromatic and bitter, no projecting stem-remnants, but indistinct, medullary rays in the wood; 2, *Hydrastis canadensis*—yellow interior, odorless, oblique growth; 3, *Aristolochia Serpentina* var. *hastata*, S. Carolina, La.—Leaves auriculate, stems smaller, more simple and slender; 4, *Cypripedium hirsutum* (*pubescens*) and *C. parviflorum*—scars circular, roots coarse; 5, *Polemonium reptans*—resemble serpentaria, but nearly white; 6, Roots of *Panax quinquefolium*, *Ginseng*.

Commercial.—Plants grow in rich shady woods from which the rhizomes are taken and dried, sometimes having been washed; enters market in bags, casks, more commonly bales of 100 pounds (45 Kg.),

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often mixed with leaves, stems and adhering earth. There are two varieties: 1, *Virginia Snakeroot* (*A. Serpentaria*), exterminated practically from many former sections, and now largely from mountainous districts, south of Pennsylvania and the Ohio River, being brought eastward chiefly by the routes of Wheeling and Pittsburgh; 2, *Texas Snakeroot* (*Red River*—*A. reticulata*), rhizome usually larger, roots fewer, thicker, less interlaced than preceding.

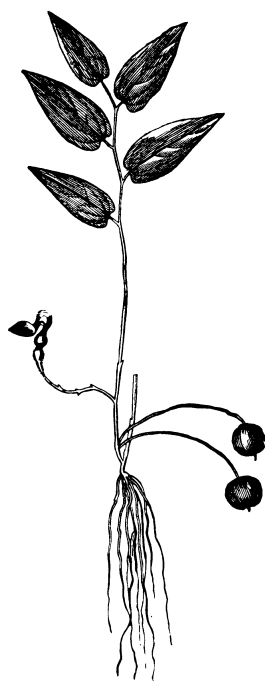


FIG. 96.—*Aristolochia Serpentaria*.

CONSTITUENTS.—Volatile oil .5–1 p. c., Aristolochine, Aristolochin (clematitin, bitter principle), Serpentin (bitter principle, poisonous), resin 5 p. c., aristic acid (resinous), tannin, starch, sugar, mucilage, albumin, ash 11 p. c.

Volatile Oil.—Obtained by distilling with water; contains a terpene (probably pinene), $C_{10}H_{16}$, also borneol ester, $C_{18}H_{29}O$, 60 p. c., and a green or bluish-green fraction.

Aristolochine, $C_{32}H_{22}O_{13}N$.—Obtained by precipitating decoction with lead acetate, exhausting precipitate with hot alcohol, evaporating, dissolving bitter principle (alkaloid) by shaking with water; it is yellow, amorphous or in needles; soluble in water, alcohol, ether, precipitated by tannin.

PREPARATIONS.—1. *Tinctura Cinchonæ Composita*, 2 p. c. 2. *Fluidextractum Serpentariæ*, *N.F.* (80 p. c. alcohol). Dose, $\mathfrak{m}\text{v}$ –30 (.3–2 cc.); 3. *Tinctura Serpentariæ*, *N.F.*, 20 p. c. (67 p. c. alcohol). Dose, $\mathfrak{z}\text{ss}$ –2 (2–8 cc.).

Unoff. Prep.: *Infusion*, 5 p. c., dose, $\mathfrak{z}\text{j}$ –2 (30–60 cc.).

PROPERTIES.—Stimulant, tonic, diaphoretic, diuretic, emmenagogue, aphrodisiac, antiperiodic; like calumba promotes appetite, digestion, increases bronchial and intestinal secretions, heart action, mental exhilaration. Large doses are irritant, causing vomiting, vertigo, colic, purging, tenesmus.

USES.—As a stimulating expectorant in typhoid pneumonia, exanthematous diseases, intermittents, dyspepsia, diphtheria. Fluidextract good locally against poison-ivy rash.

Allied Plant:

1. *Asarum canadense*, *Asarum*, *Canada Snake-root*, *Wild Ginger*, *N.F.* The dried rhizome and roots with not more than 5 p. c. of foreign organic matter, North America. Small plant with dividing stem;

leaves 2, reniform; flowers brownish-purple, woolly; fruit capsule, 6-celled. Rhizome 5-17 Cm. (2-7') long, 2-4 Mm. ($\frac{1}{12}$ — $\frac{1}{6}$ ') thick, 2-edged (young), quadrangular (old), finely striate, nodes with irregular scars, internodes with annular scars, purplish-brown, fracture short, whitish, few starchy or resinous roots; odor ginger-like or recalling serpentaria, non-irritating upon heating; taste pungent, bitter. Powder, brownish—starch grains, tracheæ, epidermal tissue, parenchyma and numerous oil cells; contains volatile oil 1.5-3.5 p. c., resin, asarin. Stimulant, carminative, tonic, diaphoretic, diuretic; whooping cough, colic, febrile affections. Dose, gr. 30 (2 Gm.); 1. *Syrupus Asari Compositus*, 6.2 p. c., + fldext. ipecac $\frac{3}{10}$ p. c., potassium carbonate $\frac{1}{4}$ p. c., +, dose, 5ss-1 (2-4 cc.). *Infusion*. *Tincture*.

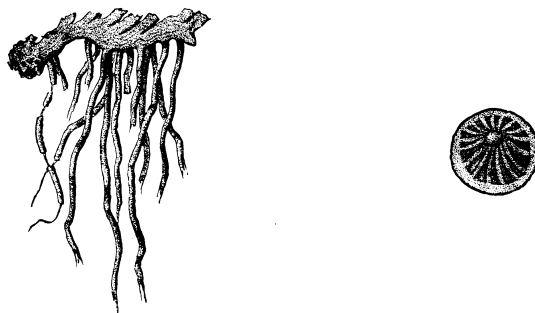


FIG. 97.—Serpentaria: rhizome with roots.

Rhizome: transverse section.

19. POLYGONACEÆ. Buckwheat Family.

Pol-i-go-na'se-e. L. *Polygon-um* + aceæ, fr. Gr. *πολύς*, many, + *γόνυ*, knee, joint—*i. e.*, from stem's numerous joints. Herbs, shrubs. Distinguished by acrid, astringent, purgative properties, stems composed of many swollen joints, with ocreate stipules above each; flowers perfect, on jointed pedicels; calyx 3-6, greenish or petaloid, inferior; ovary 1-celled, superior, styles and stigmas 2-3; stamens 6-9; fruit 3-angled, seeds solitary; temperate climates; astringent, purgative; contain oxalic acid and oxalates.

Genus: 1. **Rheum**.

RHEUM. RHUBARB, U.S.P.

Rheum	{	officinale , <i>Baillon</i> , palmatum , <i>Linné</i> , and var., or other species grown in China and Thibet.	{	The dried rhizome and roots deprived of periderm tissues, yielding not less than 30 p. c. of diluted alcohol-soluble ex- tractive.
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POLYGONACEÆ

Habitat. W. and C. China, Thibet, Chinese Tartary; mountains, southern exposure—light, loose, sandy and rich black forest soil.

Syn. Turkey or China Rhubarb; Br. Rhei Rhizoma; Fr. Rhubarbe de Chine; Ger. Rhizoma Rhei, Rhabarber.

Rhe'um. L. Rha, the river Volga, upon whose banks it grows and was first found, fr. Gr. *ῥῥον, ῥεῖν*, to flow—*i. e.*, it causes purgation.

Of-fi-ci-na'le. L. *officina*, workshop; *opus*, work, + *facere*, to do—*i. e.*, used in or belonging to the shop or store.

Pal-ma'tum. L. *palmatus*, fr. *palma*, palm of the hand—*i. e.*, the much divided leaves.

Rhubarb, contraction of *rheubarbarum*—*rheum* + *barbarum*—*i. e.*, barbarian plant from the Rha (Volga), whence name *rha Ponticum*—*Pontic-rha*, *R. rha-ponticum*, fr. Pontic or Euxine Sea.

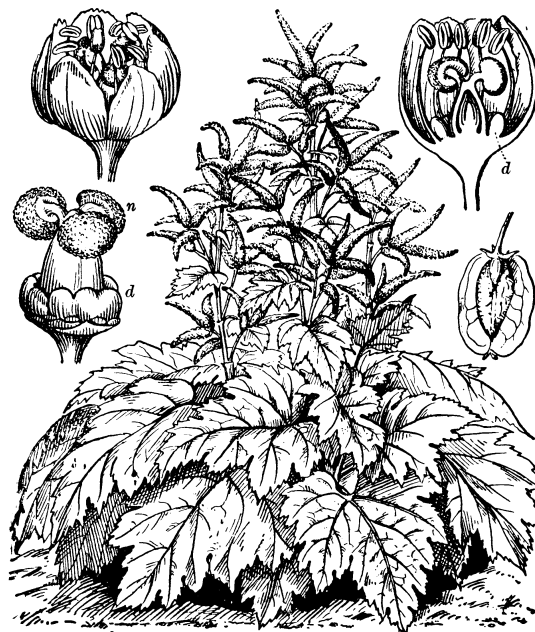


FIG. 98.—*Rheum officinale*: n, pistils and stigmas; d, nectar tubes.

PLANTS.—Large compact perennial herbs; aërial stem persisting through the winter, after a few years 30 Cm. (1°) high, 10–15 Cm. (4–6') thick, branches 25–37.5 Cm. (10–15') long, blunt summit, brown coat from withered scales (ocreas) and leaf-bases; internally fleshy (semi-pulpy) with yellowish juice; leaves very large, petiole .3–.5 M. (12–18') long, 2.5–4 Cm. (1–1½') thick, solid; lamina .6–1.3 M. (2–4°) long and broad, suborbicular, palmately-veined, 5–7-lobed, reticulate, pubescent, pale green; stipules very large; flowering branches (stems) several, 1.5–3 M. (5–10°) high, hollow, thick, green, striate, smoothish; flowers May–June, 6 Mm. (¼') long, clusters of 7–10, catkin-like com-

pound panicles, greenish-white; fruit August, small clusters, 12 Mm. ($\frac{1}{2}$ ') long, 6 Mm. ($\frac{1}{4}$ ') broad, triangular, wing at each angle, crimson-red; seed solitary. RHIZOME, subcylindrical, barrel-shaped, conical, *rounds*, or flattened pieces, *flats*, frequently with a perforation; hard, moderately heavy, 5–17 Cm. (2–7') long, 4–10 Cm. ($1\frac{3}{5}$ –4') thick, or cut into variable shape and size; yellowish-brown, with lighter striations and occasional small patches of brown cork, more or less covered with yellowish-brown powder; fracture uneven, stellate vascular bundles, granular yellowish mottled surface; odor aromatic, agreeable; taste bitter, astringent, gritty when chewed, tingeing saliva yellow. POWDER, yellowish-brown—calcium oxalate rosette aggregates, starch grains .004–.025 Mm. ($\frac{1}{6250}$ – $\frac{1}{1000}$ ') broad, few tracheæ, reticulate and spiral. *Tests*: 1. Boil .1 Gm. with aqueous solution of potassium hydroxide (1 in 100) 10 cc., cool, acidulate filtrate with hydrochloric acid, shake with ether 10 cc.; ethereal layer (yellow on standing) shaken with ammonia T. S. 5 cc.—ammonia layer cherry-red color (pres. of emodin), ethereal layer remains yellow (pres. of chrysophanic acid). 2. Boil 1 Gm. + diluted alcohol 50 cc. for 15 minutes under a reflux condenser, filter, evaporate to 10 cc., cool, shake with ether 15 cc., set aside for 24 hours—yellowish prismatic crystals should not form (abs. of rhapontic rhubarb). *Solvents*: alcohol; water. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Irrespective of variety, rhubarb should be moderately heavy, compact, bright color, brittle, broken edges with fresh appearance, red and yellow veins intermingled with white, decidedly aromatic odor, bitter, astringent, slightly gritty, non-mucilaginous, staining saliva yellow; pieces that are porous, mucilaginous taste, dark brown interior should be rejected. Turmeric sometimes added to the powder and also rubbed over unsightly pieces—recognized by its starch grains, as well as by adding to 5 gr. (.3 Gm.) of suspected rhubarb a few drops of chloroform on white paper, when Chinese slightly stains the paper, while the European, or dark-colored Chinese, imparts a deep yellow stain; now on adding a few grains of borax + a drop of hydrochloric acid, if pure rhubarb—stain not changed, if tumeric present—get a distinct red.

Commercial.—Plants, resembling our garden rhubarb—pie-plant, grow wild and largely under cultivation in Chinese Empire, where a number of species, chiefly the two recognized, furnish the official product. Rhizome, when 8–10 years old, is dug in the autumn (Tartary, spring, China, Sept.–Oct.), and, after removing roots and corky layer, is divided into segments (to aid drying), perforated, strung on cords, and suspended in the shade or under cover (house roofs and eaves) to be cured by circulating air, a process that often requires a year and a loss of 80 p. c.; frequently that dried by the sun, heated stones, stoves, ovens, kilns, or brushwood fires, *high dried* (usually having broad ridges, blackish grooves, heavy disagreeable odor) and the larger roots, *tails*, are included, but both are more or less inferior.

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Variety and quality are distinguished, in experienced hands, by odor (bouquet), while all kinds are subject to insect attack, which is prevented best by keeping in tightly-closed containers having a tuft of cotton saturated with chloroform or carbon tetrachloride. Most of our supply comes from Hankow, on the Upper Yang-tse, that from Hsining (Tze-chuen and Shensi products) commanding the highest price. There are three varieties: 1, *Russian* (*Turkish, Crown*—*R. palmatum*), no longer on the market, but consisted of the best rhizome,

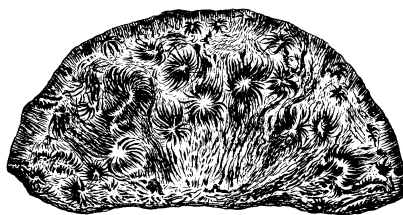


FIG. 99.—Russian rhubarb: transverse section.

from Chinese Tartary via Siberia, trimmed to beneath the cambium, perforated with large conical hole (for easy examination), inspected rigorously at Kiachta, refuse burned, the reserve sewed in linen sacks, covered with hide, and sent to Leningrad (Petrograd St. Petersburg); Turkish ports once supplied it (hence name), being brought from Tartary by caravans through Persia and Anatolia; 2, *Chinese* (*E. Indian*—*R. officinale*, *R. palmatum*, var. *tanguticum*, etc.), our official rhizome, having inner bark, and sometimes patches of rough corky layer and twine fibers; color less bright and odor less aromatic than Russian; flourishes best at

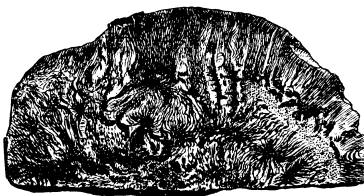


FIG. 100.—Chinese rhubarb: transverse section.

2,400–3,000 M. (8,000–10,000°) elevation in the Himalaya and other mountains, on the shady side of damp ravines, with northern exposure; distinguished natively as “northern” and “southern,” also as “Shensi” (best, most expensive—orange color, agreeable odor), “Canton” (smoky odor, bitter, ochre-yellow), “Shanghai” (smoky odor, light yellow; exported chiefly from Canton, occasionally via India; 3, *European* (*Rhaponticum*—*R. palmatum*, *R. rhaponticum*, *R. compactum*, *R. undulatum*, *R. Emodi* +), cultivated in England, France, Austria

(Moravia), the rhizome being cut to resemble the Chinese, but differing in having the outside nearly or entirely without white meshes, the medullary rays interrupted, narrow, nearly straight, with paler color, weaker odor, and less gritty but more mucilaginous taste; rarely imported.

CONSTITUENTS.—Resin, Aloe-emodin, Chrysophanic acid, rhein, emodin, emodin monomethyl ether, rheinolic acid (new anthraquinone derivative), volatile oil, rheotannic acid, gallic acid, cinnamic acid, palmitic acid, stearic acid, oleic acid, linolic acid, verosterol (phytosterol), dextrose, levulose, calcium oxalate 2-40 p. c. (the greater the amount, the greater the activity of the drug, the two going hand in hand); starch, ash 12-13 p. c.—very inferior 35-45 p. c.

Resin.—Chief purgative principle; amorphous, non-glucosidic—obtained from alcoholic extract, after removing volatile oil, by separating from greenish-yellow residue in still the dark aqueous liquid, extracting it with ether, then with amyl alcohol, evaporating to get brown tarry liquid and yellowish granules, crystals (aloe-emodin, chrysophanic acid, rhein, emodin, emodin monomethyl ether, rheinolic acid—all of which the resin yields upon hydrolysis); evaporate brown tarry filtrate, dissolve in alcohol and precipitate with equal quantity of chloroform.

Aloe-emodin and Chrysophanic Acid.—Both slightly purgative, obtained by concentrating above ethereal liquid, heating residue with ethyl acetate, adding petroleum, decanting from tarry precipitate, evaporating petroleum solution, dissolving in ether, extracting with 10 p. c. aqueous solution of sodium carbonate (aloe-emodin), or with 10 p. c. aqueous solution of potassium hydroxide (chrysophanic acid). Aloe-emodin is the rhabarberon and iso-emodin of some writers.

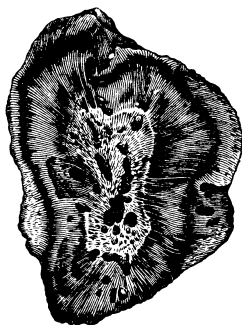


FIG. 101.—European rhubarb: transverse section.

PREPARATIONS.—1. *Extractum Rhei.* Extract of Rhubarb. (Syn., Ext. Rhei., Powdered Extract of Rhubarb, Extractum Rhei Alcoholicum; Fr. Extrait de Rhubarbe; Ger. Rhabarberextrakt.)

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Manufacture: Macerate, percolate 100 Gm. with 80 p. c. alcohol until exhausted, reclaim alcohol, continue distillation until residue syrupy consistence, transfer to a dish, rinse still with little warm menstruum, which add to dish and evaporate to dryness at 70° C. (150° F.), stirring frequently; add dried starch enough for extract to weigh 50 Gm., pulverize, mix thoroughly, pass through fine sieve; 1 Gm. represents 2 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. 3–10 (.2–.6 Gm.).

2. *Fluidextractum Rhei.* Fluidextract of Rhubarb. (Syn., Fldext. Rhei, Fluid Extract of Rhubarb; Fr. Extrait fluide de Rhubarbe; Ger. Rhabarberfluidextrakt.)

Manufacture: Similar to Fluidextractum Sarsaparillæ, page 126; menstruum: 80 p. c. alcohol. Dose, ʒv–30 (.3–2 cc.).

Preps.: 1. *Syrupus Rhei.* Syrup of Rhubarb. (Syn., Syr. Rhei; Fr. Sirop de Rhubarbe; Ger. Rhabarbersirup (saft).)

Manufacture: 10 p. c. Mix fluidextract of rhubarb 10 cc., spirit of cinnamon .4 cc., add potassium carbonate 1 Gm., dissolved in water 5 cc., and to this mixture add syrup q. s. 100 cc. Dose, ʒj–4 (4–15 cc.).

2. *Mistura Rhei Alkalina*, Neutralizing Cordial, *N.F.*, 1.6 p. c.

3. *Mistura Rhei Composita*, Mixture of Rhubarb and Soda, *N.F.*,

1.5 p. c. 4. *Elixir Catharticum Compositum*, *N.F.*, 6.2 p. c.

3. *Pulvis Rhei Compositus.* Compound Powder of Rhubarb. (Syn., Pulv. Rhei Co., Gregory's Powder, Powder Magnesia and Rhubarb, Pulvis (Infantum) Antacidus; Fr. Poudre de Rhubarbe composée; Ger. Pulvis Magnesiae cum Rheo, Kinderpulver.)

Manufacture: 25 p. c. Triturate together rhubarb 25 Gm., ginger 10, add gradually magnesium oxide 65; mix thoroughly, pass through No. 60 sieve. It is pinkish-white, mobile, darker on exposure to moisture; it exhibits fine particles of magnesium oxide, numerous elliptical starch grains (ginger), .005–.06 Mm. ($\frac{1}{5000}$ – $\frac{1}{4000}$) broad, and fragments of vegetable tissues; polygonal starch grains (rhubarb), .002–.02 Mm. ($\frac{1}{12500}$ – $\frac{1}{1500}$) broad. Dose, ʒss–1 (2–4 Gm.).

4. *Tinctura Rhei.* Tincture of Rhubarb. (Syn., Tr. Rhei; Fr. Teinture de Rhubarbe; Ger. Rhabarbertinktur.)

Manufacture: 20 p. c. Similar to Tinctura Veratri Viridis, page 104; 1st menstruum: glycerin 10 cc., alcohol 50, water 40, 2d: diluted alcohol q. s. 100 cc. Dose ʒss–4 (2–15 cc.): Prep.: 1. *Mistura Opii et Rhei Composita*, *N.F.*, 10 p. c.

5. *Tinctura Rhei Aromatica.* Aromatic Tincture of Rhubarb. (Syn., Tr. Rhei Arom.; Fr. Teinture de Rhubarbe aromatique; Ger. Aromatische Rhabarbertinktur.)

Manufacture: 20 p. c. Similar to Tinctura Veratri Viridis, page 104—using rhubarb 20 Gm., cinnamon 4, clove 4, myristica 2; 1st menstruum: glycerin 10 cc., alcohol 50, water 40, 2d: diluted alcohol q. s. 100 cc. Dose, ʒss–4 (2–15 cc.).

Prep.: 1. *Syrupus Rhei Aromaticus*. Aromatic Syrup of Rhubarb. (Syn., Syr. Rhei. Arom., Spiced Syrup of Rhubarb; Fr. Sirop de Rhubarbe aromatique; Ger. Gewürtzer Rhabarbersirup (saft).)

Manufacture: 3 p. c. Dissolve potassium carbonate .1 Gm. in aromatic tincture of rhubarb 15 cc., to this add syrup q. s. 100 cc. Mix thoroughly. Dose, for a child with diarrhea, $\bar{5}$ j-2 (4-8 cc.).

6. *Fluidglyceratum Rhei*, N.F. 7. *Pilulæ Rhei*, N.F., 3 gr. 8. *Pilulæ Rhei Compositæ*, N.F., 2 gr. 9. *Pulvis Rhei et Magnesiae Anisatus*, Compound Anise Powder, N.F., 35 p. c. 10. *Tinctura Rhei Aquosa*, N.F., 10 p. c. (11 p. c. alcohol). 11. *Tinctura Rhei Dulcis*, N.F., 10 p. c., 1st menstruum: glycerin 10, alcohol 50, water 40, 2d: diluted alcohol. 12. *Tinctura Rhei et Gentianæ*, N.F., 7 p. c., + gentian 1.75 p. c. (diluted alcohol). 13. *Pilulæ Antiperiodicæ*, N.F., $\frac{1}{2}$ gr. 14. *Syrupus Sennæ Aromaticus*, N.F., 1.75 p. c. 15. *Tinctura Antiperiodica*, N.F., $\frac{4}{5}$ p. c. Dose, each, $\bar{5}$ ss-2 (2-8 cc.).

Unoff. Preps.: *Aromatic Fluidextract*, \mathfrak{M} xv-60 (1-4 cc.). *Infusum Rhei* (Br.), 5 p. c., $\bar{5}$ iv-8 (15-30 cc.). *Liquor Rhei Concentratus*, 50 p. c., $\bar{5}$ ss-1 (2-4 cc.). *Vinum Rhei Compositum*, 8 p. c., +, $\bar{5}$ j-4 (4-15 cc.). *Torrefied Rhubarb*.—By roasting, the cathartic principle is volatilized and the full astringency left behind; long boiling will effect the same result.

PROPERTIES.—Aperient, purgative, astringent, stomachic, tonic. It increases saliva, gastric juice, bile, peristalsis, vascularity, and absorption. The cathartic effect comes first (4-8 hours), due to resins (mainly pheoretin), emodin, etc.; then follows astringency from rheo-tannic acid; both actions being chiefly on the duodenum. The milk, urine, and sweat become colored, the first also acquiring bitterness and purgative properties. Purgation may result from its application to ulcers, abraded skin, or in poultices to abdomen.

USES.—Diarrhea, hemorrhoids, cholera infantum, chronic dysentery, dyspepsia, thread worms. With calomel good in bilious fevers; with magnesium oxide for stomach and bowel disorders. By association with other cathartics both rendered more efficient; sometimes used with opium.

Allied Plants:

1. *Rheum rhaponticum*. Asia Minor, Siberia, Russia. This is cultivated as pie-plant, the leaf-petioles being used, as they possess pleasant acidulous properties; this species is the source of the cultivated European rhizome, and that of Moravia (Austria), Hungary, England, and Banbury, which is usually less than half the size of official rhubarb, conical, harder, lighter color, more bitter and astringent, less gritty; contains rhapontin, $C_{22}H_{24}O_9$. *R. undulatum*, *R. compactum*, *R. Emodi*, *R. australe*, *R. hybridum*.—All produce handsome, but smaller, less valuable, and lighter-colored rhizomes.

2. *Rumex crispus*, or *R. obtusifolius*, *Rumex*, Yellow (Curled) Dock, N.F.—The dried root with not more than 5 p. c. of stem-bases or other foreign organic matter; Europe, N. America. Common

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obnoxious weeds, 30–120 Cm. (1–4°) high, coarsely angled; leaves (lower) 15–35 Cm. (6–14') long, decreasing toward summit, lanceolate, crisped, wavy; flowers terminal panicle becoming a dense mass of rusty-brown 3-winged capsules. Root, nearly simple, few rootlets, somewhat twisted, up to 30 Cm. (12') long, 7 Cm. (3') thick, reddish-brown, grayish from adhering soil, annulate above, wrinkled longitudinally, indented root-scars, stem-scars or remains (hollow); fracture short, dusty, fibrous; usually split longitudinally or cut transversely, 2 Cm. ($\frac{1}{2}$ ') long; odor slight; taste astringent, bitter. Powder, brownish—calcium oxalate rosettes, crystals, numerous starch grains, few fibers, tracheæ, cork cells light brown; contains (cascara-) emodin .17 p. c., chrysophanic acid (rumicin, lapathin), tannin, calcium oxalate, starch. Astringent, alterative, tonic, laxative, antiscorbutic; similar to rhubarb and sarsaparilla; cutaneous eruptions, scorbutic manifestations, itch,

FIG. 102.—*Rumex crispus*.

scrofula, syphilis, hepatic congestion, dyspepsia, intermittents; leaves used as a laxative diet, and as spinach. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Rumicis* (diluted alcohol), dose, ℥xv–60 (1–4 cc.). Decoction; Ointment.

3. *R. britan'nica*, *Water Dock*. The root, U.S.P. 1820–1850. Europe, naturalized in N. America. Plant 1.6–2 M. (5–6°) high, leaves lanceolate, acute, transversely veined, obscurely crenate, .3–.6 M. (1–2°) long; root more astringent but physically and medicinally similar to *R. crispus*, with which it is often indiscriminately collected. *R. sanguin'eus*, *Red-veined Dock*. Leaf-veins and stems reddish; *R. aqua'ticus*, fruit smooth, both astringent. *R. Acetosel'la*, *Field* or *Sheep Sorrel*, contains acid potassium oxalate and tartaric acid, sour taste lost upon drying; refrigerant, diuretic, good diet in scurvy.

4. *Polyg'onum Bistort'a*, *Bistort*.—Europe, Asia, N. America, in meadows. Produces an S-shaped rhizome, bent upon itself—bistorted,

5 Cm. (2') long, 15 Mm. ($\frac{3}{8}$ ') thick, flattened or channeled, upper side transversely striate, root-scars on under side, red-brown; contains tannin 20 p. c., starch, calcium oxalate; tonic, astringent. Dose, gr. 5–30 (.3–2 Gm.).

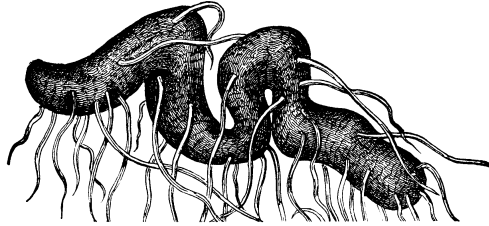


FIG. 103.—*Polygonum Bistorta*: rhizome, natural size.

20. CHENOPODIACEÆ. Goosefoot Family.

Ke-no-po-di-a'se-e. L. *Chenopodi-um* + aceæ, fr. Gr. χήν, goose, + πούς, foot—*i. e.*, referring to the shape of leaves. Herbs, shrubs. Distinguished by being homely, succulent; leaves exstipulate, no bracts; flowers minute, greenish, with free calyx imbricated in the bud, persistent; 2–5-lobed; petals none; ovary 1-celled, forming 1-seeded utricle; universal, saline places; anthelmintic, antispasmodic, aromatic, carminative, stimulant (vol. oil).

Genus: 1. **Chenopodium.**

CHENOPODIUM. CHENOPODIUM.

Oleum Chenopodii. Oil of **Chenopodium**, *U.S.P.*

Chenopodium ambrosioides,
var. **anthelminticum**, *Linné.*

{ A volatile oil distilled with steam from the fresh, overground parts of the flowering and fruiting plant, yielding not less than 65 p. c. ascaridol ($C_{10}H_{16}O_2$).

Habitat. W. Indies, C. and S. America, waste places, roadsides; naturalized in United States, Europe, Africa; cultivated in Maryland for the oil.

Syn. American (Wild) Wormseed, Stinking Weed, Goosefoot, Jerusalem (Jesuit) Tea, Jerusalem Oak (Jak), Fructus *Chenopodii Anthelmintici*; Ol. *Chenopod.*, Oil of American Wormseed; Fr. Anserine Vermifuge (plante fleurie), Essence de *Chénopode anthelmintique*; Ger. Amerikanischer Wurmsamen, Wurmsamenöl, *Chenopodiumöl*.

Che-no-po'di-um. L. see etymology, above, of *Chenopodiaceæ*.

Am-bro-si-oi'des. L. fr. Gr. α, priv., not, + βροτός, mortal, + ο-είδης, like—*i. e.*, resembling that which is immortal, once thought to effect that condition when taken.

An-thel-min'ti-cum. L. fr. Gr. ἀντί, against, + ἔλμυθα, a worm—*i. e.*, worm antagonist or destroyer.

PLANT.—Annual or perennial, .6–1.6 M. (2–5°) high; stem angular, furrowed, branched; leaves toothed, yellowish-green, gland-dotted on under surface; flowers July–Sept., greenish-yellow, dense leafy

CHENOPODIACEÆ

spikes. Fruit, 2 Mm. ($\frac{1}{12}$ ') thick, size of pin's head, depressed-globular, greenish-gray, integuments friable, containing a lenticular, obtusely edged, glossy, black seed; odor peculiar, terebinthinate; taste bitter, pungent. All parts of the plant have this disagreeable odor and same medicinal properties when dry and fresh; grows best in rubbish, along fences, in village streets, vacant lots, and should be collected in October.

CONSTITUENTS.—Volatile oil 3–3.5 p. c., from fresh herb .5–1 p. c.

Oleum Chenopodii. **Oil of Chenopodium.**—This volatile oil, obtained by distilling with water or superheated steam, is a colorless, pale yellowish liquid, peculiar, disagreeable odor, bitter, burning taste, soluble in 70 p. c. alcohol (8), sp. gr. 0.967, levorotatory; contains a terpene — pinene, $C_{10}H_{16}$, and a liquid oxygenated portion ($C_{10}H_{16}O_2$), ascaridol. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mij–10 (.13–.6 cc.).

PREPARATIONS. — (U n o f f.).
FRUIT: *Fluidextract*, m_{xv}–30

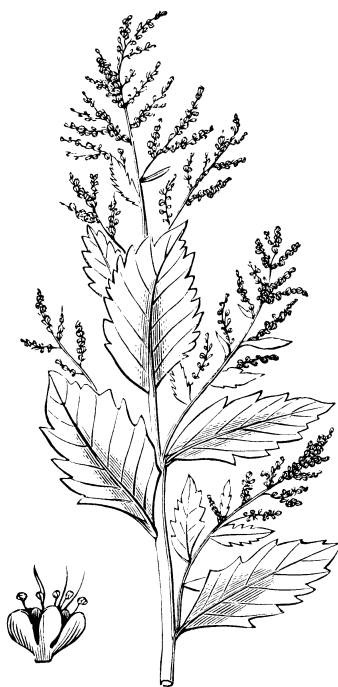


FIG. 104.—*Chenopodium ambrosioides* var. *anthelminticum*.



FIG. 105.—*Chenopodium ambrosioides*.

(1–2 cc.). *Decoction* (water or milk), ʒj–2 (30–60 cc.). FRESH PLANT: *Expressed Juice*, ʒij–4 (8–15 cc.), ter die.

PROPERTIES.—Anthelmintic, vermifuge, round worms (*Ascaris lumbricoides*).

USES.—While mainly for worms, it has also been used in intermittents, hysteria, chorea, nervous affections, tenia. May give the powder

incorporated with molasses or syrup, but the oil is more popular, being well taken on sugar by children. Should be given twice daily for several days, on empty stomach if possible, and follow with a dose of castor oil. Fruit, U.S.P. 1820–1890.

Allied Plants:

1. *Chenopodium ambrosioides*, *Herba Botrys Mexicanæ*, *Mexican Tea*.—The fruit, U.S.P. 1890; Europe, Asia. This resembles very closely the preceding plant, the latter being, however, more strongly aromatic, leaves more deeply toothed, the lower ones often nearly pinnatifid, spikes more elongated, usually leafless; fruit of both alike. *C. Bo'trys*, *Jerusalem Oak* (*Feather Geranium*); Europe, Asia. Strongly



FIG. 106.—*Phytolacca americana*: 2, single fruit, showing carpels.

aromatic; catarrh, asthma. *C. Bo'nus Henri'cus*, *Good King Henry*; Europe; taste saline, mucilaginous. *C. al'bum*, *Pig Weed* (*Lamb's Quarters*); taste mucilaginous, saline. *C. Vulva'ria*, *Fetid Goosefoot*; Europe; plant has fish-brine odor, due to trimethylamine.

2. *Phytolacca americana*, *Phytolacca*, *Poke Root*, N.F.—Phytolaccaceæ. The dried root with not more than 5 p. c. of stem-bases nor 2 p. c. of other foreign organic matter; N. America, waste places. Perennial herb, 1.3–2.5 M. (4–8°) high, stem annual, 2.5–5 Cm. (1–2') thick, purplish, hollow; leaves 12.5 Cm. (5') long, ovate, smooth, rich-green, entire; flowers greenish-white, racemes; fruit purplish berry, 8 Mm. ($\frac{1}{3}$ ') thick, 10-seeded, juice purplish-red. Root, cylindrical,

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3–7 Cm. (1–3') thick, transverse or longitudinal slices, yellowish-brown, longitudinally wrinkled, annulate; internally fibro-vascular tissue and parenchyma, the latter much retracted; odor slight, taste sweetish, acrid. Powder, brownish-yellow, sternutatory—starch grains, calcium oxalate raphides, fragments of parenchyma, tracheæ, cork tissue; solvents: diluted alcohol, boiling water; contains glucoside—active, poisonous, saponin-like—starch, sugar, calcium oxalate (phytolaccine, -in, -ic acid). Alterative, laxative, emetic, resolvent,



FIG. 107.—Phytolacca root: transverse section, natural size.

anodyne, paralyzant; rheumatism, skin diseases, syphilis, ulcers, scabies, eczema, tonsillitis, diphtheria. *Poisoning*: Symptoms and treatment similar to aconite. Dose, alterative, gr. 1–5 (.06–.3 Gm.), emetic, gr. 10–30 (.6–2 Gm.); 1. *Fluidextractum Phytolacæ* (diluted alcohol), dose, m̄v–30 (.3–2 cc.); 2. *Fluidextractum Trifolii Compositum*, 10 p. c. *Decoction*, 5 p. c., ʒiv–8 (15–30 cc.); *Tincture*, 10 p. c., m̄x–60 (.6–4 cc.). *P. octan'dra*, C. and S. America, and *P. acino'sa*, N. India, are used similarly. All of these furnish young shoots which in spring may be eaten for asparagus, spinach, etc., imparting no odor to urine, but when old none should be taken except in medicinal doses.

3. *Magno'lia virginia'na* (*glau'ca*), *M. acumina'ta*, and *M. tripet'ala*.—Magnoliaceæ. The bark, U.S.P. 1820–1880: United States; trees 6–28 M. (20–90°) high; flowers white, fragrant; fruit cones; bark in thin quills or curved pieces, orange-brown, glossy, warty, fissured, astringent,

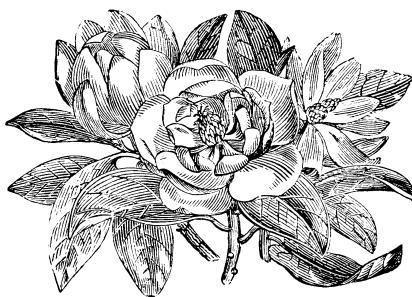


FIG. 108.—*Magnolia acuminata*.

bitter; contains volatile oil, resin, magnolin, tannin. Used for malaria, rheumatism, gout, intermittents, catarrhs; in decoction, infusion, tincture. Dose, ʒss–1 (2–4 Gm.).

4. *Lirioden'dron Tulipif'era*, *Tulip-tree*.—The bark, U.S.P. 1820–1870; United States, China; tree 18–45 M. (60–150°) high; flowers yellowish; fruit cone, 7.5 Cm. (3') long. Bark in quills or curved pieces 2 Mm. ($\frac{1}{12}$ ') thick, purplish-brown, thin ridges, inside whitish,

smooth, astringent; contains volatile oil, resins, liriiodendrin, tulipiferine, tannin; injured by boiling. Used for chronic rheumatism, dyspepsia, intermittent fever; in infusion or fluidextract. Dose, 3 ss-1 (2-4 Gm.).

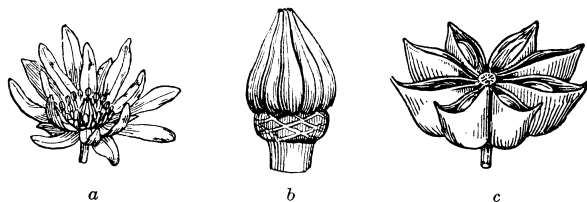


FIG. 109.—*Illicium verum*: a, flower; b, fruit carpels of the flower magnified; c, fruit.

5. *Illicium ve'rum*, *Star Anise*.—The fruit, U.S.P. 1880-1890; N. Annam, S. W. China (mountains). Small tree, 3-6 M. (10-20°) high, branched; leaves evergreen, lanceolate, pointed, entire, pellucid-punctate, 5-15 Cm. (2-6') long; flowers greenish-yellow. Fruit (capsule—integuments 87 p. c., seed 22 p. c.), star-shaped, being composed of 8 stellately arranged boat-shaped carpels, 8 Mm. ($\frac{1}{3}$ ') long, woody, wrinkled, brown, dehiscent on upper suture; internally each carpel glossy, reddish-brown, containing 1 flattish, oval, glossy-brown seed; odor anise-like (*anisatum*); taste sweet, aromatic—seed oily; contains (integuments)—volatile oil (one of the sources of *Oleum Anisi*, U.S.P.) 5.3 p. c. (congeals at



FIG. 110.—*Illicium religiosum* (*anisatum*).



FIG. 111.—*Drimys Winteri*.

1° C.; 34° F., and consists chiefly of anethol), resin 10.7 p. c., fixed oil 2.8 p. c., saponin, protocatechuic acid, shikimic acid, mucilage, ash 2 p. c.; (seed)—volatile oil 1.8 p. c., resin 2.6 p. c., fixed oil 20 p. c.; solvents: alcohol, hot water partially. *Adulteration*: Poisonous fruit

MYRISTICACEÆ

of the allied species, *Illicium religiosum* (*anisatum*). Carminative, anodyne, stimulant, diuretic; flatulent colic, indigestion, infantile catarrh, bronchitis, rheumatism, earache, flavoring. Dose, gr. 5–30 (.3–2 Gm.); infusion, 5 p. c., ʒj–2 (30–60 cc.); volatile oil m̄j–2 (.06–.13 cc.).

6. *I. religio'sum* (*anisa'tum*).—Cultivated around Buddhist temples in China and Japan, being called *Shikimi*. Fruit very similar to the preceding, having 8 carpels, but is more woody and shriveled, with thin, upward-curved beak; odor faint, clove-like; taste unpleasant; contains .44 p. c. of a non-solidifying volatile oil, sp. gr. 0.990, shikimic acid, sikimipicrin (crystalline, bitter), and sikimin (poisonous). The oil consists of a terpene, safrol, $C_{10}H_{10}O_2$, eugenol, $C_{10}H_{12}O_2$, and liquid anethol. The fruit is used natively for killing rats, fish, etc., the latter serving as food in spite of the poison. Upon persons it causes vomiting, epileptiform convulsions, and dilated pupils; *I. florida'num* and *I. parviflo'rum*; Fla., Ga., La.; the former has fruit with 13 carpels, the latter with only 8; barks are substituted sometimes for cascarilla.

5. *Dri'mys Win'teri* (*Win'tera aroma'tica*).—The bark, U.S.P. 1820–1860; S. America; small tree; leaves coriaceous; flowers white; fruit black berries, 4–8; bark in quills or curves, 2.5–8 Mm. ($\frac{1}{10}$ – $\frac{1}{3}$ ') thick, grayish-brown, striate, fracture granular, with white stone cells and yellow resin cells, odor of canella and cinnamon, for which drugs it has been substituted; sometimes called Winter's cinnamon; contains volatile oil (which has winterene, $C_{15}H_{24}$), tannin 9 p. c., pungent resin 10 p. c. Used for colic, flatulence, scurvy; in infusion or tincture. Dose, gr. 5–30 (.3–2 Gm.).

21. MYRISTICACEÆ. Nutmeg Family.

Mi-ris-ti-ka'se-e. L. *Myristic-a* + aceæ, fr. Gr. *μυρίτζεω*, to anoint—*i. e.*, an ointment used for its sweet odor. Trees. Distinguished by aromatic properties: leaves dotted, entire, stalked, leathery; flowers regular, diœcious, calyx 3–4-cleft, leathery, inferior; filaments 3–12, united, ovary 1-celled, ovule 1; fruit succulent, seeds oily; tropics; aromatic, seeds the strongest; bark and pericarp acrid.

Genus: 1. **Myristica.**

MYRISTICA. MYRISTICA, U.S.P.

Myristica fragrans,
Houttuyn.

{ The dried ripe seed deprived of seed-coat—
the kernel, with or without thin coating of
lime, yielding not less than 25 p. c. non-
volatile, ether-soluble extractive, nor more
than .5 p. c. acid-insoluble ash.

Habitat. Molucca Islands; cultivated in tropics, India, Philippine Islands, Amboyna, Boura, New Guinea, E. Indies, W. Indies, S. America, Ceylon, Sumatra, Java, etc.

Syn. Myrist., Nutmeg, Round Nutmeg; Fr. Muscade des Moluques, Noix Muscade, Nux Muschata, Nuces Nucistæ; Ger. Semen Myristicæ, Muskatnuss, Myristicasamen.

My-ris'ti-ca. L. see etymology, page 190, of Myristicaceæ.

Fra'grans. L. *fragan(t)s*, sweet-scented—*i. e.*, from its fragrant odor.

Nut'meg. OE, *nut* + *muge*, musk, corrupted into *meg*—*i. e.*, from its odor.

PLANT.—Evergreen tree 7.5–15 M. (25–50°) high, much branched, bark brownish-gray, smooth, young branches green; leaves leathery, smooth, entire, 10–15 Cm. (4–6') long, acute at both ends, prominently veined, dark green; flowers diœcious, small, yellow, fruit pendulous, smooth, yellow, 7.5 Cm. (3') long, 5 Cm. (2') wide, resembling a peach, but grooved by a longitudinal furrow, pericarp, 12 Mm. ($\frac{1}{2}$ ') thick, tough, fleshy, with astringent juice, yellowish-white, dehiscing from above along the furrow into 2 equal valves that become dry and coriaceous when ripe, and from between which readily falls out the erect, blunt, single seed closely enveloped, reticulately furrowed and almost completely covered by an irregularly cut fleshy arillus (mace); when deprived of this latter the seed-testa is dark brown, hard, thick, smooth, shining, woody; inner seed-coat thin, membranous, pale brown. **KERNEL** (myristica, nutmeg), ovoid, ellipsoidal, 20–30 Mm. ($\frac{4}{5}$ – $1\frac{1}{5}$ ') long, 15–20 Mm. ($\frac{3}{8}$ – $\frac{4}{5}$ ') thick, light brown, reticulately furrowed from the tightly oppressed arillus, broad end with large circular, upraised scar from which arises a groove extending to a depression at opposite end (chalaza), easily cut, surface having waxy luster, mottled from light brown perisperm penetrating into the yellowish-brown endosperm; longitudinal section through endosperm above large scar shows cavity with shrunken remains of embryo and usually with a growth of mold; odor characteristically aromatic; taste pungently aromatic. **POWDER**, reddish-brown—fragments of perisperm with reservoirs containing volatile oil, parenchyma cells filled with aleurone and starch grains, .003–.02 Mm. ($\frac{1}{8325}$ – $\frac{1}{1250}$ ') broad—blue with iodine T. S., whereas starch in mace—yellowish-red; occasional tracheæ; mounts in chloral hydrate T. S.—shows numerous globules of fixed oil, which may separate in rod-like crystals; mounts in fixed oil—show separated aggregates of crystals which strongly polarize light; powder from “limed” nutmegs under microscope, upon adding water containing 25 p. c. of sulphuric acid—show separation of calcium sulphate crystals (needles, short rods) which do not polarize light. Some accept the hard testa and kernel as the seed, like peach seed, but the U.S.P. recognizes solely the kernel or nucleus, that central part left after the fleshy portion, arillus, and hard testa have been removed. Those that are broken, of light weight, feeble odor and taste, musty, wormy and black-veined should be rejected. *Solvents*: alcohol; ether. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—**KERNELS**: Rare—those punctured, boiled, and plugged, recognized by lightness, insect ravages, and pegs (on breaking open); also false nutmegs, in spite of easy detection; Papua (large), Macassar (small)—*M. fatua* and *M. argentea*—both longer, more

MYRISTICACEÆ

narrow and pointed, the former with little aroma after drying, the latter more brittle and aromatic, and furrowed with 4 broad stripes. POWDER (GROUND): Common—partially or wholly exhausted refuse, from percolation or distillation.

Commercial.—Plant prefers light soil, shade, and moist climate, produces fruit when 8–9 years old, matures at 25, and yields annually for 60–70 years. Fruit was unknown to the ancients, Avicenna being the first to notice it, and is collected when split on one or both sides, Sept.–Dec., (also April–June) by means of a hook on a long pole, or by hand, placed into baskets, pericarp and arillus removed, and the

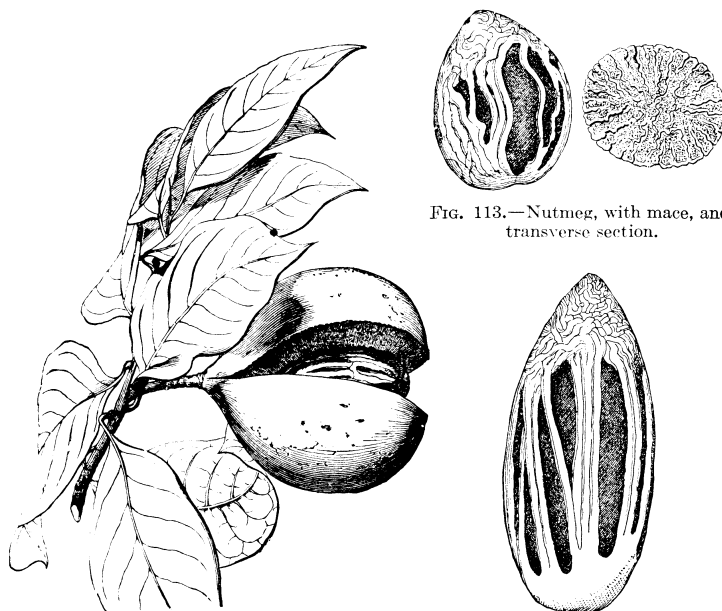


FIG. 112.—*Myristica fragrans*: twig with the fruit.

FIG. 114.—Wild nutmeg, with mace.

seed, spread on frames to dry by sun or fire at 60° C. (140° F.), being turned over every few days for 2 months. When kernels rattle in the shells, the latter are cracked off with mallets, and the former assorted, the best being rubbed over with powdered lime and packed in white-washed casks or chests for market. The Chinese are supplied with uncracked seed, while inferior grades are utilized for expressing the fixed oil. There are several varieties: 1, *Unlimed* (*Brown, Penang, Singapore*), as above described, sometimes oily to the touch, and mixed with clove; 2, *Limed* (*Dutch, Batavian*), prepared in the Banda Islands by steeping the dried seed for a short time in a mixture of salt water

and lime (a protection against insect attacks, and possibly to kill the embryo thereby restricting the culture to their own provinces), then exposing to the sun several days and packing for market; 3, *Artificial*, prepared by compressing a mixture of earthy and powdery matter, being less aromatic than the genuine, also soft and crumbly when in boiling water 3 minutes; contains volatile oil 2 p. c., fat 15 p. c., ash 11–18 p. c.

CONSTITUENTS.—Volatile oil 2–8–15 p. c., fixed oil 25–30 p. c., starch, proteins, mucilage, ash 2–5 p. c.

Oleum Myristicæ. **Oil of Myristica**, *U.S.P.*—(Syn., Ol. Myrist., Myristica Oil, Oil of Nutmeg, Oleum Nucistæ Æthereum; Fr. Essence de Muscade; Ger. Oleum Macidis, Ätherisches Muskatnussöl.) This volatile oil, distilled from the dried kernels of the ripe seed with water or steam, is a colorless, pale yellow liquid, characteristic odor and taste of nutmeg; soluble in alcohol (1), in 90 p. c. alcohol (3), sp. gr. 0.859–0.924, dextrorotatory; contains *d*-pinene and *d*-camphene 80 p. c., dipentene 8 p. c., eugenol, safrol, myristicol, $C_{10}H_{16}O$, and myristicin, $C_{12}H_{14}O_3$. The nutmeg camphor (once thought to be myristin), which sometimes settles on standing, is myristic acid. *Tests*: 1. Evaporate 3 Gm. on water-bath—residue .06 Gm. 2. Recently distilled oil in alcohol (1)—neutral or only slightly acid. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mij –3 (.13–.2 cc.).

Fixed Oil. (**Oleum Myristicæ Expressum**, **Oleum Nucistæ**.)—Obtained by bruising nutmegs, exposing them in a bag to steam, and expression between heated plates; the oil runs out a liquid, but congeals upon cooling; often called *nutmeg butter*, and improperly *oil of mace*; it is an orange-brown solid, sp. gr. 0.995, melting at 45°C . (113°F .), soluble in hot ether (2), hot alcohol (4); consists mainly of myristin, with some myristic acid, palmitin, olein, resin, volatile oil 6 p. c. Dose, gr. 2–5 (.13–.3 Gm.).

PREPARATIONS.—I. SEED: 1. *Tinctura Lavandulæ Composita*, 1 p. c. 2. *Tinctura Rhei Aromatica*, 2 p. c. 3. *Pulvis Aromaticus*, *N.F.*, 15 p. c. 4. *Pulvis Cretæ Aromaticus*, *N.F.*, 6 p. c. 5. *Syrupus Sennæ Aromaticus*, *N.F.*, $\frac{1}{5}$ p. c. II. OIL: 1. *Spiritus Ammoniaë Aromaticus*, $\frac{1}{10}$ p. c. 2. *Elixir Pepsini et Rennini Compositum*, *N.F.*, $\frac{1}{100}$ p. c. 3. *Mistura Oleo-Balsamica*, *N.F.*, $\frac{2}{5}$ p. c. *Spiritus Myristicæ* (Br.), 10 p. c. Dose, $\text{m}\nu$ –20 (.3–1.3 cc.).

PROPERTIES.—Stimulant, stomachic, narcotic, flavoring, condiment, increases gastric juice, digestion, appetite; large doses, like camphor, act on the cerebrum, causing stupor, delirium.

USES.—Flatulence, gastric debility, diarrhea, dysentery, vomiting, colic, dyspepsia, flavoring, condiments.

Allied Products:

1. *Macis*, *Mace*.—The arillode of the seed of *Myristica fragrans*, *U.S.P.* 1850–1900. When fruit first gathered the fleshy pericarp is removed, the thin coating (arillode) enveloping the seed peeled off with a knife, then sprinkled with salt water, as a preservative, and

RANUNCULACEÆ

dried by sun or fire; or it may be allowed to remain on the seed until thoroughly dry, when it freely cracks and peels off. It is a brilliant, scarlet (fresh), or brownish-orange (dry), brittle, in narrow bands, 2.5 Cm. (1') long, branched, lobed above, fatty when scratched or pressed, fracture short, showing many oil-cells; odor fragrant; taste warm, aromatic; contains volatile oil (oleum macidis) 4–9–17–35 p. c., resin 25 p. c., sugar 1 p. c., amyloextrin 1.8 p. c., fixed oil, mucilage, proteins (no starch), ash 1–3 p. c.; solvent: alcohol. Tinctura Macidis, 20 p. c. (alcohol). *Adulterations*: Common (entire and powdered)—nutmeg, starch, ginger, and mace of *M. malabar'ica* and *M. fatua*; this latter readily being detected by darker reddish color, more fatty, resinous, lustrous surface, weaker taste and odor, yielding 10 times more ether-extract, and microscopic specimen turning dark brown with potassium hydroxide solution, becoming yellow with sulphuric acid. Stimulant, tonic, flavoring. Dose, gr. 5–20 (.3–1.3 Gm.).

2. *False, Long, Wild, Male Nutmegs*—*M. fat'ua* and *M. argen'tea*.—These are 4–5 Cm. (1½–2') long, paler and less aromatic than official, the mace inodorous and less deeply lobed.

22. RANUNCULACEÆ. Crowfoot Family.

Ra-nung-ku-la'se-e. L. *Ranuncul-us* + aceæ, dim. of *rana*, a frog; hence little frog, as many species grow in moist places near that reptile. Herbs, shrubs with colorless, acrid, poisonous juice. Distinguished by flowers being regular or irregular, most complete; organs all distinct; no adhesion or cohesion; often yellow; sepals 3–15, mostly 5 (often petaloid); petals 3–15; only 1 circle; stamens many, hypogynous; pistils distinct; seeds albuminous, superior; temperate climates; narcotic, bitter, tonic, poisonous.

Genera: 1. *Hydrastis*. 2. *Cimicifuga*. 3. *Aconitum*.

HYDRASTIS. HYDRASTIS, U.S.P.

Hydrastis canadensis,
Linné.

{ The dried rhizome and roots with not more than 2 p. c. stems and leaves, nor 2 p. c. other foreign organic matter, yielding not less than 2.5 p. c. ether-soluble alkaloids, nor more than 3 p. c. of acid-insoluble ash.

Habitat. N. America, Canada, east of the Mississippi; rich woodlands, mountains.

Syn. Golden Seal, Yellow (Orange) Root, Yellow Puccoon (Indian Paint), Turmeric (Jaundice) Root, Ohio Curcuma, Indian Turmeric (Dye), Ground Raspberry, Eye Balm (Root), Yellow Eye; Br. Hydrastis Rhizoma; Fr. Racine Orange, Seeau d'Or; Ger. Hydrastisrhizom, Canadische Gelbwurzel.

Hy-dras'tis. L. fr. Gr. ὕδωρ, water, + δράω to act—*i. e.*, alluding to the active properties of the juice, or to the plants growing in marshy places.

Can-a-den'sis. L. of Canada—*i. e.*, its northern habitat limit.

Golden Seal—*i. e.*, its yellow scarred rhizome, once used as a paint and dye.

PLANT.—Perennial herb 15–30 Cm. (6–12') high, simple, hairy, 2-leaved near apex, one sessile at top, the other an inch or so below with thick petiole; leaves pubescent, round, cordate, palmately 5–7-lobed, pointed, serrate, 10–22.5 Cm. (4–9') wide; flowers May–June, only one, greenish-yellow, arising from upper leaf on a peduncle; fruit compound red berry, 12 Mm. ($\frac{1}{2}$ ') thick, composed of 12 or more 1–2-seeded berries like raspberry. RHIZOME, horizontal or oblique growth, subcylindrical, flexuous, 1–5 Cm. ($\frac{2}{5}$ –2') long, 2–10 Mm. ($\frac{1}{12}$ – $\frac{2}{5}$)

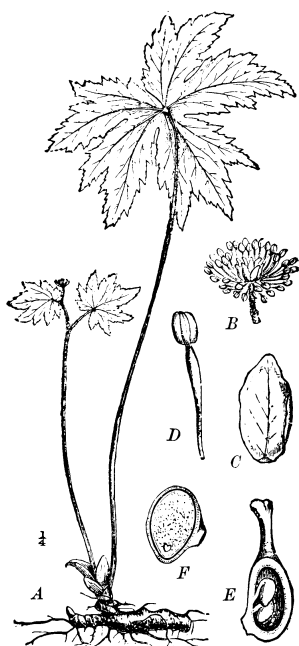


FIG. 115.—*Hydrastis canadensis*: A, rhizome, stem, etc.; B, flower; C, petal; D, stamen; E, fruit carpel, longitudinal section; F, seed.



FIG. 116.—*Hydrastis canadensis*: rhizome.

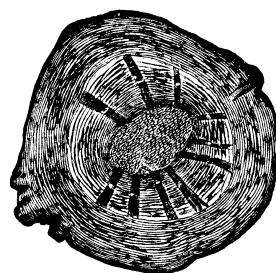


FIG. 117.—*Hydrastis* rhizome: transverse section, magnified.

thick, grayish-brown, longitudinally wrinkled, annulate from scars of bud-scales; upper surface occasionally with stem- or leaf-bases, many stem-scars; under and lateral surfaces with easily detached filiform roots, up to 35 Cm. (14') long, and 1 Mm. ($\frac{1}{25}$ ') thick; yellowish; brittle; curved, twisted, matted, or broken; fracture short, waxy; internally deep yellow, or greenish-yellow, enclosing an interrupted circle of small fibro-vascular bundles; odor distinctive; taste bitter. POWDER, brownish-yellow—numerous starch grains, .002–.015 Mm. ($\frac{1}{12500}$ – $\frac{1}{6300}$) broad, parenchyma and fragments of tissues with fibro-vascular

RANUNCULACEÆ

bundles, tracheæ, tabular cork cells, no calcium oxalate crystals. *Test*: 1. Moistened with water, mounted directly in sulphuric acid shows numerous acicular, or rod-shaped crystals. *Solvents*: alcohol; diluted alcohol; boiling water. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Rhizomes of *Aristolochia Serpentaria*, *Aristolochia reticulata*, *Cypripedium hirsutum*, *Cypripedium parviflorum*, *Asarum canadense*, *Xanthorrhiza apiifolia*, and roots of *Stylophorum diphyllum*.

Commercial.—The Cherokee Indians used hydrastis very early as a domestic remedy and dye, and although they disclosed its value to the American settlers, it did not attract medical attention until 1798, but soon thereafter became popular with the “Eclectics” and later one of our important drugs.

CONSTITUENTS.—Hydrastine 1.5–3.14 p. c., Berberine 3–4 p. c., Canadine (resin, fluorescent compound, starch, sugar, gum, fat, coloring matter), ash 5 p. c.

Hydrastina, Hydrastine, $C_{21}H_{21}O_6N$.—This characteristic colorless alkaloid is obtained by adding hydrochloric or sulphuric acid in excess to an alcoholic tincture of hydrastis, whereby the corresponding berberine salt deposits in crystals; to the filtered mother-liquor add ammonia water until acidity is nearly neutralized, strain to remove ammonium salt, concentrate to a syrupy consistence and pour this into 10 volumes of cold water, to remove fat and resin; to the filtrate, containing crude hydrastine salt, add ammonia water in excess to precipitate impure alkaloid, which may be purified by dissolving in diluted sulphuric acid, again precipitating with ammonia water and repeated crystallization from hot alcohol; also prepared synthetically; occurs in white, creamy white, glistening prisms, white microcrystalline powder, permanent, soluble in benzene, alcohol (170), hot alcohol (22), chloroform (1.4), ether (175); insoluble in water; saturated alcoholic solution alkaline, melts at $131^{\circ}C$. ($268^{\circ}F$). Dose, gr. $\frac{1}{4}$ – $\frac{1}{2}$ (.016–.03 Gm.).

Hydrastinae Hydrochloridum, Hydrastine Hydrochloride, $C_{21}H_{21}O_6N.HCl$, *N.F.*—The hydrochloride of the alkaloid hydrastine obtained by dissolving the pure alkaloid in alcoholic solution of hydrochloric acid, concentrating until crystals appear; occurs as a white, creamy-white powder, odorless, hygroscopic; soluble in water, alcohol, slightly in chloroform, ether; aqueous solution (1 in 20) neutral, slightly acid. *Tests*: 1. With silver nitrate T. S.—white precipitate, insoluble in nitric acid; with sulphuric acid—yellow color, changing to purple on heating. 2. With sulphuric acid containing .005 Gm. molybdic acid in each cc.—green, olive-green, brown; substitute selenous acid for molybdic acid—light green color, changing to brown; with nitric acid—reddish-yellow color; incinerate .1 Gm.—ash non-weighable. 3. Solution of .1 Gm. in diluted sulphuric acid 10 cc.—no blue fluorescence (abs. of hydrastinine), but gradually adding potassium permanganate T. S., avoiding excess—blue fluorescence develops. 4. Aqueous solu-

tion (1 in 20)—not reddened by chlorine water (abs. of berberine). Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{4}$ – $\frac{1}{2}$ (.016–.03 Gm.).

Hydrastininæ Hydrochloridum, Hydrastinine Hydrochloride, $C_{11}H_{11}O_2N.HCl$.—This hydrochloride of the artificial alkaloid is obtained by the oxidation of hydrastine with an oxidizing agent (nitric acid, potassium dichromate or permanganate, etc.) in acid solution; dissolve hydrastine 10 Gm. in nitric acid 75 cc., heat to 60° C. (140° F.), upon cooling opianic acid crystallizes out, add to filtrate potassium hydroxide solution to precipitate hydrastinine, purify by recrystallizing from benzene or acetic ether, dissolve crystals in hydrochloric acid, crystallize from alcohol; occurs in light yellowish needles, yellowish-white, crystalline powder, odorless; soluble in water, alcohol, chloroform (195), ether (1820); aqueous solution (1 in 20) neutral, with blue fluorescence, especially when highly diluted, melts at 210° C. (410° F.) with partial decomposition. Used chiefly for uterine hemorrhage (hypodermically), also as oxytocic; slows heart, but increases force of contraction, motor-depressant, paralyzant. Dose, gr. $\frac{1}{3}$ – $\frac{1}{2}$ (.02–.03 Gm.), in 10 p. c. solution.

Berberine, $C_{20}H_{17}O_4N$.—This colored alkaloid is obtained by the preceding process for separating hydrastine; occurs in bitter yellow needles, crystalline powder, soluble in hot water or alcohol; the hot alcoholic solution with iodine gives dark green lustrous scales; forms several yellow salts, carbonate, hydrochloride, phosphate, sulphate, etc., which dissolve in water with difficulty; found also in berberis, calumbæ, coptis, menispermum, xanthorrhiza, etc. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.).

Canadine, $C_{20}H_{21}O_4N$.—This forms white needles; in alcohol solution, with iodine get yellow crystals; it is called sometimes tetrahydroberberine, and differs from hydrastine in being more soluble in acetic ether and alcohol; only the hydrochloride and sulphate are easily soluble in alcohol or hot water; the name xanthopuccine once assigned to it, but as such it was very likely impure berberine.

PREPARATIONS.—I. RHIZOME: 1. *Fluidextractum Hydrastis*. Fluid-extract of Hydrastis. (Syn., Fldext. Hydrast., Fluid Extract of Hydrastis, Fluidextract of Golden Seal; Br. Extractum Hydrastis Liquidum; Fr. Extrait fluide d'Hydrastis; Ger. Hydrastisfluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st menstruum: alcohol 60 cc., water 20, glycerin 10; 2d: 67 p. c. alcohol; reserve first 75 cc., in which dissolve soft extract, assay and add 2d q. s. for 100 cc. to contain 1.8–2.2 Gm. of ether-soluble alkaloids. Dose, m̄v–30 (3–2 cc.): Preps.: 1. *Mistura Rhei Alkalina*, *N. F.*, $\frac{4}{5}$ p. c.

2. *Elixir Hydrastis Compositum*, Alkaline Elixir, *N. F.*, fldext. 1.75 p. c. + fldexts. oat, xanthox. āā 1.75, fldexts. gentian, ginger āā .875, sodium bicarb. .875, elix. arom. q. s. 100.

2. *Extractum Hydrastis*, *N. F.*; yields 9–11 p. c. of ether-soluble alkaloids, and 1 Gm. represents 4 Gm. of hydrastis. Dose, gr. 1–10 (.06–.6 Gm.). 3. *Tinctura Hydrastis*, *N. F.*, 20 p. c. (67 p. c. alcohol). Dose,

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℥ss-1 (2-4 cc.). II. HYDRASTINE: 1. *Liquor Hydrastinæ Compositus*, Colorless Hydrastine Solution, *N.F.*, $\frac{3}{10}$ p. c. Dose, ℥ss-1 (2-4 cc.).

Unoff. Preps.: *Decoction*, 5 p. c., ℥j-2 (30-60 cc.). *Hydrastin* of "Eclectics" is a resinoid, prepared by exhausting the drug with alcohol, evaporating, and precipitating with acidulated (HCl) water; it is chiefly berberine chloride, which often occasions for it the substitution of the pure hydrochloride of that alkaloid, dose, gr. 2-6 (.13-.4 Gm.).

PROPERTIES.—Upon digestion, circulation, respiration, and nervous system analogous to, but much milder than, strychnine. Bitter tonic, increases appetite, digestion, gastric secretions (berberine), and the

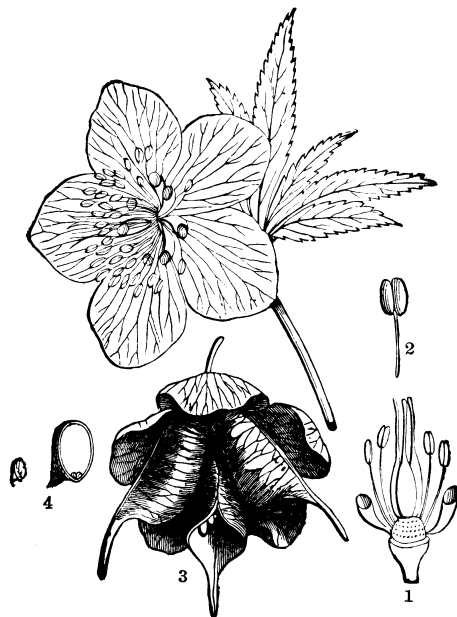


FIG. 118.—*Helleborus viridis*: 1, receptacle, tricarpedal ovary, and stamens; 2, a stamen; 3, the three resulting ripened fruits; 4, a seed.

flow of bile; antiperiodic, protoplasmic poison, interfering with the white blood-corpuscle movement, alterative to the mucous membranes, deobstruent to the glandular system, antiseptic, cholagogue, diuretic. Hydrastine acts on the nervous system like quinine, but it is non-toxic, as large doses only produce warmth in the stomach and ringing in the ears.

USES.—Chronic dyspepsia and cystitis, catarrhs of the stomach, duodenum, gall-ducts, bladder, uterus and vagina, constipation, bronchitis, malaria, intermittent fever, jaundice. Locally in gonorrhea, leucorrhea, otorrhea, gleet, chronic nasal catarrh and pharyngitis,

syphilitic sores in the mouth, nares, and throat, unhealthy intractable ulcers and sores, cancers, fistulas, hemorrhoids, fissured nipples, conjunctivitis, tonsillitis, hemorrhage. Hydrastine for chronic malaria is much weaker, but next in value to quinine; hydrastinine (hypodermically) for menorrhagia and metrorrhagia. The yellowish liquids are objectionable owing to their staining qualities, for which, however, the Indians valued them in dyeing fabrics yellow; with indigo they impart a fine green to wool, silk, and cotton.

Poisoning: Same as for *nux vomica* and strychnine.

Incompatibles: Alkalies, mineral acids, tannic and other vegetable acids, chloral hydrate, potassium bromide, motor depressants.

Synergists: Quinine and the vegetable tonics upon the stomach, ergot upon the uterus, and strychnine upon the spinal cord.

Allied Plants:

1. *Coptis trifolia*, *Coptis*, *Goldthread*, *N.F.*—The dried plant with not more than 3 p. c. of foreign organic matter; N. America, damp, mossy woods. Plant with scape 7.5–12.5 Cm. (3–5') high, leaves radical, 3-foliate; evergreen, obovate-cuneate, coriaceous, flowers May, whitish; fruit 7 follicles, seed black. Rhizome, in loose, matted masses (rhizome, roots, leaves), golden-yellow; odor faint; taste bitter without astringency. Powder, yellowish-green—starch grains, elliptical stomata, chloroplastids, root cells with reddish contents, tracheæ; contains berberine, coptine (white, possibly identical with hydrastine), resin, ash 8 p. c. Masticatory; mouth wash for canker-sores, gargle for sore throat, ulcerated mouth. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Coptis* (diluted alcohol). *Tincture*, 10 p. c.; *Infusion*, *Decoction*, 5 p. c.

2. *Adonis vernalis*, *Adonis*, *Pheasant's Eye*, *False Hellebore*, *N.F.*—The dried overground portion with not more than 5 p. c. of foreign organic matter; N. Europe, Asia, cultivated for ornament. Plant 15–50 Cm. (6–20') high, leaves light green, pinnatifid; flowers yellow, stem glabrous, grooved, soft, weak, fruit, head of ovoid achenes; odor faint; taste bitterish, acrid. Powder, grayish-green—pith parenchyma, tracheæ, elliptical stomata, few or no starch grains and calcium oxalate crystals; contains aconitic acid, *adonidin* (adonin—consisting largely of aconitic acid) and *picroadonidin* which is a powerful heart poison, bitter, amorphous, soluble in water, alcohol, ether. Cardiac stimulant, diuretic, resembles *digitalis*, being more prompt and non-cumulative, but inferior to it—increases heart-force and arterial pressure; cardiac failure and dropsy, dyspnea, epilepsy. Dose, gr. 1–2 (.06–.13 Gm.); 1. *Fluidextractum Adonidis* (75 p. c. alcohol); *Adonidin*, gr. $\frac{1}{16}$ – $\frac{1}{3}$ (.004–.02 Gm.).

3. *Helleb'orus ni'ger*, *Black Hellebore*.—The dried rhizome and roots, U.S.P. 1820–1870; C. and S. Europe, mountains. Acaulescent perennial, leaves evergreen, 7–9-lobed, flowers rose-like. Rhizome knotty, 5 Cm. (2') long, 12 Mm. ($\frac{1}{2}$ ') thick, blackish, bark thick, wood-wedges 8, medullary rays broad, taste sweet, bitter, usually from Germany;

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contains helleborin, helleborein, helleboretin, resin, volatile oil, fixed oil, gum, etc. Heart stimulant, drastic hydragogue cathartic, alterative; used for melancholia, mania, dropsy, amenorrhea, epilepsy, skin troubles; in decoction, infusion, tincture, extract. Dose, gr. 5-20 (.3-1.3 Gm.).

4. *H. fœtidus*, *Bear's Foot*.—The leaves, U.S.P. 1820-1830; Europe. Perennial herb—the most energetic of the genus. Used for asthma, hysteria, hypochondriasis, tenia; in powder, decoction, syrup. Dose, gr. 5-20 (.3-1.3 Gm.). *H. viridis*, *Green Hellebore*. The rhizome (root), United States, Europe; rhizome about the same as *H. niger*, but has only 4 wood-wedges, and is smaller.

5. *Xanthorhiza apifolia*, *Shrub Yellow-Root*.—The rhizome and roots, U.S.P. 1820-1870; S. and C. United States. Shrub .6-1 M. (2-3°) high, stem clustered, 6 Mm. ($\frac{1}{4}$ ') thick, wood yellow, leaves compound, flowers April, purple, racemes, rhizome .6-1 M. (2-3°) long, 12 Mm. ($\frac{1}{2}$ ') thick, yellowish internally and externally, bitter; contains berberine, resin, starch, gum, etc. Used as a tonic like calumba or quassia; in infusion, decoction, tincture. Dose, 5ss-1 (2-4 Gm.).

CIMICIFUGA. CIMICIFUGA, U.S.P.

<p>Cimicifuga racemosa, (Linné) Nuttall.</p>	{	<p>The dried rhizome and roots with not more than 2 p. c. stems or other foreign organic matter, yielding not more than 4 p. c. acid-insoluble ash.</p>
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Habitat. United States, Canada; in shady, rocky places.

Syn. Cimicif., Black Cohosh, Black Snakeroot, Macrotys, Bugbane, Bugwort, Rattleroot, Rattleweed, Richweed, Squawroot, Rattlesnake's Root; Cimicifuga Rhizoma, Actææ Racemosæ Radix; Fr. Racine d'Actée a Grappes; Ger. Schwarze Schlangenwurzel.

Cim-i-cif u-ga. L. *cimez*, bug, + *fugare*, to drive away—*i. e.*, from the fact of *Cimicifuga fatida* being used for that purpose in Siberia and Kamtchatka.

Ra-ce-mo'sa. L. *racemosus*—*i. e.*, full of clusters, racemes—*i. e.*, the flowers.

PLANT.—Perennial; stem slender, unbranched, 1.5-2.5 M. (5-8°) high; leaves irregularly ternately decomposed, the rather small leaflets incised, 2.5-7.5 Cm. (1-3') long; flowers June-July, regular, numerous, small, white, in wand-like racemes, 20-50 Cm. (8-20') long, emit disagreeable odor. RHIZOME, horizontal in growth, branched, 2-15 Cm. ($\frac{1}{2}$ -6') long, 1-2.5 Cm. ($\frac{1}{2}$ -1') thick, dark brown, grayish-black, slightly annulate from circular scars of bud scale-leaves; upper surface with numerous hard, erect, curved branches terminated by deep cup-shaped scars showing radiate structure; lower and lateral surfaces with numerous root-scars and few short roots; fracture horny; internally whitish and mealy or dark brown and waxy; bark thin, wood distinctly radiate and of same thickness as pith; odor slight; taste bitter, acid; roots cylindrical, obtusely quadrangular, 1-3 Mm. ($\frac{1}{25}$ - $\frac{1}{8}$)

thick, 3-12 Cm. ($1\frac{1}{5}$ - $4\frac{4}{5}$ ') long, brownish, blackish, longitudinally wrinkled, fracture short; internally cortex thin, brownish, wood yellowish, 4-6-rayed. POWDER, light brown—numerous starch grains, .003-.015 Mm. ($\frac{1}{8325}$ - $\frac{1}{1650}$ ') broad, fragments showing tracheæ with



FIG. 119.—*Cimicifuga racemosa*.

bordered pores and lignified wood-fibers, fragments of suberized epidermis made up of tabular cells. *Solvents*: alcohol, boiling water. Dose, gr. 5-30 (.3-2 Gm.).

ADULTERATIONS.—Rare: Caulophyllum, podophyllum, each sometimes 1 p. c., comfrey, possessing similar blackish color, smaller amount.

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Commercial.—Plant, also named *Actæ'a racemosa*, emits when in bloom an odor resembling meadow-sweet, by many considered unpleasant. Rhizome should be collected in autumn (most active), and used shortly thereafter, as it deteriorates with age; recognized readily by the microscope from black and green hellebore whose rhizomes have few and broad wood-bundles and roots with pentagonal or hexagonal wood-zone; rhizome of *Actæa spicata*, Europe, very similar, but its juicy berries are in marked contrast with the official plant's dry follicles.

CONSTITUENTS.—Cimicifugin, resins 3.5 p. c., amorphous resinous body (probably the active principle), racemosin, fat, starch, gum, tannin, volatile oil, sugar; ash 8–10 p. c.; latest investigators claim activity to depend upon: isoferulic acid, salicylic acid, palmitic acid, phytosterol, 3 crystalline bodies (alcohols ?), alkaloids (trace).

Cimicifugin.—Bitter, acrid crystalline principle, obtained by acting on the "Eclectic" resinoid, cimicifugin, or upon the fresh rhizome with alcohol, precipitating (resin, tannin, coloring matter) with lead subacetate, removing lead with hydrogen sulphide, and evaporating; it is soluble in alcohol, chloroform, slightly in ether.

Resins.—There are two of these, one soluble in alcohol but not in ether, the other soluble in ether as well as alcohol.

These two are obtained as a mixture by exhausting powdered drug with alcohol, precipitating with water, drying precipitate, and as such constitutes the "Eclectic" *cimicifugin (macrotin)*, a yellowish-brown hygroscopic powder. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

PREPARATIONS.—1. *Fluidextractum Cimicifugæ*. Fluidextract of Cimicifuga. (Syn., Fldext. Cimicif., Fluid Extract of Cimicifuga, Fluidextract of Black Cohosh, Fluidextract of Black Snakeroot; Extractum Cimicifugæ Liquidum; Fr. Extrait fluide d'Actée a Grappes; Ger. Cimicifugafluidextakt.)

Manufacture: Similar to Fluidextractum Sarsaparillæ, page 126; menstruum: alcohol. Dose, $\mathfrak{m}\nu$ –30 (.3–2 cc.).

Prep.: 1. *Elixir Sodii Salicylatis Compositum*, N. F., 3.2 p. c.

2. *Tinctura Cimicifugæ*, N. F., 20 p. c. (alcohol). Dose, $\mathfrak{z}\text{ss}$ –2 (2–4 cc.).

3. *Elixir Tongæ et Salicylatum*, N. F., 3.5 p. c.

Unoff. Preps.: *Decoction*, 5 p. c., $\mathfrak{z}\text{ss}$ –1 (15–30 cc.). *Compound Syrup*, 4 p. c.

PROPERTIES.—Alterative (diuretic, diaphoretic, expectorant), antispasmodic, sedative (arterial and nervous), cardiac stimulant—safer than digitalis, emmenagogue. Acts on the gastric secretion like any other bitter, slightly depresses the rate, but increases the force of the pulse, like digitalis; contracts the uterus, increasing the menstrual flow and arterial tension.

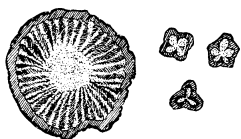


FIG. 120.—*Cimicifuga racemosa*: transverse section through a branch of the rhizome and through rootlets; natural size.

USES.—It was introduced first into medicine in 1831 by Dr. Young. Given as cardiac tonic in fatty heart, chorea, acute and chronic bronchitis, rheumatism, neuralgia, hysteria, phthisis, dyspepsia, amenorrhea, dysmenorrhea, seminal emissions. Large doses cause vertigo, tremors, reduced pulse, vomiting, prostration. Once, but not now, thought efficacious in snake bite, labor-pains, and ills of late pregnancy.

Incompatibles: Iron preparations, stimulants, alcohol, ammonia.

Synergists: Gold, digitalis, ergot, belladonna, etc.

Allied Plants:

1. *Delphinium Aja'cis*, *Delphinium*, *Larkspur Seed*, *N.F.*—The dried ripe seed with not more than 2 p. c. of foreign seeds or other foreign organic matter; S. Europe, cultivated as ornament, naturalized in United States. Plant, annual, hairy, bearing attractive flowers. Seed, irregularly tetrahedral, triangulate, 2 Mm. ($\frac{1}{12}$ ') long and broad, blackish-brown, seed-coat crustaceous, endosperm whitish, fleshy, oily,



FIG. 121.—*Delphinium Aja'cis*, *Delphinium*, *Larkspur Seed*, *N.F.*

embryo small; odor faint; taste bitter, then biting, acrid. Powder, gray-brown—endosperm parenchyma filled with fixed oil and aleurone grains, elongated cells from inner layer of seed-coat; contains alkaloids ajacine, ajaconine, (activity), fixed oil, volatile oil, resin, ash 7 p. c. Parasiticide, sedative, poisonous—similar to aconite and staphisagria; locally to destroy vermin, lice, itch-mite; rheumatism, neuralgia; rarely used internally. 1. *Tinctura Delphinii*, 10 p. c.



FIG. 122.—*Stavesacre seed*: a, natural size; b, cross-section; c, longitudinal section.

(alcohol). *D. Consol'ida*, *Field Larkspur*, U.S.P. 1820–1870, is a near related species with beautiful blue flowers, similar seed (tetrahedral, 1–2.5 Mm. ($\frac{1}{25}$ – $\frac{1}{10}$ ') broad, black, pitted), constituents, properties and uses. *D. urceola'tum* (*exalta'tum*), Penn., Minn., and *D. carolinia'num* (*azu'reum*), Wis., Ark. supply seeds having similar properties.

2. *D. Staphisag'ria*, *Staphisagria*, *Stavesacre*, Ripe seed, U.S.P. 1880–1910, Mediterranean Basin, cultivated. Annual herb, 1–1.3 M. (3–4°) high, branched, downy; root large, tapering; leaves 10–12.5 Cm. (4–5') broad, palmately 5–9-parted, long, hairy petioles, flowers purplish, racemes; fruit 3-follicles, each 12-seeded, seed irregularly triangular, tetrahedral, flattened, dark brown, grayish, lighter with age, 4–7 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') long, 3–6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') broad, coarsely reticulate; odor

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slight, disagreeable; taste bitter, acrid. Powder, grayish-black—parenchyma and endosperm cells enclosing aleurone grains and fixed oil; solvents: alcohol, boiling water; contains alkaloids 1 p. c.: delphinine, delphinoidine, delphisine, staphisagrine, fixed oil, volatile oil, resin, ash 9 p. c. Parasiticide, sedative, irritant, poisonous; popular with Greeks, Romans, etc., but too dangerous for internal use—locally to kill vermin, lice, itchmite; rheumatism, neuralgia, earache, toothache. *Poisoning*: Symptoms and treatment similar to aconite and veratrum viride. Dose, gr. 1–2 (.06–.13 Gm.). *Fluidextract*; *Extract*; *Tincture*, 10 p. c., m_v–15 (.3–1 cc.); *Ointment*, 20 p. c. Delphinine, gr. $\frac{1}{60}$ – $\frac{1}{10}$ (.001–.006 Gm.).

ACONITUM. ACONITE, U.S.P.

Aconitum Napellus, *Liné.* { The dried tuberous root with not more than 5 p. c. of stems, nor 2 p. c. of other foreign organic matter.

Habitat. Europe, Asia, N. America, Himalaya, Alps, Pyrenees Mountains, 3,300–4,800 M. (11,000–16,000') elevation; cultivated in England, C. Europe.

Syn. Aconit., Aconite Root, Monkshood, Wolfsbane, Cuckoo's or Friar's Cap, Friar's Cowl, Wolfroot, Styrian Monkshood, Mousebane, Face-in-hood, Jakob's-chariot, Blue-rocket; Br. Aconiti Radix; Fr. Aconit Napel, Coqueluchon; Ger. Tubera Aconiti, Eisenhutknollen, Sturmhut.

Ac-o-ni'tum. L. fr. Gr. *ên*, on, + *ákónais*, rock—*i. e.*, it grows upon steep rocks in mountains; or fr. Fr. *Acone*, a town in Bithynia, where it grows plentifully.

Na-pel'lus. L. a little turnip; fr. *napus*, a turnip—*i. e.*, mediæval name from shape of roots, once used generically.

PLANT.—Perennial herb; stem .6–1.5 M. (2–4') high, round, smooth, leafy; leaves 5–10 Cm. (2–4') broad, palmately 3–7 divided, dark green above, lighter below, smooth, shining, petiolate, divisions wedge-shaped, with 2–3 lobes extending midway; flowers July (third year), large, beautiful, violet-blue, on stem's summit, racemes, sepals petaloid, nectariferous; fruit, 3–5 pod-like capsules. Root, produced at the end of a short rhizome, conical, fusiform, 4–10 Cm. (1 $\frac{3}{8}$ –4') long, 1–3.5 Cm. ($\frac{2}{3}$ –1 $\frac{2}{5}$ ') thick at crown; grayish-brown, smooth or longitudinally wrinkled, upper end with a bud, remains of bud-scales or a stem-scar, other portions with many root-scars or short rootlets; fracture short, horny, mealy; internally, bark brownish, 1–2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') thick, cambium zone 5–8-angled with a small fibro-vascular bundle in each angle; pith whitish, 2–7 Mm. ($\frac{1}{2}$ – $\frac{1}{4}$ ') broad; odor very slight; taste sweetish, acrid, soon developing tingling sensation, numbness. **POWDER** grayish-brown—numerous, spherical (plano-convex) starch grains, .003–.02 Mm. ($\frac{1}{8325}$ – $\frac{1}{1250}$ ') broad, tracheæ, stone cells tabular, irregular, fragments of cork (few) and parenchyma (many), stem bast-fibers (few, long). *Solvent*: alcohol. Dose, gr. 1–2 (.06–.13 Gm.).

ADULTERATIONS.—Allied aconite roots (*A. variegatum*—much smaller, *A. Fischeri*—light gray, plump, smooth), defective roots,

small horse-radish roots (collected only when leaves absent, as by these they may easily be distinguished), yellowish externally, taste exceedingly pungent irritating; roots of European Masterwort (*Imperatoria* (*Peucedanum*) *Ostruthium*), which closely resemble aconite root, but are aromatic, pungent, with oil-cells arranged in several circles, easily visible in cross-sections.

Commercial.—Plant grows wild, but under cultivation becomes slightly stronger, owing to which the Br. P. recognizes alone its root collected in autumn; all parts are very poisonous, a fact even known to the ancients, and was not introduced into medicine until 1762 (Baron Störck, Vienna); it is grown in gardens for ornamental flowers and when these have expanded, thereby insuring identity, the root should be collected. Imported mostly from Germany (England, France, Switzerland, India) in packages, bales, etc.

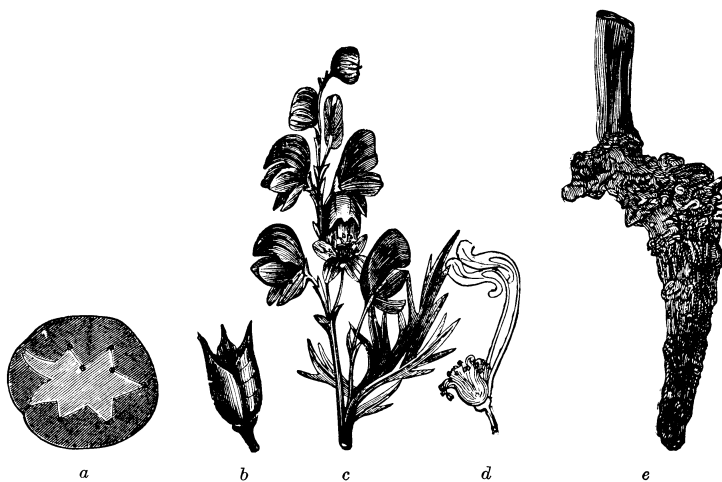


FIG. 123.—*Aconitum Napellus*: a, transverse section of tuber, b, fruit carpels; c, flowering branch; d, flower deprived of calyx, showing the only 2 peculiarly shaped petals, the 6 others almost aborted; e, tuber.

CONSTITUENTS.—Four alkaloids (one crystalline, three amorphous) .24-.62-1.15 p. c.: Aconitine (crystalline), Picroaconitine (benzaconine, isaconitine), $C_{25}H_{39}O_{11}N$, Aconine, Pseudoaconitine (napelline), $C_{33}H_{45}O_{12}N$, aconitic acid, $H_3C_6O_6H_3$, starch, resin, fat, sugar, mannite.

Aconitina, Aconitine, $C_{34}H_{47}O_{11}N$, *U.S.P.*—(Syn., Aconitin., Nap-aconitine, Aconitia; Fr. Aconitine; Ger. Aconitin.) Exists in combination with aconitic acid, and is obtained by exhausting root with cold rectified fusel oil, shaking resulting tincture with diluted (1 p. c.) sulphuric acid, adding chloroform to remove resin, rendering alkaline with sodium carbonate, shaking out with ether. It is in colorless or

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white crystals, odorless, permanent, producing tingling and numbing sensation to tongue, lips—taste cautiously even when diluted; soluble in alcohol (28), ether (65), benzene (7), slightly in water, almost insoluble in petroleum benzin; solutions alkaline; melts at 195° C (383° F.); forms salts, as hydrochloride, nitrate, sulphate, etc.; commercial aconitine occurs in amorphous and crystalline forms, but the latter should alone be used, as the former contains derivatives lessening its activity 10–15 p. c. *Tests*: 1. Dissolve .001 Gm. with 2–3 drops of nitric or sulphuric acid on white porcelain surface—colorless solution; with 2 drops of sulphuric acid containing .005 Gm. of ammonium vanadate in each cc.—orange solution. 2. Dilute solutions, + mercuric potassium iodide T. S., or + tannic acid T. S., or + gold chloride T. S.—precipitate; concentrated solutions, + platinic chloride T. S., or + mercuric chloride T. S., or + trinitrophenol (picric acid) T. S.—precipitate; incinerate—ash negligible. 3. Evaporate a solution of 0.1 Gm. with 5 drops of fuming nitric acid, cool, resulting yellow residue, + alcoholic potassium hydroxide T. S.—not violet (abs. of pseudaconitine, atropine). Should be kept dark in well-closed containers. Dose (crystals), gr. $\frac{1}{84}$ — $\frac{1}{200}$ (.0001–.00035 Gm.; (amorphous), gr. $\frac{1}{84}$ — $\frac{1}{20}$ (.001–.003 Gm.).

Aconine, $C_{26}H_{41}O_{11}$.—This appears antagonistic to aconitine in cardiac effect; picroaconitine is considered inert; aconitic acid is abundant, but is chiefly in combination with calcium, and is almost inert.

PREPARATIONS.—1. *Tinctura Aconiti*. Tincture of Aconite. (Syn., Tr. Aconit.; Fr. Teinture de Racine d'Aconit; Ger. Akonittinktur, Eisenhuttinktur.)

Manufacture: 10 p. c. Similar to *Tinctura Veratri Viridis*, page 104; use menstruum: 70 p. c. alcohol, and adjust to assay (biological). Dose, mss–10 (.03–.6 cc.).

Preps.: 1. *Dentilinimentum Aconiti Compositum*, N.F., 80 p. c.

2. *Dentilinimentum Aconiti et Iodi Compositum*, N.F., 85 p. c.

2. *Fluidextractum Aconiti*, N.F. (75 p. c. alcohol). Dose, mss–2 (.03–.13 cc.): Prep.: 1. *Linimentum Aconiti et Chloroformi*, N.F., fldext. 4.5 p. c., alcohol 8, chloroform 12.5, soap liniment 75.

Unoff. Preps.: *Abstract* (alcohol), gr. $\frac{1}{4}$ –1 (.016–.06 Gm.). *Extract* (alcohol), gr. $\frac{1}{6}$ – $\frac{1}{3}$ (.01–.02 Gm.). *Fleming's Tincture Aconite Root*, 70 p. c. (alcohol), mss–4 (.03–.26 cc.). *Linimentum Aconiti* (Br.), 50 Gm. + camphor 3 Gm., alcohol q. s. 100 cc. *Oleate of Aconitine*, 2 p. c. *Tincture Aconite Leaves*, 8 p. c. (diluted alcohol), mj–6 (.06–.4 cc.). *Unguentum Aconitinæ* (Br.), 2 p. c. *Glycerite*. *Plaster*. Pseudoaconitine (*A. ferox*), gr. $\frac{1}{250}$ — $\frac{1}{100}$ (.00026–.00065 Gm.).

PROPERTIES.—Sedative (heart and nerve), anodyne, diaphoretic, antipyretic, myotic, poisonous. Produces tingling and numbness of the lips, mouth, and fingers; increases the secretion of the kidneys, salivary glands, and skin; circulation (heart action, pulse) becomes weak and slow, due to direct depression of heart-muscle, and stimula-

tion of *vagus* (pneumogastric) nerve; respiration (breathing) shallow and slow; arterial pressure is decreased; temperature is lowered, all causing a tendency to fainting when in the erect position, and giving rise to its popular name "therapeutic lancet;" it increases urinary flow; effect lasts about 3 hours—paralyzes first the sensory and then the motor nerves.

USES.—It should never be given in asthenic or debilitated conditions, or when the heart action is weak, or in gastric catarrh, but may be employed in all sthenic or inflammatory fevers of the young and vigorous; croup, laryngitis, pharyngitis, tonsillitis, acute meningitis, peritonitis, pleuritis, rheumatism; measles, scarlet fever, erysipelas, first stage of pneumonia, pericarditis and pleurisy, nervous heart palpitation, cardiac hypertrophy, epistaxis, vomiting of pregnancy. Locally on non-abraded surfaces; neuralgia, rheumatism, sciatica, herpes zoster, chilblains, pruritus, odontalgia, periodontitis, inflamed pulps.

Poisoning: Have anxious countenance, pallid, clammy skin covered with cold sweat; pulse and respiration slow, weak, and irregular; muscular weakness, loss of sight and hearing, pupils either normal, contracted or dilated, general anesthesia, collapse, death from syncope, or respiratory paralysis, sometimes preceded by convulsions; conscious until near the end, when carbon dioxide narcosis sets in. Evacuate stomach reclining, direct recumbent position, feet elevated, warmth to extremities, give diffusible cardiac stimulants (brandy, whisky, alcohol, ether, ammonia) by the stomach, rectum, or skin, then digitalis, tannin; artificial heat and respiration (rhythmically raising and lowering arms from straight at sides to up over head and back again 20 times per minute), amyl nitrite, atropine, and strychnine (hypodermically) to stimulate heart and respiration.

Incompatibles: Ammonia, alcohol, alkalies, atropine, digitalis, ether, morphine, heat, turpentine.

Synergists: *Veratrum viride*, *pulsatilla*, *staphisagria*, cold, fatigue.

Leaves, U.S.P. 1820–1870. These are considered 5–20 times weaker than the root, yet many specimens yield considerable alkaloids; their uncertainty and deception have led to disuse; but if collected when flowers are two-thirds in bloom they are reliable; it is then that all nutrient constituents are in demand for the perfection of reproductive organs, thus leaving behind in the leaves a goodly quantity of the (waste products) alkaloids. Dose, gr. 1–4 (.06–.26 Gm.).

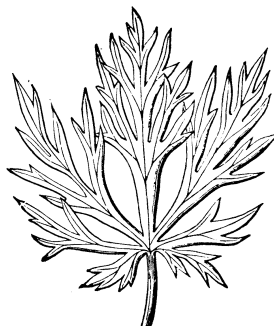


FIG. 124.—*Aconitum Napellus*:
leaf, small sized.

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Allied Plants:

1. *Aconitum neomonta'num*.—Leaves, U.S.P. 1820–1830, and *A. panicula'tum*, leaves, U.S.P. 1840, possess very little acidity, but even now their roots are collected and mixed with the official.

2. *A. Cam'marum (variega'tum)*.—Europe; root globular, ovate, 12 Mm. ($\frac{1}{2}$ ') long, pith rays 5, short, rounded; and *A. Störckia'num*, Europe; root conical, slender, pith roundish pentagonal, similar in effect, smaller than, but often found mixed with the official.

3. *A. fer'ox*.—India aconite (native Bikh or Bish) is the strongest species, with root 5–10 Cm. (2–4') long, 2.5 Cm. (1') thick, conical and brown; yields pseudaconitine (peraconitine), similar to and as active as aconitine; *A. uncinat'tum* and *A. lu'ridum* roots are collected with this, as they all have constituents similar to the official, but here pseudaconitine predominates.

4. *A. Fisch'eri* and *A. japon'icum*, Japanese and Chinese Aconite.—Roots napiform, long, pith circular, 5–7-rayed; yields japaconitine, identical with aconitine; allied to former is *A. columbia'num*; Rocky Mountains; poisonous. *A. heterophyll'um*, India—fusiform, conical, bitter, not acrid or poisonous, *A. Antho'ra*, Europe—fusiform, long, pith thin, rays short and long, and *A. Lycoc'tonum*, Europe, N. Asia—rhizome oblique, several-headed, bitter.

5. *Pulsatill'la (Anem'one) vulgar'is*, *P. pratens'is*, or *P. pa'tens*, *Pulsatilla*, *Pasque Flower*, N.F.—The dried herb with not more than 5 p. c. of foreign organic matter; Europe (England, Siberia). Perennial herbs, 10–25 Cm. (4–10') high, covered with soft, silky hairs. Leaves and flowering scapes matted, silky-villous, petioles hollow often purplish, blades pinnately cleft, flowering scape up to 30 Cm. (12') in length, solid below, hollow above, flowers purplish, terminal, bell-shaped, 6 sepals, fruit achene, plumose-tailed; nearly odorless; taste acrid. Powder, brownish—thick-walled hairs, tracheæ, stomata, epidermal cells with wavy vertical walls, calcium oxalate crystals and starch grains few or absent; contains anemonin (activity—volatile, causing drug to be inert after 1 year), acrid anemone camphor, volatile oil, iso-anemonic acid, $C_{15}H_{14}O_7$, ash 10 p. c. Sedative, anodyne, mydriatic, diuretic, diaphoretic, emmenagogue, expectorant, vesicant, emetic, poisonous—similar to aconite, causing tingling, numbness, reducing respiration, temperature, cardiac and arterial tension, paralysis of motion and sensation; dysmenorrhea, bronchitis, asthma, whooping-cough, gastritis, epididymitis, orchitis, conjunctivitis, eczema, ulcers, meningitis. *Poisoning*: Symptoms and treatment similar to aconite. Dose, gr. 1–5 (.06–.3 Gm.); 1. *Tinctura Pulsatillæ*, 10 p. c. (75 p. c. alcohol), dose, $\mathfrak{m}\mathfrak{xv}$ –30 (1–2 cc.). *Extract* (expressed juice + alcohol), gr. $\frac{1}{2}$ –3 (.03–.2 Gm.); Homeopathic tincture (extract); anemonin, gr. $\frac{1}{4}$ – $\frac{3}{4}$ (.016–.05 Gm.). *P. hirsutis'sima (Anemone pa'tens* var. *Nuttallia'na*); herb, U.S.P. 1880, W. N. America, flowers whitish, purplish, sepals 5–7,—2.5–4 Cm. (1–1 $\frac{3}{8}$ ') long, developed before the leaves; *A. quinquefo'lia (nemoro'sa)*, *Wood Flower*, *Wood Anemone*, N. America;

flowers purplish-white, *A. corona'ria*, *A. sylves'tris*, and *A. ranunculoi'-des*, Levant, Asia, Europe, are all acrid and deteriorate upon drying.

6. *Hepat'ica Hepatica (tri'loba)*, *Noble Liverwort*.—The leaves, U.S.P. 1830–1870, N. America, Europe. One of our earliest harbingers of



FIG. 125.—*Pulsatilla (Anemone) Pulsatilla*. FIG. 126.—*Pulsatilla (Anemone) pratensis*.

spring; acaulescent perennial, flowers, April, bluish, leaves reniform, 5 Cm. (2') long, 3-lobed; contains mucilage, tannin. Tonic, demulcent, deobstruent; liver affections, bronchitis, phthisis; in decoction, infusion. Dose, $\overline{3ss}$ –2 (2–8 Gm.).



FIG. 127.—*Hepatica Hepatica (tri'loba)*:
leaf showing venation. ✓

FIG. 128.—*Ranunculus* in bloom.

7. *Ranun'culus bulbo'sus*, *Bulbous Buttercup*.—The corm and herb, U.S.P. 1820–1870, Europe, N. America. Plant hairy, 15–45 Cm. (6–18') high, bulb at stem base, flowers May, yellow, 5's; contains volatile

BERBERIDACEÆ

oil (anemonin + anemonic acid). Irritant, diuretic, narcotic; externally —bronchitis, rheumatism, sciatica; in decoction, infusion. Dose, ʒss-1 (2-4 Gm.).

23. BERBERIDACEÆ. Barberry Family.

Ber-be-ri-da'se-e. L. *Berber(is)id* + aceæ, fr. *Berberys*—*i. e.*, Arabic name of the fruit. Shrubs, herbs with watery juice. Distinguished by few stamens (same number as petals and opposite them) in 2-3 whorls, anthers opening by 2-hinged valves (Podophyllum, longitudinal, as in Ranunculaceæ); leaves usually with spiny teeth, sometimes reduced to spines or barbs, hence the name *barberry*; sepals and petals in 2 rows, 3 each, imbricate; ovary 1-celled, superior; temperate climates, tropics; cathartic, astringent, bitter, acrid (oxalic), yellow dye.

Genus: **1. Podophyllum.**

PODOPHYLLUM. PODOPHYLLUM, U.S.P.

Podophyllum peltatum, { The dried rhizome and roots with not less
Linné. { than 3 p. c. of resin.

Habitat. N. America (Canada, United States) in rich woods, thickets.

Syn. Podoph., Mandrake, May Apple Rhizome, American (Wild) Mandrake, Ground (Wild) Lemon, Hog (Indian, Devil's) Apple, Duck's Foot, Umbrella Plant, Vegetable Mercury (Calomel); Br. Podophylli Rhizoma; Fr. Rhizome de Podophyllum; Ger. Fussblattwurzel.

Pod-o-phyll'um. L. fr. Gr. *ποδός*, foot, + *φύλλον*, leaf—*i. e.*, its 5-7-parted leaf resembles the foot of aquatic birds or domestic fowls, as ducks, etc.

Pel-ta'tum. L. *peltatus*, having a pelta or light shield—*i. e.*, petioles attached to the middle of the lamina instead of to the margin.

May apple—*i. e.*, plant blooms in May, thus starting the fruit, which ripens in summer (August).

PLANT.—Perennial herb; stem .3 M. (1°) high, pale green, divides near the summit into 2 petioles, each bearing a palmately 5-7-deeply-lobed, peltate leaf 10-15 Cm. (4-6') wide, segments wedge-shaped, coarsely toothed at their ends, glaucous-green, petioles 7.5 Cm. (3') long; flowers May, borne at fork of petioles, single, nodding, white 5 Cm. (2') broad, 6-9 petals, 12-18 stamens; fruit yellowish berry, 2.5-5 Cm. (1-2') long, ovoid, fleshy, soft, indehiscent; seed about 12; often eaten by animals, hence some of its names. **RHIZOME**, of horizontal growth, creeping, subcylindrical, jointed, compressed on upper and lower surfaces, sometimes branched, 3-20 Cm. (1½-8') long, internodes 2-9 Mm. (¼-⅓') thick, nodes annulate, 12 Mm. (½') thick, dark brown, longitudinally wrinkled or nearly smooth with irregular, somewhat V-shaped scars of scale leaves, upper surface of nodes marked with large, circular, depressed stem-scars, sometimes with buds or stem-bases, lower surface of nodes with numerous root-scars or roots, 2-7 Cm. (⅔-3') long, 2 Mm. (¼') thick, fracture short;

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internally, cork light brown, wood with yellowish vascular bundles, pith large, white; odor slight; taste disagreeably bitter, acrid. POWDER,



FIG. 129.—*Podophyllum peltatum*.

yellowish-brown—numerous starch grains, .003–.02 Mm. ($\frac{1}{8}$ – $\frac{1}{2}$ – $\frac{1}{5}$ – $\frac{1}{10}$ '), broad, few rosette aggregates of calcium oxalate, tracheæ, parenchyma,

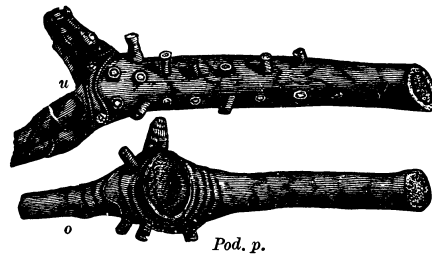


FIG. 130.—*Podophyllum*: *u*, under side; *o*, upper side.

cork cells; odor pronounced, characteristic. *Solvents*: alcohol; boiling water partially. Dose, gr. 5–15 (.3–1 Gm.).

ADULTERATIONS.—Sanguinaria (due to similarity of leaves despite greater value) 2–3 p. c., geranium 2–3 p. c., comfrey 1 p. c.

Commercial.—Plants of 100 or more grow in rounded or irregular-shaped clusters (patches), 3–6 M. (10–20°) broad, near wood-borders, fence-panels, or in the open, preferably on heavy soil; rhizome and roots should be collected soon after the leaves fall off, Aug.-Sept., those containing much resin being surprisingly heavy considering their appearance, breaking with an elastic, short, noisy fracture; drug often recognized in the trade as *thick, thin, heavy, light*, referring chiefly to physical characteristics. That collected in autumn, after flowering and fruiting, is preferred, being heavier from abundant resin content (podophyllotoxin) and breaking with a cleaner fracture.

CONSTITUENTS.—Resin 4–5 p. c. (varying little in quantity but greatly in content (podophyllotoxin) according to season and time of collection), starch, gum, fixed oil, gallic acid, ash 2–3 p. c.

Resin (Resina Podophylli, Podophyllin), U.S.P.—This is a complex substance consisting of: (1) *podophyllotoxin*, $C_{15}H_{14}O_6$, 20–26 p. c. which is obtained after removing the fat with benzin, by precipitating the podophyllinic acid from a chloroformic solution of the resin or rhizome, by the addition of ether and then simply evaporating the ethereal solution; this is the cathartic principle, being whitish, bitter, resinous, crystallizable, soluble in chloroform, ether, acetone, alcohol; cherry-red, then greenish-blue and violet by sulphuric acid, when heated with alkalies is converted by hydration into podophyllic acid, $C_{15}H_{16}O_7$, which readily loses water, forming crystalline picropodophyllin (inactive, isomeric with podophyllotoxin); (2) *podophyllinic acid*, which is an inactive resin-acid, insoluble in ether, but soluble in chloroform or alcohol, and obtained by the above process for podophyllotoxin (being precipitated and left behind upon the addition of ether). The color is due to *podophylloquercetin*, which occurs in yellow needles, insoluble in water, slightly in chloroform, more so in ether, freely in alcohol. The small amount of uncrystallizable resin, *podophylloresin*, is also purgative.

PREPARATIONS.—1. *Resina Podophylli*. Resin of Podophyllum. (Syn., Res. Podoph., Podophyllin; Fr. Résine de Podophylle; Ger. Podophyllinum, Podophyllin, Podophyllumharz.)

Manufacture: Macerate, percolate 100 Gm. with alcohol until percolate when dropped into water produces only slight turbidity, reclaim alcohol until percolate the consistence of thin syrup, and pour this slowly, stirring constantly, into 100 cc. of water mixed with hydrochloric acid 1 cc., cool, let precipitate subside, decant supernatant liquid, wash precipitate twice by decantation, each time with cold water 100 cc., dry on strainer in a cool place exposed to air and protected from light, and if it should coalesce into lumps with a glossy surface reduce to powder in a mortar. It is an amorphous powder, light brown, greenish-yellow, darker on exposure to heat or light, slight peculiar odor, faintly bitter taste; very irritating to mucous

membrane, especially that of the eye; soluble in alcohol with only slight opalescence; alcoholic solution faintly acid; 75 p. c. soluble in ether; 65 p. c. soluble in chloroform. *Tests*: 1. Hot aqueous solution on cooling—deposits most of its contents; filtrate bitter, with a few drops of ferric chloride T. S.—brown. 2. Dissolve in potassium or sodium hydroxide T. S.—deep yellow liquid, becoming darker on standing, from which resin is reprecipitated by acids. 3. Add .4 Gm. to 3 cc. of 60 p. c. alcohol, + .5 cc. potassium hydroxide T. S., shake—does not gelatinize (dif. from resin in *P. Emodi*); ash 1.5 p. c. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ –1 (.008–.06 Gm.).

Preps.: 1. *Pilula Aloes et Podophylli Composita*, N.F., $\frac{1}{2}$ gr. 2. *Pilula Aloes, Hydrargyri et Podophylli*, N.F., $\frac{1}{4}$ gr. 3. *Pilula Aloini Composita*, N.F., $\frac{1}{8}$ gr. 4. *Pilula Cathartica Vegetabiles*, N.F., $\frac{1}{4}$ gr.

Unoff. Preps.: *Fluidextract* (alcohol), dose, m̄v–30 (.3–2 cc.). *Abstract* (alcohol), dose, gr. $\frac{1}{4}$ –2 (.016–.13 Gm.). *Extract* (80 p. c. alcohol), dose, gr. 5–10 (.3–.6 Gm.). *Tincture* (Br.), 3.65 p. c. of resin in alcohol, dose, m̄v–15 (.3–1 cc.). *Podophyllotoxin* (pure), dose, gr. $\frac{1}{12}$ – $\frac{1}{8}$ (.005–.008 Gm.).

PROPERTIES.—Hydragogue cathartic, cholagogue, alterative, irritant, tonic—slowest acting official purgative. Increases intestinal secretion, bile-flow, causes copious watery stools, griping, nausea in from 10–20 hours, acts mainly on the duodenum, but is a powerful intestinal irritant, resembling jalap and calomel, only slower; large doses are distinctly poisonous, producing in the young vomiting, purging, collapse, coma, finally epileptiform convulsions. Those employed in powdering the drug have irritation of the eyes, nose, mouth, respiratory passages, and skin. The resin applied to ulcers produces purgation and is also a powerful irritant to the skin. Its action upon the liver, being somewhat similar to that of mercury, led some early to claim for it alterative properties equal to those of that metal, and for a time it was employed under the name of “vegetable calomel” in those diseases for which mercury is a recognized specific, but now it is believed to have incidentally only very slight alterative power, and to possess no property in common with mercury save that of catharsis.

USES.—Constipation, torpid liver, lead costiveness, diarrhea, catarrhal or malarial jaundice, remittent fevers, dyspepsia, bilious vomiting, and headache. With cream of tartar useful in dropsies, rheumatic, scrofulous, and syphilitic affections; should be associated with hyoseyamus or belladonna to overcome griping, and, owing to extremely slow action, should not be given in combination with brisk cathartics, but preferably with such as act in approximately the same time, as calomel, jalap, aloe, leptandra, etc.—gr. 5 (.3 Gm.) of podophyllin (resin) have killed, so have ʒiiss (6 Gm.), but in one case gr. 10 (.6 Gm.) failed to produce more than abdominal pains.

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Allied Plants:

1. *Podophyllum Emu'di*, *Podophylli Indici Rhizoma* (Br.)—India, Hazara, Kashmir; Himalaya Mountains; rhizome, collected after flowering, cylindrical, stem-scars crowded on upper surface, many roots beneath; yields resin (*Podophylli Indici Resina*—Br.) 10–14 p. c., which contains podophyllotoxin 38–63 p. c., thereby making it similar to but stronger than our official drug. Dose of resin, gr. $\frac{1}{8}$ –1 (.008–.06 Gm.).

2. *Caulophyllum thalictroides*, *Caulophyllum*, *Blue Cohosh*, *Papoose* (*Squaw*) *Root*, *N.F.*—The dried rhizome and roots with not more than 3 p. c. of foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; N. America (Canada, United States). Smooth, glaucous perennial, .6 M. (2°) high, with large trternately compound leaf at summit, leaflets 3–5-lobed; flowers greenish-yellow. Rhizome horizontal,



FIG. 131.—*Berberis vulgaris* (*canadensis*).

7–25 Cm. (3–10') long, 5–15 Mm. ($\frac{1}{5}$ – $\frac{3}{5}$ ') thick, large cup-shaped stem-scars above, curved, tortuous, thin, tough, tangled or matted roots below often concealing rhizome, yellowish-gray; fracture tough, woody; odorless, sternutatory; taste bitter-sweet, acrid. Powder, light brown—numerous starch grains, fragments of cork, tracheæ, wood-fibers, tracheids, parenchyma; contains caulophylline, caulophyllin (resins) 12 p. c., leontin (saponin-like glucoside—active principle). Antispasmodic, diuretic, emmenagogue, demulcent, sternutatory, sedative, oxytocic; hysteria, amenorrhea, spasmodic dysmenorrhea, uterine subinvolution (causing mus-

cular contraction), arrests or produces abortion; the aborigines believed the infusion their best parturient, drinking it for several weeks prior to labor. Dose, gr. 10–30 (.6–2 Gm.); 1. *Fluidextractum Caulophylli* (75 p. c. alcohol): Preps.: 1. *Elixir Aletridis Compositum* (fdext. 6.55 p. c.); 2. *Elixir Heloniadis Compositum* (fdext. 3.2 p. c.). *Extract*, gr. 2–5 (.13–.3 Gm.), *Tincture*, 25 p. c., 3j–2 (4–8 cc.); decoction, infusion, each 5 p. c., 3j–2 (30–60 cc.).

3. *Berberis Aquifo'lium*, *Berberis*, *Oregon Grape Fruit*, *N.F.*—The dried rhizome and roots with not more than 5 p. c. of overground parts or other foreign organic matter—rejecting pieces over 45 Mm. (1 $\frac{1}{2}$ ') thick, or with bark removed; United States, Oregon, California, mountains. Tall shrub, 1.5–2 M. (5–6°) high; leaves coriaceous, evergreen, shining, flowers small, numerous, yellowish-green; fruit purple berry with acid pulp. Rhizome cylindrical, knotty, branched,

cut into pieces of varying length, up to 45 Mm. ($1\frac{1}{2}$ ') in thickness, splitting on drying, yellowish-brown, wrinkled; fracture hard, tough; bark 1 Mm. ($\frac{1}{25}$ ') thick, separable into layers, wood yellow, radiate, pith small, sometimes excentric, odor slight; taste distinctive, bitter, on chewing—saliva yellow. Powder, yellowish-brown—medullary rays, wood-fibers, few tracheæ, starch grains; solvent: diluted alcohol; contains (bark) berberine 2.35 p. c., oxyacanthine 2.82 p. c., resin, tannin, phytosterin. Alterative, diuretic, antiperiodic, tonic, laxative; scrofulous and syphilitic cachexia, chronic eczema, psoriasis, uterine diseases, dyspepsia with constipation. Dose, gr. 10–30 (.6–2 Gm.); 1. *Fluidextractum Berberidis* (diluted alcohol), dose, m̄x–30 (.6–2 cc.); 2. *Fluidextractum Trifolii Compositum*, 10.8 p. c.

4. *B. vulga'ris* (*canaden'sis*).—The fruit, U.S.P. 1830; the bark of the root, 1860–1870. Spreading shrub, 1–2 M. ($3-6^{\circ}$) high, thorny branches, bark gray, wood yellow, leaves toothed, spiny; flowers, yellow racemes; fruit, oval, scarlet berry; root-bark yellowish-gray, separable into laminæ, bitter, astringent; contains berberine, resin, tannin, fat. Used in febrile diseases, diarrhea; bark in dysentery, dropsy, dyspepsia, to lessen size of spleen; similar to calumba. Dose (bark), gr. 2–10 (.13–.6 Gm.); infusion, decoction; fruit juice sometimes made into syrup, preserves, etc.

24. MENISPERMACEÆ. Moonseed Family.

Men-i-sper-ma'se-e. L. *Menisperm-um* + aceæ, fr. Gr. *μήνη*, the moon, + *σπέρμα*, a seed—*i. e.*, fruit (seed) kidney- or crescent-shaped. Shrubs, woody climbers, herbaceous vines; leaves exstipulate, alternate; flowers diceious; sepals 4–12; petals 6, similar, usually in 2 rows, imbricate; stamens mostly 6; fruit drupe, superior; species very heteromorphous; embryo horseshoe-shape; albumin scanty; tropics; bitter, narcotic, tonic, poisonous.

Genus: 1. **Jateorhiza.**

CALUMBA. CALUMBA, U.S.P.

Jateorhiza palmata, (*Lamarck*) { The dried root yielding not more than
Miers. { 2.5 p. c. of acid-insoluble ash.

Habitat. E. Africa, Madagascar (Mozambique and Quilimane forests, along the lower Zambesi River); cultivated in Africa and E. India islands.

Syn. Calumb., Columba, Columbo, (Foreign) Colombo, Kalumb.; Br. Calumbæ Radix; Fr. Colombo, Racine de Colombo (Calumbé); Ger. Radix Colombo, Kolombowurzel.

Jat-e-o-rhi'za. L. fr. Gr. *ιατήρ*(*ios*), healing, + *ρίζα*, a root—*i. e.*, its medicinal virtues.

Pal-ma'ta. L. *palmatus*, like the palm of the open hand with radiating fingers (segments)—*i. e.*, the leaves palmately-lobed or divided.

Ca-lum'ba. L. fr. native African name, *kalumb*, hence Colombo in Ceylon, supposed to be the plant's original habitat.

MENISPERMACEÆ

PLANT.—Perennial climber; stems several, green, 6–12 Mm. ($\frac{1}{4}$ – $\frac{1}{2}$ ') thick, hairy, from short, thick, irregular rhizome; leaves petiolate, large, 25 Cm. (10') long, 35 Cm. (14') broad, orbicular, cordate, 3–5–7-palmately-lobed, lobes entire, wavy, hairy; flowers diœcious, 6's, 12 Mm. ($\frac{1}{2}$ ') broad; fruit 3 ovoid fleshy drupes, size of hazelnut, 1-seeded. Roots, from rhizome, many, fleshy, fasciculated, fusiform; commercially in circular, oval disks up to 10 Cm. (4') and seldom exceeding 2 Cm. ($\frac{4}{5}$ ') thick, or longitudinal, oblique slices up to 30 Cm. (12') long; edge brown, roughly wrinkled, cut surfaces yellowish-brown, grayish-yellow, transverse slices radiate in outer portion with dark cambium, center often depressed (thinnest); fracture short, mealy; odor slight; taste slightly aromatic, very bitter. POWDER,

FIG. 132.—*Jateorhiza palmata* (calumba).

greenish-brown, grayish-yellow—many starch grains, .003–.085 Mm. ($\frac{1}{8325}$ – $\frac{1}{3000}$ ') broad, few stone cells with one or more calcium oxalate prisms or sphenoidal microcrystals; few fragments with tracheæ associated with wood-fibers. *Solvents*: alcohol (75 p. c.); boiling water largely (calumbin, berberine). Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Roots of *Bryonia alba* and *Frasera carolinensis* (Walteri)—American Columbo. These sometimes are dyed yellow with turmeric or safflower, and made bitter with infusion of calumba or quassia, thus giving a near resemblance, but recognized by the lighter or slightly false color, absence of dark cambium zone, radiating lines, etc.; the latter also precipitates with iron salts, is not mucilaginous nor affected by infusion of galls, reddens litmus, evolves ammonia with fixed alkalies, and contains no starch. Occasionally with slices of the

stem of *Coscin'ium fenestra'tum*, Ceylon, which are harder, smoother, and not contracted centrally; false calumba—center elevated, not depressed.

Commercial.—Plant, also named *Menispermum palmatum*, *Coc'culus palma'tus*, and natively called *Kalumb*, resembles very closely our *Menispermum canadense*, reaching the top of lofty forest trees from the sea-coast to many miles inland. Roots of wild plants are dug in hot dry season (March), tubercles separated, washed, cut into transverse and longitudinal slices, and dried slowly in the shade; often more or less worm-eaten. Portuguese always have controlled (1508) its trade, exporting it for 3 centuries via Colombo, Ceylon, also their possession, to veil its origin; now enters market from Zanzibar, or via Bombay.

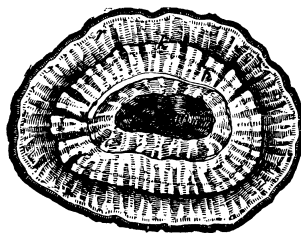


FIG. 133.—Calumba: transverse section, natural size; *r*, bark; *k*, cambium; *h*, wood; *m*, pith (medulla).

CONSTITUENTS—Calumbin .8 p. c., Berberine 1 p. c., Calumbic acid, calumbine (?), starch 35 p. c., pectin 17 p. c., gum 4.7 p. c., resin 5 p. c., wax, calcium oxalate, ash 6–8 p. c.

Calumbin, $C_{21}H_{24}O_7$.—Gives most of the bitterness—obtained by exhausting root or alcoholic extract with alcohol or ether, evaporating and letting stand several days for crystals to form, which are white, bitter, odorless, soluble in alcohol, ether, chloroform, alkalies, acetic acid, almost insoluble in water. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.).

Berberine, $C_{20}H_{17}O_4N$.—This is left in mother-liquor from calumbin, which is evaporated to dryness, exhausted with boiling alcohol, evaporated, allowed to crystallize upon standing. Recently this content has been resolved into three alkaloids—palmatine, calumbamine, jateorhizine—which with calumbin constitute the drug's activity. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.).

Calumbic Acid, $C_{21}H_{22}O_6 \cdot H_2O$.—Obtained from 3 p. c. oxalic acid infusion by adding barium hydroxide and treating precipitate with alcohol; it is less bitter than calumbin, amorphous, straw-yellow, soluble in alcohol, alkalies, almost insoluble in water or ether, and is in combination with berberine—the two believed to be derived from calumbin, this latter being the anhydride of calumbic acid.

Calumba contains no tannin, hence can well be used with iron salts and alkalies as a substitute for gentian, etc.; its infusion or tincture, however, precipitates with infusion of galls or solution of lead acetate.

PREPARATIONS.—1. *Tinctura Calumbæ*. Tincture of Calumba (Syn., Tr. Calumb., Tinctura Colombo; Fr. Teinture de Colombo; Ger. Kolombotinktur.)

Manufacture: 20 p. c. Similar to Tinctura Veratri Viridis, page 104—packing moderately; menstruum: 60 p. c. alcohol. Dose 5ss–2 (2–8 cc.). 2. *Fluidextractum Calumbæ*, N.F. (67 p. c. alcohol). Dose,

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mv-30 (.3-2 cc.). *Extract*, gr. 1-5 (.06-.3 Gm.). *Infusion*, 5 p. c., 3 ss-1 (15-30 cc.).

PROPERTIES.—Tonic, stomachic, stimulant, increases appetite and digestion by stimulating the gustatory nerves, thereby dilating the gastric vessels and augmenting secretion, does not constipate; externally—antiseptic, disinfectant, anthelmintic.

USES.—Dyspepsia, debility, remittent fevers, dysentery, diarrhea, cholera morbus, cholera infantum, hectic fever of phthisis, vomiting of pregnancy, bowel flatus, purging; large doses emeto-cathartic.

Allied Plants:

1. *Jateorhiza Calumba*.—About the same as the official, possibly having a variety difference in that the basal lobes of leaves are rounded but do not overlap, and male inflorescence is hispid. In the official variety, basal lobes mostly overlap, and male inflorescence is smooth. Our commercial root is collected indiscriminately from both species.

2. *Anamir'ta Cocculus*, *Cocculus (Indicus)*, *Fish (Indian) Berry*, *N.F.*—The dried ripe fruit with 2 p. c. foreign organic matter; E. India, Ceylon. Large woody climber; leaves 10-20 Cm. (4-8') long, cordate; flowers, small, diœcious. Fruit (in clusters 2-5) drupe, reniform, 8-13.5 Mm. ($\frac{3}{8}$ - $\frac{7}{12}$ ') long, 7-11 Mm. ($\frac{1}{4}$ - $\frac{1}{2}$ ') broad, 7-10 Mm. ($\frac{1}{4}$ - $\frac{2}{5}$ ') thick, blackish-brown, wrinkled, hilum and micropyle near ridge on convex side; stalk scar; pericarp tough, 1 Mm. ($\frac{1}{25}$ ') thick, 1 urn-shaped seed, taste bitter, seed intensely bitter. Powder, brown—epicarp fragments with alkalies—reddish-brown, fixed oil globules, aleurone grains, acicular crystals soluble in diluted hydrochloric acid, fibers, tracheæ; contains (seed)—picrotoxin, anamirtin (cocculin, not bitter or poisonous), fat; (pericarp, nearly tasteless)—menispermene, paramenispermene, hypopicrotoxic acid, resin. *Picrotoxin* (picrotoxinum), $C_{30}H_{34}O_{13}$ —U.S.P. 1880-1890, not a single body, but composed of picrotoxin 54 p. c., and picrotin 46 p. c.; obtained by evaporating to syrup a tincture made with hot alcohol, removing fat, boiling residue with water, filtering, which deposits picrotoxin upon cooling. It is in colorless, shining prismatic crystals or powder, odorless, very bitter, soluble in alcohol, ether, chloroform; with $H_2SO_4 + NaNO_3 + NaOH$ gives brick-red, fading in few hours. Cerebrospinal excitant, nervine, antiparasitic, with combined action of belladonna and nux vomica; slows heart and respiration, causes spasms of flexors, death by paralyzing heart; convulsions resemble epileptic paroxysms (circular spasms)—those of strychnine being tonic (tetanic), affecting the extensors; paralysis (laryngeal), epilepsy, chorea, eclampsia, chronic spasms of the limbs, vomiting with giddiness, morphine antidote; externally—parasitic skin diseases, itch, lice, ringworm (avoiding abraded surfaces); powdered berries, mixed with dough, sometimes thrown upon water in order to catch fish; after eating this, fish whirl around, become stupefied, and lie motionless upon the surface, so that they may readily be picked up; berries also prevent secondary fermentation of alcoholic liquors, adding strength thereto, but dangerous. *Poisoning*: Symptoms and treatment similar to strychnine. Dose, seed, gr. 1-3 (.06-.2 Gm.); 1. *Tinctura*

Cocculi, 10 p. c. (diluted alcohol), dose, mij-15 (.13-1 cc.)—externally to destroy parasites; picrotoxin, gr. $\frac{1}{64}$ — $\frac{1}{32}$ (.001-.002 Gm.); menispermine, gr. 1-2 (.06-.13 Gm.); *decoction*, 2.5 p. c.; *ointment*, 2 p. c.



FIG. 134.—*Anamirta Cocculus (paniculata)*.

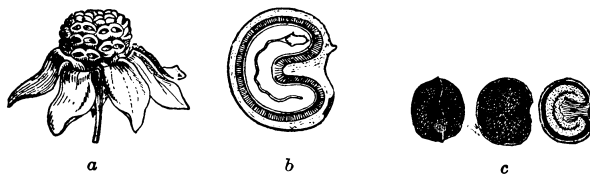


FIG. 135.—*Anamirta Cocculus*: a, staminate flower; b, longitudinal section of fruit, magnified; c, fruit and section, normal size.

3. *Chondroden'dron tomento'sum*, *Parei'ra*, *Parei'ra Bra'va*, N.F.—The dried root with not more than 5 p. c. of stems nor 2 p. c. of other

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foreign organic matter; Brazil, near Rio Janeiro, Peru. Tall woody climber; stem 1–10 Cm. ($\frac{2}{5}$ –4') thick; bark rough, with elevated prominences; leaves 12.5–30 Cm. (5–12') long, ovate, cordate, petiolate, smooth above, finely woolly beneath; flowers diœcious, panicles; fruit purplish-black drupe, 6 in a bunch like grapes. Root subcylindrical, tortuous, in pieces 10–15 Cm. (4–6') long, 1–6 Cm. ($\frac{2}{5}$ –2') thick, brownish, furrowed, hard, heavy, tough; internally brownish-gray, waxy luster (fresh), several successive concentric zones of fibro-vascular bundles, each 2–4 Mm. ($\frac{1}{12}$ – $\frac{1}{6}$ ') wide, separated by zones of parenchyma

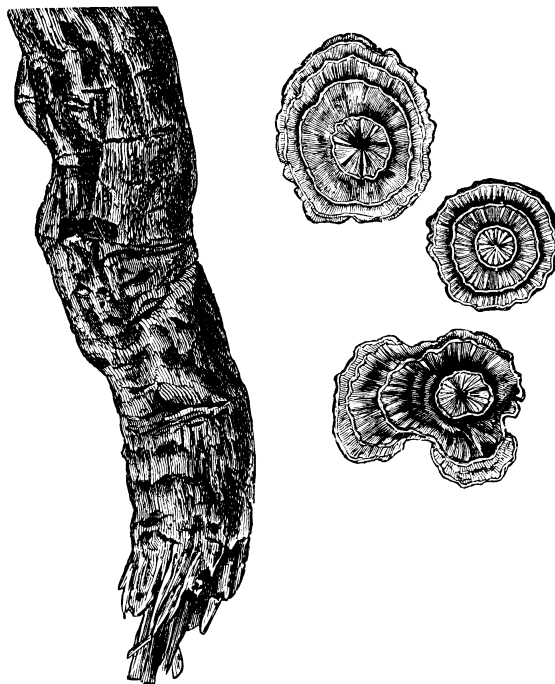


FIG. 136.—Pareira (brava): portion of a root and transverse section of the same.

and stone cells, prominent medullary rays; stems grayish, usually covered with lichens, without waxy luster; odor slight; taste bitter. Powder, dark brown—numerous starch grains, tracheæ, wood-fibers, stone cells, brownish cork; bluish-black with iodine T. S.; solvents: 70 p. c. alcohol, boiling water; contains pelosine (cissampeline—identical with bebeerine, buxine, paricine), tannin, starch, gum, ash 6–11 p. c. Diuretic, tonic, laxative; cystitis, calculi, gonorrhea, leucorrhea, dropsy, rheumatism, jaundice; natively for bites of poisonous serpents (leaves to wound, vinous infusion internally). Dose, ʒss–1 (2–4 Gm.);

1. *Fluidextractum Pareiræ* (diluted alcohol), dose, \mathfrak{z} ss-1 (2-4 cc.).
Extract, gr. 10-20 (.6-1.3 Gm.). *Infusion*, *Decoction*, each, 5 p. c.,
 \mathfrak{z} j-2 (30-60 cc.).

4. *Menispermum canadense*, *Yellow Parilla*, *Canadian Moonseed*.—
 The rhizome and roots, U.S.P. 1880-1890; N. America (Canada to
 S. Carolina). Perennial climber, 2.5-3.5 M. (8-12°) long; stem round,
 striate; leaves 10-12.5 Cm. (4-5') broad, peltate, 3-5-lobed, pale beneath
 petioles long; flowers small, yellowish; fruit 8 Mm. ($\frac{1}{3}$ ') thick, black,
 resembling grapes. Rhizome 1 M. (3°) long, 6 Mm. ($\frac{1}{4}$ ') thick, yellow-
 ish-brown, knotty, wrinkled lengthwise, roots many, fracture tough,
 woody, inside yellowish, bark thick, wood-rays broad, porous, and
 longest on lower side, pith distinct; nearly inodorous; taste bitter;

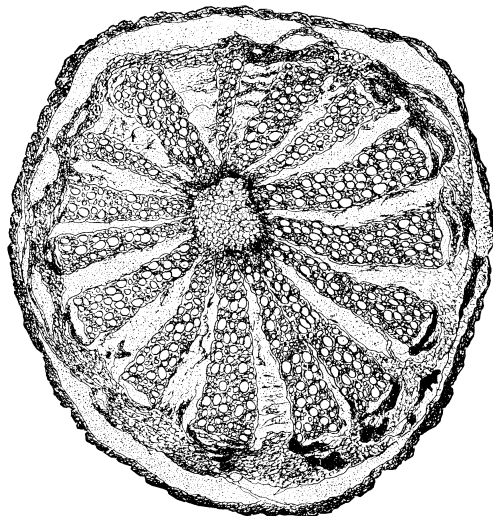


FIG. 137.—*Menispermum canadense*: transverse section of rhizome magnified.

contains berberine (yellow), menispine, starch, gum, resin, tannin.
 Tonic, alterative, diuretic; similar to calumba (owing to its bitterness);
 scrofulous affections, as a substitute for sarsaparilla. Dose, gr. 15-60
 (1-4 Gm.); fluidextract (alcohol 65 p. c.), \mathfrak{z} ss-1 (2-4 cc.).

5. *Cissampelos pareira* (Gr. *κισσός*, ivy, + *ἄμπελος*, a vine).—W.
 Indies, C. America. Root and stem 6-25 Mm. ($\frac{1}{4}$ -1') thick, not con-
 centric, wood in 20 porous wedges, separated by narrow medullary
 rays, bark brownish-gray, suberous; lighter than pareira, non-waxy,
 and the infusion gives no blue color with tincture of iodine.

6. *Bol'du Bol'dus*, *Boldus*, *Boldo*, *Boldo Leaves*, *N.F.*—Monimiaceæ.
 The dried leaf with not more than 2 p. c. of stems or other foreign
 organic matter, yielding not more than 6 p. c. of acid-insoluble ash;

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S. America, Chile. A large aromatic evergreen diœcious shrub. Leaves ovate, 3–7 Cm. ($1\frac{1}{5}$ –3') long, 1–4 Cm. ($\frac{2}{5}$ –1 $\frac{3}{5}$ ') broad, base and apex rounded or indented, entire, revolute, thick coriaceous, rigid, brittle, pale green, papillose, petiole stout; odor peculiar, disagreeable (crushed) chenopodium-like; taste bitter, warm, pungent, camphoraceous, terbinthinate. Powder, greenish—parenchyma, volatile oil cells, calcium carbonate cystoliths, hairs, numerous stomata; contains volatile oil, resin, boldine, boldoglucin (glucoside—liquid), tannin. Sedative, hypnotic; tonic; atonic dyspepsia, nervousness, hepatitis, rheumatism, urethritis. Dose, gr. 5–10 (.3–.6 Gm.); 1. *Fluidextractum Boldi* (alcohol). *Tincture*, 20 p. c. Mv–20 (.3–1.3 cc.), boldine—local anesthetic, gr. 3 (.2 Gm.).

25. LAURACEÆ. Laurel Family.

La-ra'se-e. L. *Laur-us* + aceæ, bay tree, fr. Celtic *blaur* (*laur*, the *b* dropped), signifying green—*i. e.*, referring to plant's foliage. Trees, shrubs. Distinguished by being aromatic (volatile oils); leaves simple, pellucid-dotted; flowers polygamous, calyx 4–6, in 2 rows, petaloid, regular; stamens perigynous, distinct, anthers opening by 2–4 uplifted valves; ovary 1-celled; ovules 1 in each cell; fruit drupe or berry; tropics, temperate climates; aromatic, stimulant (vol. oil), narcotic, sudorific, tonic, stomachic, febrifuge, astringent; timber, some fruit edible.

Genera: 1. **Cinnamomum**. 2. **Sassafras**.

CINNAMOMUM. CINNAMON, U.S.P.

Cinnamomum Loureirii, { The dried bark, yielding not less than 2
Nees. p. c. of volatile ether-soluble extractive.

Habitat. Annam (Cochin China).

Syn. Cinnam., Cinnamomum Saigonicum, Annam—China—God's Cinnamon, Annam Cassia, Cortex Cinnamomi Saigonici; Fr. Cannelle de Saigon; Ger. Saigon-zimt.

Cin-na-mo'mum. L. fr. Ar. *kinnamon*, cinnamon, probably connected with *qaneh*, a reed, cane—*i. e.*, resemblance of stems; or Malay *kaju manis*, sweet wood, from its aromatic odor and taste.

Lou-rei'ri-i. L. *Loureiri-um* in honor of Jean de Loureiro, 1710–1791—*i. e.*, a celebrated Portuguese botanist and writer, author of *Flora Cochinchinensis*, and other important works.

Sa-i-gon'i-cum. L. belonging to Saigon, a country and city in Southern Annam—*i. e.*, its native habitat.

PLANT.—Handsome evergreen tree, 6–9 M. (20–30°) high, trunk .3–.5 M. (12–18') thick, young twigs slightly quadrangular; leaves coriaceous, 3–5-nerved, but only midrib reaches apex, bright glossy-green above, glaucous beneath, 10–20 Cm. (4–8') long; flowers Jan.–March, small, hermaphrodite or polygamous, fleshy, black, ovoid, size of small olive, adhering, like acorn, to cup-shaped perianth. BARK, in quills, 30 Cm. (12') long, 4 Cm. ($\frac{4}{5}$ ') broad; bark .5–3 Mm. ($\frac{1}{50}$ – $\frac{1}{5}$ ')

thick, light brown, dark purplish-brown with grayish patches of crustose lichens and numerous bud-scars, finely wrinkled, especially that of younger twigs, otherwise rough from corky patches surrounding the lenticels; inner surface reddish-brown, dark brown, granular, slightly striate; fracture short—inner bark porous from large oil and mucilage cells, and separated from the outer by a layer of stone cells; odor characteristic, aromatic; taste sweetish, aromatic, pungent; POWDER, yellowish-brown—numerous starch grains; single and 2-4-compound, single grains .005-.025 Mm. ($\frac{1}{5000}$ – $\frac{1}{1000}$ '), stone cells irregular, bast-fibers with slightly lignified walls; parenchyma, reddish-brown walls; oil and mucilage cells. *Solvents*: alcohol; hot water partially. Dose, gr. 5-30 (.3-2 Gm.).

ADULTERATIONS.—BARK: *Saigon*—Cassia bark, and a closely resembling bark of unknown derivation, having lighter gray color and coarser structure identified by weak odor and taste; possibly unscraped Guava bark quills, and clove bark; *Ceylon*—Scarcely possible in the entire state; POWDER: Neither Saigon or Ceylon found on the market, all so labeled being cassia, which is subject to endless admixtures—chips, siftings, buds, walnut-shells, oil stone, flour, sand, beans, grains, starch, clove-buds—exhausted drug, by percolation, distillation; ash (sometimes) 8-10 p. c.; OIL: That distilled from flowers and roots. phenol, oil of clove, petroleum, colophony, lead.



FIG. 138.—Cinnamomum twig, showing leaf venation.

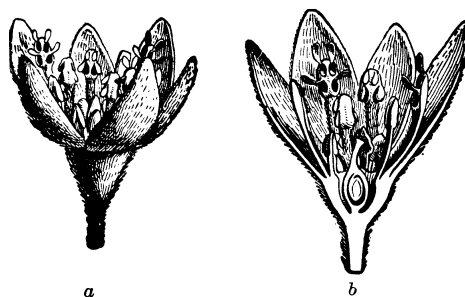


FIG. 139.—Cinnamomum: a, flower; b, vertical section of the same.

Commercial.—Cinnamon was a very early favorite spice, being brought by Arabian navigators to the Phœnicians, Grecians, and Romans, the Chinese cassia being used first, the Ceylon not until 1275. While there are about 50 species growing wild, only a few yield the

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commercial bark—this resulting mostly from cultivated plants. At one time Ceylon excelled in the industry, but there coffee largely has replaced it, thus restricting to the neighborhood of Colombo the principal cinnamon gardens; however, S. China has become equally interested in the cultivation and as a result produces much valuable bark. There are two important varieties: 1, *Saigon, Annam Cassia* (*Cinnamon, U.S.P.*), thought to be entirely from wild trees (*C. Lourei'rii*, and other species), growing in the mountainous districts of Annam. While chips and thick trunk-bark sometimes reach us, most is from branches and small stems, all being of good quality—sweet,

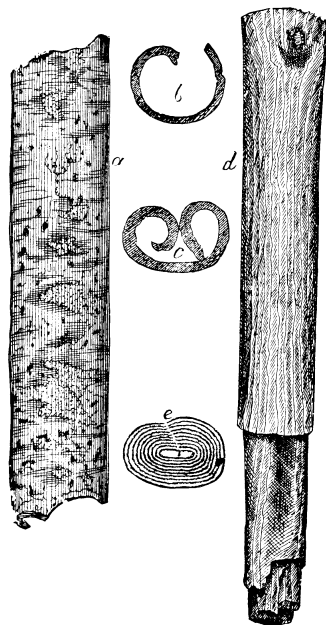


FIG. 140.—*Cinnamomum*: *a, b, c*, from China; *d, e*, from Ceylon.

aromatic, almost void of astringency and bitterness; some consider it high-grade cassia, but its own specific structure, area of growth, and absence of objectionable qualities in the corky layer seem to preclude such a possibility; certainly it is related more closely to cassia than to Ceylon, and may be an inferior grade (from one or more species distinct from *C. Cassia*) of that distinctive Chinese cinnamon so highly prized by the natives; 2, *Ceylon (Cinnamon)*, formerly in U.S.P., considered best, being nearly all from cultivated plants through the process of pollarding, so that in 2-3 years many slender stems are produced with bark devoid of astringent and corky layer, this latter

not yet having had time to form. The cultivation of cinnamon begins with the planting of seed in prepared soil, 4–5 in each hill, from which, in 5–6 years, the straight stems due to continued pruning, 1.5–3 M. (5–10°) high, are cut down with catty-knives, and by coppicing a new crop of twigs is formed every 2–3 years. The barking (March–June, after which delicacy and aroma lessen) takes place under cover by making 2 equidistant longitudinal incisions and transverse ones every few feet apart, then teasing off easily with a mama-knife (Saigon); the bark may now be allowed to wilt or undergo partial fermentation for several days, becoming soft and pliable, thus facilitating epidermal separation, when it is laid concave downward and scraped to the layer of stone cells, thereby rejecting the bitter or astringent portion (Ceylon); congeries of quills are formed, which when dried (first by shade, then by sun) are made into 30-pound (14 Kg.) bundles and marketed as to quality in *firsts*, *seconds*, *thirds*, the inferior grades being distilled for oil; or each quill is dried separately (Saigon) and tied into bundles for exportation. The bark is imported loose or in bundles with split bamboo bands from Canton, Hong Kong (Saigon), Calcutta, Colombo.

CONSTITUENTS.—Volatile oil .5–2 p. c., tannin 3–5 p. c., resin, bitter principle, sugar, mannite, starch, mucilage, ash 6 p. c., of which 2 p. c. is insoluble in diluted hydrochloric acid.

Oleum Cinnamomi. **Oil of Cinnamon, U.S.P.**—(Syn., Ol. Cinnam., Oleum Cassiæ, U. S. P. 1910, Cassia Oil, Oleum Cinnamomi Cassiæ, Oil of Chinese Cinnamon; Fr. Essence (Huile) de Cannelle de Chine; Ger. Zimöl, Zimtkassienöl.) This volatile oil distilled from the leaves, twigs, and waste bark of *Cinnamomum Cassia* (Chinese), and rectified by steam distillation, is a yellowish, brownish liquid, darker and thicker by age and exposure, characteristic odor and taste of cassia cinnamon, sp. gr. 1.055 soluble in alcohol (1), glacial acetic acid (1), 70 p. c. alcohol (2), optically almost inactive; contains at least 80 p. c. of cinnamic aldehyde, C_9H_8O (oxidizing into resin and cinnamic acid) upon which the value depends, also cinnamyl acetate, $C_9H_9C_2H_3O_2$ (liquid of unpleasant acrid taste), and phenyl-propyl acetate, orthocumaric aldehyde, cinnamic acid, $C_9H_8O_2$; this latter is not in fresh oil, and after being formed becomes, by further oxidation, benzoic acid. *Tests:* 1. Shake oil (2) with purified petroleum benzin (5–10)—decanted liquid is colorless and gives no green color when shaken with equal volume of (1 in 1000) copper acetate solution (abs. of rosin or rosin oils). 2. Thoroughly wash a 1000 cc. beaker and a filter paper free of chlorides; place 3 or 4 drops of oil on a clean watch glass on triangle, ignite, immediately cover with moistened beaker; wash products of combustion through washed filter paper with 10–20 cc. distilled water, acidulate filtrate with 1 drop nitric acid, add 1 drop silver nitrate T. S.—no turbidity (abs. of chlorinated products). Should be kept cool, dark, in well-stoppered, amber-colored bottles. The Ger. P. and U. S. P. recognize only the oil of Chinese cinnamon (cassia),

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while the Br. P. and Fr. Codex that of Ceylon cinnamon; the former is more abundant and cheaper, the latter of finer flavor and more delicate aroma, containing besides cinnamic aldehyde, some eugenol and phellandrene. Dose, $\text{m}\bar{\text{j}}\text{--}5$ (.06--3 cc.).

PREPARATIONS.—1. BARK: 1. *Tinctura Cardamomi Composita*, 2.5 p. c. 2. *Tinctura Gambir Composita*, 2.5 p. c. 3. *Tinctura Lavandulæ Composita*, 2 p. c. 4. *Tinctura Rhei Aromatica*, 4 p. c. 5. *Syrupus Cinnamomi*, N.F., 10 p. c. 6. *Tinctura Cinnamomi*, N.F., 20 p. c. (glycerin 7.5 p. c., alcohol 67.5, water 25. Dose, $\text{ss--}2$ (2--8 cc.); Preps.: 1. *Elixir Taraxaci Compositum*, N.F., 3 p. c. 2. *Mistura Rhei Alkalina*, N.F., 6.4 p. c. 7. *Pulvis Aromaticus*, N.F., 35 p. c. + ginger 35, cardamom seed 15, myristica 15. 8. *Pulvis Aromaticus Rubefaciens*, N.F., 30 p. c., cinnamon 30, clove 30, ginger 20, capsicum 20. 9. *Pulvis Cretæ Aromaticus*, N.F., 8 p. c. 10. *Syrupus Sennæ Aromaticus*, N.F., $\frac{2}{5}$ p. c. 11. *Tinctura Antiperiodica*, N.F., $\frac{1}{1\frac{1}{3}}$ p. c. 12. *Tinctura Aromatica*, N.F., 10 p. c. + ginger 4, galangal 2, clove 2, cardamom seed 2. 13. *Tinctura Opii Crocata*, N.F., $\frac{3}{5}$ p. c. 14. *Tinctura Opii et Gambir Composita*, N.F., $\frac{1}{40}$ p. c. 15. *Tinctura Viburni Opuli Composita*, N.F., 6.5 p. c.

II. OIL: 1. *Aqua Cinnamomi*. Cinnamon Water. (Syn., Aq. Cinnam.; Fr. Eau de Cannelle; Ger. (Einfaches) Zimtwasser.)

Manufacture: $\frac{1}{5}$ p. c. Similar to Aquæ Aromaticæ; triturate oil 2 cc. with purified talc 1.5 Gm., recently boiled distilled water q. s. 100 cc., filter until clear. Dose, $\text{ss--}1$ (15--30 cc.).

Preps.: 1. *Infusum Digitalis* (1.5 p. c.)—15 p. c. 2. *Mistura Cretæ*, 40 p. c. 3. *Liquor Ferri Albuminati*, N.F., 20 p. c. 4. *Syrupus Ipecacuanhæ et Opii*, N.F., 3.2 p. c. 5. *Tinctura Rhei Aquosa*, N.F., 12.5 p. c.

2. *Spiritus Cinnamomi*. Spirit of Cinnamon. (Syn., Sp. Cinnam.; Fr. Alcool de Cannelle; Ger. Zimtschspiritus.)

Manufacture: 10 p. c. Dissolve oil 10 cc. in alcohol q. s. 100 cc. Dose, $\text{m}\bar{\text{v}}\text{--}30$ (.3--2 cc.).

Preps.: 1. *Syrupus Rhei*, $\frac{2}{5}$ p. c. 2. *Syrupus Ipecacuanhæ et Opii*, N.F., $\frac{2}{5}$ p. c. 3. *Tabellæ Phenolphthaleini*, N.F., $\frac{1}{50}$ m .

3. *Acidum Sulphuricum Aromaticum*, $\frac{1}{10}$ p. c. 4. *Fluidextractum Cascaræ Sagradæ Aromaticum*, $\frac{1}{50}$ p. c. 5. *Acetum Aromaticum*, N.F., $\frac{1}{20}$ p. c. 6. *Dentifricium*, N.F., .175 p. c. 7. *Fluidglyceratum Cascaræ Sagradæ Aromaticum*, N.F., $\frac{1}{10}$ p. c. 8. *Lavatio Ori*, N.F., $\frac{1}{2}$ p. c. 9. *Liquor Pepsini Aromaticus*, N.F., $\frac{1}{40}$ p. c. 10. *Mistura Oleo-Balsamica*, N.F., $\frac{2}{5}$ p. c. 11. *Nebula Aromatica*, N.F., $\frac{1}{5}$ p. c. 12. *Nebula Mentholis Composita*, N.F., $\frac{1}{5}$ p. c. 13. *Odontalgicum*, N.F., 17 p. c. 14. *Oleum Ricini Aromaticum*, N.F., $\frac{3}{10}$ p. c. 15. *Spiritus Cardamomi Compositus*, N.F., 1 p. c. 16. *Spiritus Vanillini Compositus*, N.F., $\frac{1}{2}$ p. c. 17. *Syrupus Rhamni Cathartica*, N.F., $\frac{1}{50}$ p. c.

Unoff. Preps.: BARK: *Fluidextract*, $\text{m}\bar{\text{v}}\text{--}30$ (.3--2 cc.). *Infusion*, $\text{ss--}2$ (30--60 cc.).

PROPERTIES.—Carminative, stomachic, stimulant, astringent, hemostatic, aromatic, antispasmodic, germicide. The oil has no astringency.

USES.—Diarrhea, flatulence, nausea, vomiting, menorrhagia, parturient, to correct griping medicines; for flavoring preparations, chocolate, etc.

Allied Products:

1. *Cinnaldehydum, Cinnamic Aldehyde*, C_9H_8O , U.S.P. 1900.—Obtained as a natural product by shaking oil of cassia with aqueous solution of acid sodium sulphite, filtering, washing crystalline magma with alcohol, decomposing with diluted sulphuric acid, or synthetically by oxidation of cinnamyl alcohol by dry distillation of a mixture of calcium cinnamate and formate, or as a condensation-product by acting on benzaldehyde (10), acetaldehyde (15) with hydrochloric acid gas, or with 10 p. c. solution of sodium hydroxide (10) + water (900). It is a colorless liquid, cinnamon-like odor, burning, aromatic taste, sp. gr. 1.047, boils at $250^{\circ}C$. ($482^{\circ}F$.) with partial decomposition, optically inactive, solidified with ice and salt should melt at $-7.5^{\circ}C$. ($18.5^{\circ}F$.), soluble in alcohol, ether, fixed or volatile oils, sparingly in water; contains at least 95 p. c. of pure cinnamic aldehyde. Similar to oil of cinnamon, for which it may be substituted. Should be kept in well-stoppered, small, amber-colored bottles. Dose, mj–5 (.06–.3 cc.).

2. *Cinnamomum Cassia (aromat'icum), Chinese Cinnamon*.—The dried bark of the shoots deprived of most of the corky portion, U.S.P. 1820–1890; China. Plant—handsome tree, but bark removed when 5–6 years old, occurring in quills 5–20 Mm. ($\frac{1}{5}$ – $\frac{4}{5}$ ') broad, bark 1–2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') thick, deprived of corky layer, yellowish-brown, often with grayish patches, rough, inside nearly smooth, faintly striate, fracture nearly smooth; odor fragrant; taste sweet, aromatic, pungent, astringent. The outer layers are simply imperfectly removed by curved knives or planes, those of iron being avoided, consequently can be recognized readily by having undergone this treatment, also by its more irregular zone of stone cells, the greater abundance of bast-fibers and tannin. This bark is very irregular in quality, owing to its varied origin, and accordingly is recognized in commerce as Cassia, Cassia vera, Cassia lignea, etc. *C. Burman'ni* is believed to yield the Sumatra, also a portion of the Java, China, Timor; *C. Tam'ala*, some of the Calcutta, N. India, Cochin China; *C. i'ners*, part of E. Indian archipelago.

3. *Cassia Buds, Flores Cassiæ*.—These are the small, stem-like immature fruits of various species, somewhat resembling, but smaller than clove, having fine cinnamon odor and taste; contain oil of cinnamon, tannin, etc.

CAMPHORA. CAMPHOR, U.S.P.

Cinnamomum Camphora, { The dextrorotatory ketone (concrete volatile oil).
(*Linne*) *Nees et Ebermaier*.

LAURACEÆ

Habitat. China, Japan, Formosa. Tree cultivated in Italy as an ornament, and may yield profitably in California, Florida, etc., wherever frosts are light.

Syn. Camph., Camphor Laurel, Gum Camphor Tree; Fr. Camphre du Japon—droit; Ger. Kampfer, Kampher, Campfer.

Cam'pho-ra. L. fr. Ar. *kajur* or *kapur*, chalk, lime—*i. e.*, its resemblance.

PLANT.—Handsone evergreen tree, 9–12 M. (30–40°) high, .3–.6 M. (1–2°) thick, much branched above, fragrant; bark smooth, green; leaves 7.5–15 Cm. (3–6') long, 2.5–7.5 Cm. (1–3') broad, attenuated toward both ends, entire, smooth, shining, ribbed, bright yellowish-green above, paler and glaucous beneath, thick; flowers, June–July,



FIG. 141.—*Cinnamomum Camphora*.

small, whitish; fruit, Nov.–Dec., purple berry, 6 Mm. ($\frac{1}{4}$ ') thick, 1-seeded. DEXTROROTATORY KETONE (camphor), in white, translucent, tough masses, granules, penetrating, characteristic odor, pungent, aromatic taste, soluble in alcohol (1), chloroform (1), ether (1), carbon disulphide, petroleum benzin, fixed or volatile oils, water (800), sp. gr. 0.990; readily pulverized with a little alcohol, chloroform, ether, and liquefied with equal quantity of chloral hydrate, menthol, phenol, thymol; volatilizes at ordinary temperature, melts at 175° C. (347° F.). *Tests:* 1. Heat 2 Gm.—sublimes without carbonization, leaving about .05 p. c. of non-volatile matter. 2. Solution in petroleum benzin

(1 in 10)—clear (abs. of water). 3. A copper spiral 6 Mm. ($\frac{1}{4}$ ') in diameter and 6 Mm. ($\frac{1}{4}$ ') long held in flame until it glows without coloring flame green, then dipped into camphor; ignited, burned outside of flame; then in lower outer edge—no green color—(abs. of chlorinated products); alcoholic solution precipitates with water. *Impurities:* Chlorinated products, water. Should be kept cool, in well-closed containers. Dose, gr. 1–5 (.06–.3 Gm.).

Commercial.—Tree, resembling sassafras and linden, is of slow growth but flourishes up to 600 M. (2,000°) elevation in the tropics—Cape of Good Hope, Brazil, Jamaica, Madeira, Mediterranean region, etc. The wood is valuable, being white, fragrant and repellent to insects, and while all parts contain camphor, along with its strong odor, it is obtained only from the root, trunk, and branches of trees fifty or more years old—by sublimation. In Japan roots and small branches are chipped and put, with some water, in large vessels surmounted by earthen domes lined with rice-straw; on applying heat the camphor, volatilized by steam, rises to the domes and condenses upon the straw—flowers of camphor—from which it is shaken and packed in double-tubs, 100 pounds (45 Kg.). In China the comminuted plant is boiled with water until camphor adheres to the ladle and the strained liquid concentrates upon cooling, which then is sublimed with alternating layers of earth. In Formosa (island) a long wooden trough, coated with clay and fixed over a crude furnace, is half-filled with water and, upon a perforated board luted to the top, chips are placed, that in turn are covered with inverted pots; on applying heat steam is produced, which, rising, passes through the perforations and chips, thereby becoming camphor-vapor that condenses in the upper part of the pots—flowers of camphor—from which it is scraped every few days. This industry here has been monopolized and revolutionized by Japan since her last war with China, to the effect of improving quality, the government purchasing from all producers their product of a recognized standard, and refining it at Taihoku, using several thousand pounds at a charge—the oil and water being first driven off at low heat, then the camphor sublimed at higher temperature, and pressed hydraulically into blocks for exporting. The crude is forwarded often in leaf-lined baskets, 70 pounds (32 Kg.), to Tamsui, Takow, etc., there stored in vats, or packed in chests, tubs (lead- or tin-lined), 100 pounds (45 Kg.), which prior to shipping, are saturated with water to prevent loss of weight by evaporation in transit, causing it to reach us somewhat moist. When in vats a yellowish-brown volatile oil—oil of camphor—drains out, the amount increasing with pressure. There are two varieties: 1, *Japan* (*Tub*, *Dutch*—they being the first to introduce it), lighter pink, larger grained, higher priced, cleaner, dryer; usually from Batavia; 2, *China* (*Formosa*), cheapest, most abundant; usually from Canton. As such “crude camphor” contains 2–10 p. c. of *impurities*—vegetable matter, gypsum, salt, sulphur, chips, ammonium chloride, chlorinated products, etc.—which must be removed before suitable for medicine.

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Refining.—Formerly done exclusively in Europe, but now largely in Formosa and our country, by mixing crude camphor with $\frac{1}{50}$ part of quicklime (iron filings, sand, or charcoal) to remove resin, empyreumatic oil, moisture, etc., then resubliming at 175–204° C. (347–400° F.) in iron, copper or glass retorts, and pressing into rectangular blocks or circular cakes.

ADULTERATIONS.—Rare: Stearic acid 25–50 p. c., insoluble in alcohol except when hot, crystallizing therefrom upon cooling; cane-sugar (sucrose) 20 p. c.

CONSTITUENTS.— $C_{10}H_{16}O$. When heated with zinc chloride yields cymol, $C_{10}H_{14}$; with nitric acid yields camphoric acid, $C_{10}H_{16}O_4$, and camphoronic acid, $C_9H_{12}O_5$; the former acid forms colorless, inodorous prisms (see page 232); the latter acid melts at 136° C. (277° F.) with decomposition and is freely soluble in water or alcohol.

PREPARATIONS.—1. *Aqua Camphoræ*. Camphor Water. (Syn., Aq. Camph., Aqua Camphorata, Mistura Camphoræ; Fr. Eau camphré; Ger. Kampferwasser.)

Manufacture: $\frac{1}{5}$ p. c. Triturate powdered camphor .2 Gm. with purified talc 1.5 Gm. + distilled water 100 cc., agitate well, set aside 24 hours, filter repeatedly until clear; it is a saturated solution. Dose, 5j–8 (4–30 cc.).

2. *Linimentum Camphoræ*. Camphor Liniment. (Syn., Lin. Camph., Camphorated Oil, Linimentum Camphoratum; Fr. (Liniment) Huile camphré; Ger. Oleum Camphoratum, Kampferöl, Kampferliniment.)

Manufacture: 20 p. c. Heat in a flask on water-bath cottonseed oil 80 Gm., add camphor 20, stopper container and agitate occasionally until dissolved without further heating; used externally.

Prep.: 1. *Ceratum Camphoræ*, *N.F.*, 10 p. c.

3. *Spiritus Camphoræ*. Spirit of Camphor. (Syn., Sp. Camph., Tinctura Camphoræ, Tincture of Camphor, Alcohol Camphoratus; Fr. (Esprit de) Alcool camphré; Ger. Spiritus camphoratus, Kampferspirit.)

Manufacture: 10 p. c. Dissolve 10 Gm. camphor in alcohol 80 cc., add alcohol q. s. 100 cc., sp. gr. 0.825. *Test:* 1. To 5 cc. add .05 Gm. of anhydrous potassium carbonate—latter does not liquefy or adhere to bottom of container (abs. of added water). Dose, m̄v–60 (.3–4 cc.).

Preps.: 1. *Lotio Ammoniacalis Camphorata*, *N.F.*, 1 p. c. 2. *Mistura Opii et Chloroformi Composita*, *N.F.*, 20 p. c. 3. *Mistura Opii et Rhei Composita*, *N.F.*, 20 p. c. 4. *Tinctura Opii et Gambir Composita*, *N.F.*, 4 p. c.

4. *Linimentum Saponis*, 4.5 p. c. 5. *Linimentum Chloroformi*, 3.15 p. c. 6. *Tinctura Opii Camphorata*, $\frac{2}{3}$ p. c. 7. *Ampullæ Camphoræ*, *N.F.*, 3½ gr. 8. *Chloral Camphoratum*, *N.F.*, each, 50 p. c. 9. *Emplastrum Fuscum Camphoratum*, *N.F.*, 1 p. c. 10. *Linimentum Saponato-Camphoratum*, *N.F.*, 2.5 p. c. 11. *Menthol Camphoratum*, *N.F.*, 47.5 p. c. 12. *Petrozolinum Chloroformi Camphoratum*, *N.F.*, 20 p. c. 13. *Petrozolinum Phenolis Camphoratum*, *N.F.*, 37.5 p. c. 14. *Pilulæ Opii*

et Camphoræ, N.F., 2 gr. 15. *Unguentum Camphoræ*, N.F., 22 p. c. 16. *Linimentum Belladonnæ*, N.F., 5 p. c. 17. *Linimentum Opii Compositum*, N.F., 1.75 p. c. 18. *Linimentum Sinapis Compositum*, N.F., 6 p. c. 19. *Nebula Aromatica*, N.F., $\frac{3}{10}$ p. c. 20. *Nebula Mentholis Composita*, N.F., 1 p. c. 21. *Pilulæ Antiperiodicæ*, N.F., $\frac{1}{8}$ gr. 22. *Tinctura Antiperiodica*, N.F., $\frac{1}{8}$ p. c.

Unoff. Preps.: *Linimentum Camphoræ Ammoniatum* (Br.) 12.5 p. c., + stronger ammonia water 25 p. c.; *Vinum Camphoratum*. *Camphora Phenolata*, *Camphora Salicylata*, etc. Enters universally into camphorice, dentifrices, etc.

PROPERTIES.—Antispasmodic, stimulant, carminative, stomachic, (an)aphrodisiac, antipyretic, nervine, sedative, diaphoretic, rubefacient, resolvent, antiseptic. Has great healing powers; dilates vessels, increases flow of gastric juice and peristalsis.

USES.—Camphor was not known to Greeks or Romans, we having derived it from the Arabians, who use it solely as a refrigerant and to lessen sexual desire. Now employed in hysteria, dysmenorrhea, nervousness, diarrhea, colic, flatulence, rheumatism, gout, tenesmus, asthma, cough, coryza, toothache, headache, spasms, chorea, epilepsy, nausea, typhoid condition, mania. Externally as a wash, liniment, or ointment for ulcers, gangrene, scabies, sprains, bruises, rheumatic pains, convulsions.

Poisoning: Have burning pain, vomiting, weak pulse, giddiness, debility, pallor, cold, clammy skin, faintness, confused ideas, delirium, convulsions, death from collapse; does not kill healthy adults. Give water at once if camphor taken in alcoholic solution, induce vomiting, follow with alcohol in small but frequent doses, coffee, cold, arterial sedatives, ether, artificial heat, castor oil; opium and bromides for the convulsions.

Incompatibles: Aconite, acids, neutral salts, water precipitates all solutions.

Synergists: Antispasmodics, alcohol, opium, narcotics, aromatics, all in small quantity.

Allied Products:

1. *Camphora Monobromata*. *Monobromated Camphor*, $C_{10}H_{15}BrO$. —This ortho-monobromcamphor is obtained by heating together in a flask or retort camphor and bromine in molecular proportions (preferably with a little water or chloroform) until reaction ceases, allowing yellowish solution to crystallize, heating until mass becomes white, recrystallizing from alcohol or petroleum benzin. It is in colorless prismatic needles, scales, or powder, mild, characteristic, camphoraceous odor and taste, permanent, decomposed by exposure to sunlight, soluble in alcohol (6.5), chloroform (.5), ether (1.6), almost insoluble in water; melts at 75° C. (167° F.). Nervous sedative in nervous irritation, insomnia, headache—no advantages over camphor. Dose, gr. 1–5 (.06–.3 Gm.), in pill, emulsion.

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2. *Acidum Camphoricum*, *Camphoric Acid*, $C_{10}H_{16}O_4$, U.S.P. 1900.—This dibasic organic acid is obtained by oxidizing camphor 150 Gm. with hot nitric acid 2000 cc., until crystallization takes place, dissolving crystals in water (5) containing sodium carbonate, allowing solution of sodium camphorate to crystallize, dissolving crystals in water (10), decomposing with hydrochloric acid, when camphoric acid crystallizes out. It is in colorless, odorless, monoclinic prismatic crystals, plates, acid taste, melting at $187^{\circ} C.$ ($369^{\circ} F.$), soluble in alcohol, ether, chloroform, fatty oils, water (125). Antihydrotic, antiseptic, intestinal disinfectant, anticatarrhal; bronchitis, catarrh, cystitis, night-sweats of phthisis, diarrhea, sore throat, pyelitis, eczema, acne. Dose, gr. 5–30 (.3–2 Gm.); locally in 2–6 p. c. aqueous solutions, with 11 p. c. of alcohol to each 1 p. c. of acid.

3. *Borneol*, *Borneo*, *Sumatra*, or *Barus Camphor* (*Dryobalanops aromatica* (*Camphora*)), $C_{10}H_{18}O$, has different odor from official camphor, heavier than water, less volatile, with nitric acid yields ordinary camphor.

4. *Ngai Camphor* (*Blumea balsamifera*).—This is a tall weed of India, China, Formosa. Its camphor has same composition as Borneo, but is levorotatory, and natively is prized higher than our official.

5. *Artificial Camphor*.—Although this can be made by oxidizing camphene, $C_{10}H_{16}$, with chromic acid mixture, yet the more recent process is based upon the interaction of anhydrous turpentine and anhydrous oxalic acid at 120 – $130^{\circ} C.$ (248 – $266^{\circ} F.$), yielding pinyl oxalate and formate, which treated with lime gives borneol, and this by oxidation becomes camphor; however, the products terpin hydrate and terpene hydrochloride are recognized generally under this name—the latter being prepared by saturating oil of turpentine, dissolved in twice its volume of carbon disulphide, with hydrochloric acid gas, distilling with lime to form calcium chloride and camphene, oxidizing latter with nitric acid yielding camphor.

6. *Oleum Camphoræ*, *Camphor Oil*, U.S.P. 1860–1870.—This is a yellowish-brown volatile oil obtained from camphor by sublimation and expression; has camphor odor and taste, sp. gr. 0.940, dextro-rotatory; contains pinene, phellandrene, cineol, dipentene, terpineol, safrol, eugenol, cadinene—at low temperature deposits camphor; used by Chinese for rheumatism, etc. Should not be confounded with Linimentum Camphoræ, U.S.P., which also often is called oil of camphor (Ger. Oleum Camphoratum).

Allied Plants:

1. *Nectandra Rodiæi*, *Bebeeru Bark*.—The dried bark, U.S.P. 1860–1870; S. America, Guiana. Large tree, 18–24 M. (60 – 80°) high, bark ash-gray, smooth, leaves 12.5–15 Cm. (5–6') long, 5–7.5 Cm. (2–3') broad, coriaceous, shining; flowers yellowish-white, jasmine odor, wood strong (valuable in shipbuilding); fruit, subpyriform, 5–7.5 Cm. (2–3') long, bitter. Bark flat pieces 6 Mm. ($\frac{1}{4}$ ') thick, .3–.6 M. (1–2°) long, 10–15 Cm. (4–6') broad, many longitudinal depressions, inside cinna-

mon-brown, coarsely striate, fracture granular, with stone cells, astringent, bitter; contains bebeerine (identical with buxine, paracine, and pelosine), siripine; wood has nectandrine. Tonic, antiperiodic, febrifuge; intermittents, menorrhagia, leucorrhea, headache, neuralgia, dyspepsia, consumption, in infusion, decoction. Dose, $\overline{5}$ ss-1 (2-4 Gm.); bebeerine, gr. 1-10 (.06-.6 Gm.).

2. *Coto Bark*.—Bolivia. May be from *Dri'mys Win'teri* var. *granaten'sis*. In flat or curved pieces 12 Mm. ($\frac{1}{2}$ ') thick, cinnamon color and odor, taste pungent, bitter; contains cotoin, $C_{14}H_{18}O_4$, hydrocotoin, protocotoin, volatile oil, resin. Dose, gr. 1-5 (.06-.3 Gm.); cotoin, gr. $\frac{3}{4}$ -2 (.05-.13 Gm.).

3. *Paracoto Bark*.—Bolivia. 12 Mm. ($\frac{1}{2}$ ') thick, sometimes with white fissured cork, odor nutmeg-like; contains paracotoin, $C_{12}H_{18}O_4$, hydrocotoin, leucotin, volatile oil, resin. Used like coto bark for diarrhea of typhoid, phthisis, sweating, cholera, nasal catarrh. Dose, gr. 5-10 (.3-.6 Gm.); fluidextract (90 p. c. alcohol); tincture 12.5 p. c. (alcohol), $\overline{3}$ ss-1 (2-4 cc.); paracotoin, gr. 1-5 (.06-.3 Gm.).

4. *Benzoin (Lin'dera) Benzoin, Spice or Benjamin Bush*.—N. America, damp woods. Shrub 2-4.5 M. (6-15°) high, smooth; bark mostly used, berries and leaves to some extent; tonic, aromatic stimulant, diaphoretic; berries for allspice. Dose, gr. 15-60 (1-4 Gm.).

5. *Laurus nobilis, Laurel, Sweet Bay*.—The leaves and fruit; Mediterranean Basin. Leaves 5-10 Cm. (2-4') long, pellucid-punctate, smooth, aromatic, astringent; fruit (bayberries) oval drupes 12 Mm. ($\frac{1}{2}$ ') long; contain volatile oil, fixed oil (Oleum Lauri) 30 p. c.; stimulant, astringent, stomachic.

SASSAFRAS. SASSAFRAS, *N.F.*

SASSAFRAS MEDULLA. SASSAFRAS PITH, *N.F.*

Oleum Sassafras. Oil of Sassafras, *U.S.P.*

Sassafras variifolium, } A volatile oil distilled from the root.
(*Salisbury*) *O. Kuntze*.

Habitat. N. America—Canada, Florida to Texas; sandy, light soil, in the open.

Syn. Sassaif., Saxifrax, Saloop, Ague Tree, Cinnamon Wood; Sassafras (Cortex) Radix; Fr. Ecorce de Sassafras; Ger. Lignum Sassafras, Sassafrasholz, Sassafrasrinde; Sassaif. Med.; Ol. Sassaif., Sassafras Oil; Fr. Essence de Sassafras; Ger. Sassafrasöl.

Sas'sa-fras. L. *saxum*, rock, + *frangere*, to break—*i. e.*, grows in crevices of rocks; Sp. for *saxifrage*, name given by Monardes, Spanish botanist of 16th century.

Va-ri-i-fo-li-um. L. *varius*, varying, + *folium*, leaf—*i. e.*, leaves of several forms on the same tree, ovate, entire, 3-lobed and cuneate at base.

PLANT.—Shrub in the North, tree in the South, 9-24 M. (30-80°) high, .3-.6 M. (1-2°) thick; wood whitish, reddish, light, strong,

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durable, aromatic; bark of stem and large branches rough, deeply furrowed, grayish, divisible into layers, young end-twigs smooth, green; leaves 10–15 Cm. (4–6') long, varying shape; flowers, March–May, dioecious, fragrant, appearing before leaves, small, greenish-



FIG. 142.—*Sassafras variifolium*: 1, fruiting twig; 2, flowering twig.

yellow, racemes; fruit oval drupe, size of a pea, deep blue, 1-seeded. Bark — Sassafras, Sassafras, *N.F.* The dried bark of the root with not more than 4 p. c. of adhering wood, outer corky tissues or other foreign organic matter, yielding not more than 5 p. c. of acid-insoluble ash. It is in irregular, transversely curved or quilled pieces, 1–15 Cm. ($\frac{2}{5}$ –6') long, 1–4 Mm. ($\frac{1}{25}$ – $\frac{1}{6}$ ') thick, orange-brown, nearly smooth, irregular ridges, inner surface reddish-brown, obscurely short-striate; fracture short, corky layer, yellowish-white inner bark; odor aromatic; taste slightly mucilaginous,

astrigent, pungent. Powder, reddish-brown—numerous starch grains, bast-fibers spindle-shaped, red masses of tannin, tracheæ. Dose, 3ss–1 (2–4 Gm.). Pith—Sassafras Medulla, Sassafras Pith, *N.F.* The dried pith (stem) with not more than 1 p. c. of foreign organic matter, yielding not more than .5 p. c. of acid-insoluble ash. It is in subcylindrical, curved pieces, 2–10 Cm. ($\frac{4}{5}$ –4') long, 2–5 Mm. ($\frac{1}{12}$ – $\frac{1}{5}$ ') thick, light-weight, whitish, occasional wood fragments adhering; fracture

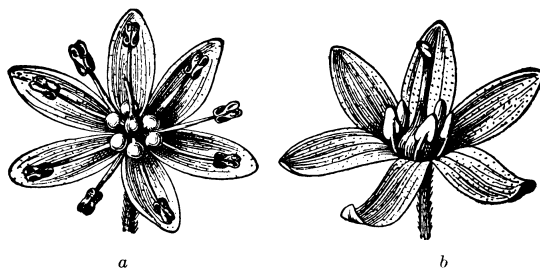


FIG. 143.—*Sassafras variifolium*: a, staminate flower; b, pistillate flower.

short; odor slight, sassafras-like; taste mucilaginous; mounts in water—thin layer of mucilage from inner walls of cells; macerate several hours .5 Gm. with cold distilled water 25 cc., filter, mucilaginous solution with alcohol (1)—no precipitate, unless excess added.

CONSTITUENTS.—I. BARK: Volatile oil 6–9 p. c., Sassafrid 9 p. c., tannin 6 p. c., resin, starch, gum, wax, ash 30 p. c. II. PITH: gum, volatile oil.

Oleum Sassafras. Oil of Sassafras.—This volatile oil distilled from the root (better—root-bark) with water or steam, is a yellow, reddish-yellow liquid, characteristic odor and taste of sassafras, soluble in 90 p. c. alcohol (2), solution being neutral, sp. gr. 1.070, dextrorotatory; contains chiefly safrol, $C_{10}H_{10}O_2$, 80 p. c., pinene and phellandrene, $C_{10}H_{16}$, 10 p. c., *d*-camphor 6.8 p. c., eugenol, $C_{10}H_{12}O_2$, .5 p. c., cadinene, residue 3 p. c. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mj–5 (.06–.3 cc.).

Sassafrid.—Supposed to be altered tannin, the result of oxidation, analogous to cinchona-red; some disclaim its presence in fresh bark; crystallizes in yellowish-brown granules, soluble in alcohol, insoluble in ether, solutions colored red by alkalies, precipitated by alkaline earths (carmine-red), ferric salts (greenish-brown), lead acetate (white) inodorous, nearly tasteless.

PREPARATIONS.—OIL: 1. *Syrupus Sarsaparillæ Compositus*, $\frac{1}{50}$ p. c. 2. *Syrupus Eriodictyi Aromaticus*, N.F., $\frac{1}{20}$ p. c. 3. *Syrupus Pini Albæ Compositus*, N.F., $\frac{1}{50}$ p. c. 4. *Syrupus Trifolii Compositus*, N.F., $\frac{1}{25}$ p. c. BARK: 1. *Fluidextractum Sarsaparillæ Compositum*, N.F., 10 p. c. 2. *Syrupus Pini Albæ Compositus*, N.F., $\frac{7}{10}$ p. c. PITH: 1. *Mucilago Sassafras Medullæ*, N.F., 3 p. c. Dose, *ad libitum*.

Unoff. Preps.: BARK: *Fluidextract*, 5ss-1 (2–4 cc.). *Infusion (Tea)*. Dose, *ad libitum*.

PROPERTIES. — Alterative, diaphoretic, stimulant, emmenagogue.

USES.—To purify blood, skin diseases, rheumatism, syphilis. Infusion valuable antidote for poison-ivy, internally and externally; it (tea) was popular at one time for so-called thinning the blood (alterative) in spring; given with sarsaparilla, guaiacum, mezereum, etc.; oil popular flavoring agent in confectionery, drinks, soaps, etc., anti-emetic, antagonist to narcotic effects of tobacco, hyoscyamus, etc.

Derivative Products:

1. *Safrolum*, *Safrol*, $C_{10}H_{10}O_2$ — $C_6H_3.C_3H_5.(OOCH_2)$.—This chemically is the methylene ether of allyl pyrocatechol, occurring in the oils of camphor, star-anise, cinnamon, etc., and constitutes 80 p. c. of the oil of sassafras. It is obtained chiefly from the red oil of camphor by collecting that fraction boiling at $230^\circ C.$ ($446^\circ F.$), purifying the same by repeated chilling and crystallization; it is a colorless or faintly

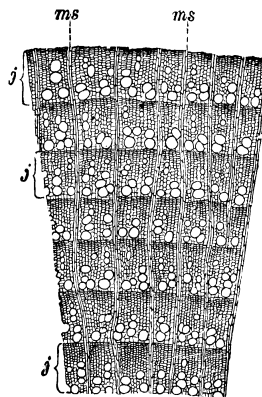


FIG. 144.—Sassafras wood: cross-section, magnified 20 diam.; *j*, annual rings; *ms*, medullary rays.

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yellow liquid, sassafras-like odor, sp. gr. 1.105, optically inactive, cooled to -20° C. (-4° F.) solidifies to a mass of crystals, melting at 11° C. (52° F.), soluble in alcohol (1), 70 p. c. alcohol (30), miscible with ether, chloroform, boils at 233° C. (451° F.); heated with alcoholic potassium hydroxide solution forms isosafrol, which is less toxic than safrol; with bromine yields crystals of $C_{10}H_8Br_2O_2$. Reduces arterial pressure by depressing vasomotor center; taken a long period produces fatty degeneration of heart, liver, and kidneys; it is eliminated as piperonic acid. Dose, m \bar{j} -2 (.06-.13 cc.).

2. *Sassafras Lignum*, *Sassafras Wood*.—Contains little volatile oil; used like the bark, but very weak medicinally.

Allied Plant:

1. *Umbellula'ria califor'nica*, *California Bay Laurel* or *Spice Tree*.—Wood brownish, close-grained, esteemed for cabinet-work; leaves yield volatile oil 4 p. c., with nutmeg and cardamom odor; seed contain a fat; stimulant, anodyne in diarrhea, neuralgia, headache.

26. PAPAVERACEÆ. Poppy Family.

Pa-pav-e-ra'se-e. L. *Papaver* + aceæ, poppy, OE, *papy*, Gr. *μήκων*, classic name, fr. *papa*, pap or thick milk—*i. e.*, formerly used for children—to nourish and cause sleep. Herbs, shrubs, with milky or colored juice. Distinguished by the 2-3 fugacious sepals and minute embryo near base of fleshy albumin; flowers large, in 2's or 4's; petals 4-12; stamens 16 +; ovary compound, 1-celled; anthers 2-celled, superior; fruit capsule; temperate climates; narcotic, emetic, cathartic, acrid poison.

Genus: 1. **Papaver.**

OPIUM. OPIUM, U.S.P. \

Papaver { <i>somniferum</i> , Linné, and { var. <i>album</i> , DeCandolle.	{	The air-dried, milky exudation obtained by incising the unripe capsules, yielding when moist, 9.5 p. c. of anhydrous morphine.
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Habitat. W. Asia (Asia Minor, Persia), China, Africa, India, Italy, Greece, England, United States; cultivated.

Syn. Opium Poppy, White Poppy, Poppy, Maw (Black, Blue) Seed Poppy, Cheesebowl, Marble-flower; Meconium, Lachryma Papaveris, Succus Thebaicus, Opium Thebaicum, Thebaica; Fr. Opium de Smyrne—thebaicum, Pavot officinal; Ger. Opium, Mohnsaft.

Pa-pa'ver. See etymology, above, of Papaveraceæ.

Som-nif er-um. L. *somnus*, sleep, + *ferre*, to bring—*i. e.*, produces sleep.

Al'bum. L. *albus*, white—*i. e.*, the flowers.

O'pi-um. L. fr. Gr. *ὀπιον*, poppy or vegetable juice.

PLANTS.—Erect annuals; stems .6-1.3 M. ($2-4^{\circ}$) high, 12 Mm. ($\frac{1}{2}$) thick, solid, smooth, glaucous, green, branched; roots yellow, thick, branched; leaves thick, ovate, cordate, variously toothed, sessile,

15–25 Cm. (6–10') long, dull green, paler beneath, glaucous, prominent veins, white wide midrib: flowers, Feb.–March, few, large, 7.5–17.5 Cm. (3–7') broad, terminal, silver-gray; sepals 2, green; petals 4, white (yellow, violet); stamens numerous; fruit capsule, 3–5–20 on each plant, nearly globular, 2.5–7.5 Cm. (1–3') broad, filled with laticiferous vessels, flat top and bottom, smooth, glaucous neck; pericarp yellowish, dehiscing by small apertures beneath stigmatic crown; seed numerous, small, white (gray, violet, black). EXUDATION (opium), in more or less rounded, mostly somewhat flattened masses of variable size, usually 8–15 Cm. (3–6') broad, dark brown, covered with fragments of poppy leaves and at times *Rumex* fruits, adhering from the packing; more or less plastic when fresh, becoming hard and brittle, or tough on keeping; internally dark brown, interspersed with lighter areas, somewhat lustrous; odor characteristic, narcotic; taste bitter, characteristic. *Solvents*: diluted alcohol; diluted acids; boiling water. Dose, gr. 1–2 (.06–.13 Gm.).

ADULTERATIONS. — Sand, stones, clay, ashes, shot, bullets, charcoal, gypsum, litharge; flour, starch, gums (acacia, tragacanth), sugar, molasses; aloe, pitch, resins, extract of capsules and herbs (papaver, lactuca, glycyrrhiza, chelidonium), pulp of apricots, fig, and grapes; camel's dung, pounded capsules, leaves, stems, moisture, exhausted opium.

Commercial. — Plant was known to the ancients, Homer mentioning it (poppy) as a medicine and as grown in gardens for strikingly ornamental flowers—a popularity still enjoyed. Seldom found wild as it requires rich soil and manure, timely rains, exact tillage and care until the yielding stage, being planted like our wheat, Sept.–Oct.—winter crop, or (when resowing is necessary through injury from absence of snow as a protection) Feb.–March—spring crop. Cultivation occasions great variability, the stronger, those having whitish petals and seed, and large capsules (var. *album*) degenerating into the weaker, those having pink, red, purple, blackish petals and seed, and small capsules (var. *nigrum*), and while all parts yield milk-juice the leaves and seed are without alkaloids, the former being used natively as spinach, the latter for the 50–60 p. c. of bland yellow oil—an acceptable substitute for olive oil in painting, cookery, pharmacy, etc. Opium is collected chiefly in Asia Minor, Egypt, India, etc., May–July, by

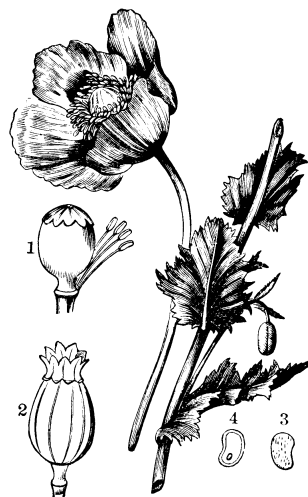


FIG. 145.—*Papaver somniferum*: 1, ovary with few remaining stamens; 2, ripened capsule; 3, seed; 4, longitudinal section of seed.

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making into the unripe pale yellow or light green capsule, a few days after the flower falls, one or more transverse or spiral incisions (longitudinal in Japan, India) with a several bladed knife (nushtur), wetted occasionally with saliva or oil to prevent adherence—a second scarification frequently occurring 1–2 days later. The incisions, owing to laticiferous vessels lying just beneath the epidermis, must be only sufficiently deep to obtain all the juice (not through the inner capsular diaphragm which would cause its loss by escaping into the center of the capsule, as well as damage to seed and plant), and are made by men, women, and children in the afternoon, yielding at once the white exudation that soon concretes into tears and turns brown by next morning, when it is scraped off (often with 5–8 p. c. of capsular epidermis and other tissues—Smyrna) with a blunt knife onto a poppy or *Rumex* leaf held in the left hand; upon the mass becoming uncomfortably weighty the leaf margins are infolded, then further wrapped if necessary with fresh leaves and dried in the shade for several days, sufficient to avoid moldiness—a very common defect. At this stage collectors may simply press together the separate masses, when a lens easily reveals the agglutinated tears—*granular opium* (Asia Minor, Persia), or the tears may be reduced in a mortar to a uniform mass—*homogeneous opium* (Egypt, India), or the pure juice may be mixed with chopped vegetable tissues, or an aqueous extract of spent capsules and leaves, etc., to the extent of 33 p. c., often without disturbing the standard strength of morphine. Small growers dispose of their product to interior merchants, who, to prevent sticking, pack it with *Rumex* capsules in bags, which are sealed, placed in baskets, and forwarded to Smyrna, Constantinople, etc., where it is sold upon physical examination—color, odor, weight, consistence, and appearance affording usually a correct estimate—and transferred to the buyer's underground warehouse to prevent evaporation, or to further cure and manipulate. There are several varieties: 1, *Asia Minor* (Turkey—*P. somniferum*, + var. *album* and *glabrum*): (a) Smyrna—most common in our market; in round, flat lumps, $\frac{1}{2}$ –2 pounds (.2–1 Kg.), tears like seed on inside, also capsular epidermis 5–8 p. c.—evidence of no manipulating, kneading; yield 10–13 p. c. of morphine; (b) Constantinople—resembles Smyrna in coming from the same northern opium districts of Anatolia, but without tears and capsular epidermis; in round, flat lumps, $\frac{1}{2}$ –3 pounds (.2–1.2 Kg.); yield 10–13 p. c. of morphine; extract 50 p. c.; from same port also comes the rich opiums of Gévê, Magnesia, Salonica, Bithynia, Amasia, Malatia, in packages 1–5 ounces (.03–.15 Kg.)—the Turkish “Adeth” (ordinary grade) yields usually 9.5 p. c. of morphine; 2, *Egyptian* (*P. somniferum*, + var. *glabrum*); in flat, roundish cakes, 2.5–15 Cm. (1–6") broad, 2–16 ounces (.06–.5 Kg.), harder, redder, darker and less tenacious than the Smyrna, brittle, conchoidal fracture, waxy luster, no *Rumex* capsules; not much produced, seldom enters our market; yield 6–7 p. c. of morphine; 3, *Persian* (Trebizond—*P. somniferum*, + var. *album*); usually

wrapped in glossy paper having Chinese characters, tied with cotton thread and packed in poppy refuse, cylindrical sticks (resembling mint-candy), 7.5 Cm. (3') long, 12 Mm. ($\frac{1}{2}$ ') thick, $\frac{1}{2}$ – $\frac{3}{4}$ ounce (15–23 Gm.), or short, rounded cones, balls 6–10 ounces (.18–.3 Kg.), or flat circular cakes, slightly agglutinated, liver-brown like Egyptian, soft in damp weather, very bitter, oily from linseed oil (instead of spittle) used on incising knives; more crystals than Asia Minor; largely doctored; exported to Europe, United States, but mostly to China; yield 8–12 p. c. of morphine; 4, *E. Indian*; wrapped in oiled paper or hard coating of leaves and poppy petals agglutinated with extract of the plant and juice—*Provision opium*; or molded into flat, square, circular cakes—*Abkari opium*; owing to moisture (dews) and delay in making up often ferments, yielding a hard brittle blackish product showing oily spots and conspicuous crystals; does not enter our market—consumed extensively in China; yield 5–7 p. c. of morphine—usually rich in narcotine, 3–4 p. c.; extract 70 p. c.; 5, *Chinese*; wrapped in white paper, flat darkish globular cakes, prepared no doubt by artificial heat, less oily than Persian, entirely consumed at home; annual production 40,000,000 pounds (18,181,800 Kg.), double the combined output of the other varieties, in addition to which the natives consume all of the Indian and much Persian in their vicious practices of smoking and chewing—now claimed to be largely on the decrease.

The once popular French (Aubergier's, *Affium*—14–23 p. c. of morphine) and Bulgarian (8–20 p. c. of morphine) are practically out of commerce. Opium has been introduced into Algeria and Mozambique (African) for Chinese trade, Bulgaria, Australia, New England, this latter being ruled from trade owing to excessive adulteration, but instead there has been manufactured in our country a “pudding”—so-called *Boston opium*, of high grade appearance but with admixtures reducing it so as just to come within the U.S.P. limit. Plants thrive in Europe and our Southern States (Virginia, S. Carolina, Georgia, Tennessee—hampered mainly by cost of labor), where during the Civil War much opium of high narcotic power was produced under cultivation, being planted in September and collected in May. *Factitious opium* is a blackish aqueous extract of the plant—nearly odorless and tasteless. London is the distributing point, as the English control its production and levy a tax upon its sale for the development of India, etc. Our entrepôts are New York and San Francisco.

CONSTITUENTS.—Morphine (1816) 2.5–15–22.8 p. c., Narcotine (1803–1817) 1.3–10 p. c., Codeine (1832) .2–.7 p. c., Narceine (1832) .02–.1–.7 p. c., Pseudomorphine (1835) .2 p. c., Thebaine (1835) .15–1 p. c., Papaverine (1848) 1 p. c., and 12 other alkaloids, all combined with either sulphuric or meconic acid, 4 p. c.; derivatives—apomorphine, apocodeine, etc.; also contains glucose, mucilage, pectin, caoutchouc, wax, fat, resin, coloring and odorous principles, lactic acid (1.25 p. c.), meconin, $C_{10}H_{10}O_4$, meconoiosin, $C_8H_{10}O_2$, extractive, minerals 6 p. c., ash 6 p. c.

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Morphina, Morphine, $C_{17}H_{19}O_3N.H_2O$.—This, the first alkaloid known, is obtained by exhausting opium with water, concentrating, filtering, adding alcohol, ammonia water, setting aside to crystallize, dissolving crystals in hot alcohol, treating with animal charcoal, crystallizing; or may treat concentrated filtered infusion with calcium chloride, evaporate filtrate, when morphine and codeine crystallize out, narcotine, etc., remaining in mother-liquors; occurs in colorless, or white shining rhombic prisms, or fine needles, or crystalline powder, odorless, bitter, permanent, soluble in water (3340), boiling water (1075), alcohol (210), boiling alcohol (98), chloroform (1220), ether (6250), lime water (100); insoluble in benzene; aqueous solution alkaline; forms numerous salts (acetate, hydrochloride, sulphate, etc.). *Tests*: 1. Add to .05 Gm. sulphuric acid 1 cc.—no color, reddish, yellowish; on heating changes to brown. 2. With sulphuric acid containing .005 Gm. of selenous acid in each cc.—blue color, changing to green, brown (codeine yields green color, changing to blue, grass-green; narcotine—green color, changing to brown, cherry-red); with sulphuric acid containing .005 Gm. of molybdic acid in each cc.—purple color, changing to blue; with sulphuric acid containing 1 drop of formaldehyde solution in each cc.—intense purple color. 3. With nitric acid—orange-red, fading to yellow. 4. With potassium ferricyanide T. S., + 1 drop ferric chloride T. S. + solution of salt (1 in 100)—deep blue at once (codeine slowly), with a few drops of ferric chloride T. S.—blue color, destroyed by acids, alcohol, heating; incinerate .5 Gm.—ash negligible. *Impurities*: Codeine, ammonium salts, foreign alkaloids, meconic acid, meconates, water. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 Gm.).

Morphinæ Hydrochloridum, Morphine Hydrochloride, $C_{17}H_{19}O_3N.HCl.3H_2O$, *U.S.P.*—(Syn., Morph. Hydrochlor., Morphine Chloride, Morphinæ Hydrochloras, Morphinæ Murias; Fr. Chlorhydrate de Morphine; Ger. Morphinum hydrochloricum, Morphinhydrochlorid, Salzsäures Morphin.) Obtained by mixing morphine with boiling distilled water, adding diluted hydrochloric acid until dissolved and neutral, concentrating until crystals appear; occurs in white, silky, glistening needles, cubical masses, or as a white, crystalline powder, odorless, bitter, permanent, soluble in water (17.5), boiling water (.5), alcohol (52), hot alcohol (46), glycerin; insoluble in chloroform, ether; aqueous solution neutral, slightly acid. *Tests*: 1. Aqueous solution + silver nitrate T. S.—white precipitate, insoluble in nitric acid. 2. Dry to constant weight—loses not more than 15 p. c. (abs. of water). 3. Aqueous solution 5 cc., + potassium carbonate T. S. 2 cc., shake—white precipitate, not green on exposure, nor colors chloroform when shaken with it (abs. of apomorphine). *Impurities*: Apomorphine, water, etc. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 Gm.).

Morphinæ Sulphas, Morphine Sulphate, $(C_{17}H_{19}O_3N).H_2SO_4.5H_2O$, *U.S.P.*—(Syn., Morph. Sulph., Morphinæ Sulphas, Sulphas (Sulfas)

Morphicus; Fr. Sulfate de Morphine; Ger. Morphinum sulfuricum, Morphinsulfat, Schwefelsaures Morphin.) Obtained by mixing morphine (1) with boiling water (2), adding diluted sulphuric acid until dissolved and neutral, setting aside to crystallize; occurs in white, feathery, silky crystals, or cubical masses, or white crystalline powder, odorless, bitter, permanent, soluble in water (15.5), hot water (.7), alcohol (565), hot alcohol (240); insoluble in chloroform, ether; aqueous solution (1 in 20) neutral, slightly acid. *Tests*: 1. Aqueous solution (1 in 30), + few drops ammonia T. S., shake—white precipitate, dissolving in sodium hydroxide T. S. 2. With sulphuric acid containing .005 Gm. of selenous acid in each cc.—blue, green, brown; codeine—green, blue, grass-green; dry to constant weight—loses not more than 12 p. c. (abs. of water). 3. Aqueous solution + barium chloride T. S.—white precipitate, insoluble in hydrochloric acid. *Impurities*: Codeine, ammonium salts, meconate, water. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 Gm.).

Æthylmorphinæ Hydrochloridum, Ethylmorphine Hydrochloride, $C_{17}H_{18}O_2N(OC_2H_5.HCl.2H_2O)$, *U.S.P.*—(Syn., Æthylmorph. Hydrochl., Ethylmorphine Chloride, Dionin; Fr. Chlorhydrate d'ethylmorphine; Ger. Salzsäure Morphinäthyläther.) This hydrochloride of a synthetic alkaloid prepared from morphine by ethylation is obtained by the action of ethyl iodide on morphine dissolved in sodium or potassium hydroxide solution, forming ethyl morphine (codethyline) and alkali, the former being insoluble in excess of alkali; purify by crystallizing from hot alcohol, dissolve in hot water, neutralize with hydrochloric acid, crystallize. It is a white, yellowish, odorless, microcrystalline powder, soluble in water (8), alcohol (22), slightly in ether, chloroform; aqueous solution neutral; melts at 123° C. (254° F.) with decomposition. *Tests*: 1. Dissolve .01 Gm. in 10 cc. of sulphuric acid, + a drop of ferric chloride T. S., warm, + a drop of nitric acid—green, then deep violet-blue, turning deep red. 2. Aqueous solution (1 in 20) + silver nitrate T. S.—white precipitate, insoluble in nitric acid. 3. Incinerate .2 Gm.—ash negligible. *Impurities*: Ammonium compounds, morphine, codeine hydrochloride. Produces no constipation, nausea, lassitude, tolerance, otherwise similar to morphine—for pain, cough, etc. Dose, gr. $\frac{1}{4}$ – $\frac{1}{2}$ (.016–.03 Gm.), tablet, suppository; externally 10–20 p. c. solutions.

Apomorphinæ Hydrochloridum, Apomorphine Hydrochloride, $C_{17}H_{17}O_2NHCl.\frac{1}{2}H_2O$, *U.S.P.*—(Syn., Apomorph. Hydrochl., Apomorphine Chloride, Apomorphinæ Hydrochloras; Fr. Chlorhydrate d'Apomorphine; Ger. Apomorphinum hydrochloricum, Apomorphinhydrochlorid.) This hydrochloride of the artificial alkaloid is prepared from morphine (abstracting 1 molecule of water) by heating morphine or codeine (1) with pure hydrochloric acid (20) in a sealed glass tube 2–3 hours at 149° C. (300° F.), cooling liquid contents, adding excess of sodium bicarbonate to precipitate apomorphine, treating precipitate with ether or chloroform, adding a little hydrochloric acid,

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when crystals form; it occurs in minute, grayish-white, glistening, crystals, odorless, slightly bitter taste, greenish upon exposure, soluble in water (50), hot water (17), alcohol (50), slightly in chloroform, ether; aqueous solution neutral; over sulphuric acid loses water of crystallization, regaining it on exposure. *Tests*: 1. Aqueous solution (1 in 100) + sodium bicarbonate solution—white, greenish-white precipitate, green on exposure, dissolving in ether (violet), chloroform (violet-blue). 2. Shake .1 Gm. + ether 5 cc.—not more than pale reddish color (abs. of decomposition products). 3. Aqueous solution + silver nitrate T. S.—white precipitate, insoluble in nitric acid, black by reduction to metallic silver—instantly reduced by ammonia water. 4. Incinerate .2 Gm.—ash negligible; salt dissolves in nitric acid—purple. *Impurities*: Decomposition products. Should be kept dark, in small, well-stoppered vials, having been rinsed with diluted hydrochloric acid and dried; should be rejected if shaking with water (100) produces at once an emerald-green; solutions should be made freshly with a little hydrochloric or acetic acid to prevent decomposition. Dose, expectorant, gr. $\frac{1}{40}$ — $\frac{1}{25}$ (.0015–.0025 Gm.); emetic, gr. $\frac{1}{16}$ — $\frac{1}{8}$ (.004–.008 Gm.).

Diacetylmorphine, Diamorphine, Heroin(e), $C_{17}H_{17}ON(C_2H_5O_2)_2$, and its soluble salt: *Diacetylmorphine Hydrochloride*, both U.S.P. 1910, are prepared from morphine by acetylation—heating morphine with acetyl chloride, washing product with water, then with dilute solution of sodium carbonate, purifying by crystallization from hot alcohol. They are white crystalline powders; odorless and bitter; soluble in water (1700), salt (2). Dose, gr. $\frac{1}{24}$ — $\frac{1}{12}$ (.0025–.005 Gm.), 3–4 times daily, 2 p. c. solution (salt) hypodermically.

Codeina, Codeine, $C_{17}H_{18}(CH_3O)_3N.H_2O$, *U.S.P.*—(Syn., Codein., Codeia, Methylmorphine; Fr. Codeine; Ger. Codeinum, Kodein, Codein.) Obtained from opium by precipitating infusion with chalk and calcium chloride, when chlorides of morphine and codeine crystallize out; dissolve these in water, add ammonia, when morphine crystallizes, evaporate filtrate for codeine; if instead of ammonia we use potassium or sodium hydroxide, codeine will be precipitated and morphine remain in solution; may obtain it also synthetically from morphine by methylation—acting upon alkaline solution of morphine with methyl iodide or chloride, or sodium methylsulphate, hence it is methylmorphine. It is in colorless, translucent crystals, crystalline powder; odorless, slightly efflorescent in warm air, soluble in water (120), alcohol (2), warm alcohol (12), chloroform (.5), ether (18), benzene (13); aqueous solution alkaline, levorotatory; when anhydrous melts at 155° C. (311° F.); heated with insufficient water to dissolve melts to oily drops, crystallizing on cooling. *Tests*: 1. With sulphuric acid containing .005 Gm. of selenous acid in each cc.—green, rapidly blue, slowly to green. 2. Dissolve .01 Gm. in sulphuric acid 5 cc.—transient pink, + a drop of ferric chloride T. S.—blue when warmed, changing to red with a drop of nitric acid; dry to constant weight—

loses not more than 6 p. c. (abs. of water); incinerate .5 Gm.—ash negligible. *Impurities*: Morphine, readily carbonizable substances, water. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

Codeinæ Phosphas, Codeine Phosphate, $C_{17}H_{18}(CH_3)_3O_3N.H_3PO_4.2H_2O$, *U.S.P.*—(Syn., Codein. Phos.; Fr. Phosphate de Codéine; Ger. Codeinum phosphoricum, Kodeinphosphate.) Obtained by dissolving codeine (10) in 25 p. c. phosphoric acid (12.5), leaving solution slightly acid, and adding alcohol sufficient to precipitate. It is in fine, white, needle-shaped crystals, crystalline powder; odorless, very efflorescent, soluble in water (2.3), hot water (.5), alcohol (325), boiling alcohol (125), chloroform (4500), ether (1875); aqueous solution acid. *Tests*: 1. Aqueous solution neutralizing with ammonia water, + silver nitrate T. S.—yellow precipitate, soluble in diluted nitric acid or ammonia water. *Impurities*: Chlorides, sulphates. Considered the best salt for hypodermic use, as it is more soluble and less irritating. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.); injection, gr. $\frac{1}{3}$ – $\frac{3}{4}$ (.02–.05 Gm.).

Codeinæ Sulphas, Codeine Sulphate, $[C_{17}H_{18}(CH_3)_3O_3N]_2H_2SO_4.5H_2O$, *U.S.P.*—(Syn., Codein. Sulph.; Fr. Sulfate de Codéine; Ger. Codeinum sulfuricum, Kodeinsulfat.) Obtained by dissolving codeine 100 Gm. in warm water, adding sufficient sulphuric acid (16.54 Gm.) to get neutral liquid, concentrating, allowing to crystallize. It is in long, glistening, white, needle-shaped crystals, rhombic prisms, crystalline powder; odorless, efflorescent, soluble in water (30), hot water (6.5), alcohol (1280), warm alcohol (440), insoluble in chloroform, ether; aqueous solution faintly acid. *Tests*: 1. Aqueous solution + barium chloride T. S.—white precipitate, insoluble in hydrochloric acid. 2. Dry to constant weight—loses not more than 12 p. c. (abs. of water). *Impurities*: Morphine, readily carbonizable substances, water. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

Narcotine, $C_{22}H_{23}O_7N$.—Obtained from an aqueous solution by shaking, or from opium itself by macerating with ether or chloroform; occurs in tasteless, colorless, shining, rhombic crystals; soluble in ether, chloroform, benzene, hot alkaline solutions; dissolves blood-red in sulphuric acid containing some nitric acid; heated with nitric acid gives meconin, $C_{10}H_{10}O_4$, cotarnine, $C_{12}H_{13}NO_3$, and opianic acid, $C_{10}H_{10}O_5$; forms salts (hydrochloride, sulphate, etc.). Dose, gr. 1–3 (.06–.2 Gm.).

Cotarninæ Chloridum, Cotarnine Chloride, $C_{12}H_{14}O_3NCl.H_2O$, *U.S.P.*—(Syn., Cotarn. Chlor., Cotarninæ Hydrochloridum, Stypticin; Fr. Chlorhydrate de Cotarnine; Ger. Cotarninhydrochlorid.) This quaternary oxymethyl-oxymethylene-dihydro-isoquinoline chloride is an oxidation product, similar to hydrastinine, obtained by hydrolyzing narcotine—boiling it with water for a long time, or heating with diluted nitric acid, precipitating with potassium hydroxide solution, dissolving the resulting cotarnine in diluted hydrochloric acid, crystallizing. It is a yellow crystalline powder, odorless, bitter,

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deliquescent in moist air, very soluble in water, alcohol (yellow solutions); aqueous solution neutral. *Tests*: 1. Aqueous solution, + silver nitrate T. S.—white precipitate, insoluble in nitric acid. 2. Dissolve .2 Gm. in 10 cc. of distilled water, + 10 cc. of $\frac{N}{10}$ iodine V. S.—brown precipitate (cotarnine periodide), which, when dried, melts at 143° C. (290° F.). 3. Heat gradually .1 Gm.—decomposes, evolving characteristic, disagreeable vapors and yielding a reddish-brown liquid, changing to hard charred mass; incinerate mass—ash negligible. 4. Dissolve .5 Gm. in 10 cc. of distilled water, add 2 cc. of aqueous solution of sodium hydroxide (15 p. c.)—milk-white precipitate, dissolved on agitation, reprecipitated on standing. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.), 4–5 times daily, in coated tablet, pill, capsule; hypodermic, m30 (2 cc.) of 10 p. c. solution; externally, pure or strong solution. Cotarnine Phthalate, Styptol, $(C_{12}H_{13}O_3N)_2C_6H_4(CO_2H)_2$ —similar to the official salt, Cotarnine Chloride; hemostatic, sedative—uterine hemorrhage. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.), 4–5 times daily.

Narceine, $C_{23}H_{29}O_9N$.—Long, silky needles, bitter, sparingly soluble in cold alcohol and water, insoluble in ether; with warm diluted sulphuric acid—violet and cherry-red; with nitric acid—transiently yellow; with iodine—blue; with Fröhde's reagent—brown-yellow; forms salts (hydrochloride, nitrate, sulphate, etc.). Dose, gr. $\frac{1}{3}$ – $\frac{3}{4}$ (.02–.05 Gm.).

The four alkaloids, morphine, codeine, narcotine, and narceine, may be extracted from any given sample of opium by shaking the concentrated infusion with ether—taking out narcotine; adding alkali in excess to filtrate—redissolving morphine and narceine, leaving codeine deposited; allowing morphine to crystallize from filtrate, and having narceine in mother-liquor, to be obtained by evaporation.

Meconic Acid, $C_7H_4O_7$.—Occurs free and in combination with the alkaloids, being obtained by adding calcium chloride to concentrated infusion of opium, decomposing the resulting calcium meconate with warm dilute hydrochloric acid and recrystallizing from water. *Tests*: 1. With ferric chloride T. S.—blood-red color, not discharged by dilute hydrochloric acid (dif. from acetic and formic acids), or by chlorides of gold or mercury (dif. from sulphocyanates).

Deodorized, granulated, and powdered opiums of a higher grade may be reduced with a lower, or with an inert diluent, to the required strength; or a proportionately less quantity of the higher percentage may be used direct in making preparations; thus of 15 p. c. opium only $66\frac{2}{3}$ Gm. need be employed where the U.S.P. directs 100 Gm.— $15 : 10 :: 100 : x$, or $x = 66.67$.

PREPARATIONS.—I. **OPIUM**: 1. *Opium Granulatum*. Granulated Opium. (Syn., Opium Gran.; Fr. Opium Grenelé; Ger. Granulirtes Opium.)

Manufacture: Dry opium, convenient quantity, at 70 °C. (158° F.), reduce it to a coarse (No. 8–20) powder; contains 10–10.5 p. c. of anhydrous morphine. Should be kept in well-closed containers. Dose, gr. 1–2 (.06–.13 Gm.).

Preps.: 1. *Tinctura Opii*. Tincture of Opium. (Syn., Tr. Opii, Laudanum, *Tinctura Opii Deodorati*, Tincture of Deodorized Opium, U.S.P. 1910; *Tinctura (Meconii) Thebaica*; Fr. Teinture d'Opium (de Extrait d'Opium)—thébaïque; Ger. *Tinctura Opii Simplex*, Einfache Opiumtinktur.)

Manufacture: 10 p. c. Pour boiling water 50 cc. on granulated opium 10 Gm. in a suitable vessel, and stir frequently during 24 hours, percolate until exhausted. Concentrate to 15 cc., add paraffin 5 Gm., and continue heat until entirely melted, beat mixture thoroughly, cool; pierce paraffin, drain off liquid, add water 60 cc., filter; to filtrate add alcohol 20 cc.; wash paraffin and filter with water q. s. for 95 cc.; assay, add 20 p. c. alcohol q. s. for 100 cc. tincture to contain .95–1.05—1. Gm. of anhydrous morphine. Dose, m̄v–20 (.3–1.3 cc.).

Preps.: 1. *Linimentum Opii Compositum*, N.F., 10 p. c.

2. *Lotio Plumbi et Opii*, N.F., 3.5 p. c. 3. *Mistura Carminativa*, N.F., 2.5 p. c. 4. *Mistura Copaibæ et Opii*, N.F.,

3.2 p. c. 5. *Mistura Magnesiae, Asafetidae et Opii*, N.F.,

1 p. c. 6. *Mistura Opii et Chloroformi Composita*, N.F.,

20 p. c. 7. *Mistura Opii et Rhei Composita*, N.F., 20 p. c.

8. *Tinctura Ipecacuanhæ et Opii*, N.F., āā 10 p. c. (diluted

alcohol). Dose, m̄v–20 (.3–1.3 cc.). 9. *Tinctura Opii et*

Gambir Composita, N.F., 4.2 p. c.

2. *Tinctura Opii Crocata*, N.F., 10 p. c.

2. *Opium Pulveratum*. Powdered Opium. (Syn., Opium Pulv., Opii Pulvis, U.S.P. 1910; Fr. Poudre d'Opium; Ger. Opium pulveratum, Opiumpulver.)

Manufacture: Dry opium, convenient quantity, at 70 °C. (158° F.), reduce it to a very fine powder; contains 10–10.5 p. c. of anhydrous morphine. It is light brown; microscopically—chiefly yellowish-brown, brownish-red, irregular and granular fragments, .015–.15 Mm. ($\frac{1}{1650}$ – $\frac{1}{165}$) broad, few fragments of strongly lignified, thick-walled, 4–5-sided or narrowly elongated epidermal cells of poppy capsules, also tissues of poppy leaves, capsules and rumex fruits. Should be kept in well-closed containers. Dose, gr. 1–2 (.06–.13 Gm.).

Preps.: 1. *Pulvis Ipecacuanhæ et Opii*. Powder of Ipecac and Opium. (Syn., Pulv. Ipecac. et Opii., Compound Powder of Ipecac, Dover's Powder; Br. Pulvis Ipecacuanhæ Compositus; Fr. Poudre d'Ipécacuanha opiacée—de Dover; Ger. Pulvis Ipecacuanhæ opiatus, Doversches Pulver, Pulvis Doveri.)

Manufacture: 10 p. c. Triturate together ipecac 10 Gm., powdered opium 10 Gm., lactose 80 Gm.; reduce to a very fine, uniform powder. It is grayish-white, light brown; exhibiting coarse angular, cone-shaped fragments soluble in water or chloral hydrate T. S., strongly polarizing light with display of colors (lactose), numerous tracheids and starch grains of ipecac, .015–.02 Mm, ($\frac{1}{1665}$ – $\frac{1}{1250}$) broad, calcium oxalate

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raphides up to .05 Mm. ($\frac{1}{500}$) long, stone cells of opium (poppy) capsules. Dose, gr. 5–10 (.3–6 Gm.).

2. *Tinctura Opii Camphorata*. Camphorated Tincture of Opium. (Syn., Tr. Opii Camph., Paregoric, Paregoric Elixir; Br. *Tinctura Camphoræ Composita*, Compound Tincture of Camphor; Fr. *Élixir Parégorique*—d'Opium Benzoïque, Teinture d'Opium camphrée; Ger. *Tinctura Opii benzoica*, Benzoësaurehaltige Opiumtinktur.)

Manufacture: $\frac{2}{5}$ p. c. Similar to *Tinctura Cardamomi Composita*, page 137—macerating powdered opium .4 Gm., benzoic acid .4, camphor .4, oil of anise .4 cc., in glycerin 4 cc., diluted alcohol 95 cc., finishing with diluted alcohol q. s. 100 cc. Dose, $\frac{5}{8}$ ss–2 (2–8 cc.).

Preps.: 1. *Mistura Glycyrrhizæ Composita*, 12 p. c. 2. *Mistura Pectoralis*, N.F., 17.5 p. c.

3. *Pilulæ Opii, Digitalis et Quininæ*, N.F., $\frac{1}{6}$ gr. 4. *Pilulæ Opii et Camphoræ*, N.F., 1 gr. 5. *Pilulæ Opii et Plumbi*, N.F., 1 gr. 6. *Pulvis Cretæ et Opii Aromaticus*, N.F., 2.5 p. c.

3. *Extractum Opii*, N.F.—Yields 19.5–20.5 of anhydrous morphine; 1 Gm. represents about 2 Gm. of opium.

II. ALKALOIDS: 1. *Elixir Terpini Hydratis et Codeinæ*, N.F., codeine $\frac{1}{5}$ p. c. 2. *Mistura Chloroformi et Morphinæ Composita*, N.F., morphine sulphate $\frac{1}{4}$ p. c. 3. *Syrupus Pini Albæ Compositus cum Morphinæ*, N.F., morphine sulphate $\frac{1}{25}$ p. c.

Unoff. Preps.: *Extractum Opii Liquidum* (Br., 3.75 p. c. of extract). *Linimentum Opii* (Br. 50 p. c. of tincture). *Pills*, 1 gr. (0.6 Gm.), dose, 1–2. *Plaster*. *Pulvis Opii Compositus* (Br., 10 p. c.). *Tinctura Opii Ammoniata* (Br., 10 p. c. of tincture). *Troches of Glycyrrhiza and Opium*, $\frac{1}{13}$ gr. (.005 Gm.). *Vinegar* (Black Drop), 10 p. c., \mathfrak{m} v–20 (.3–1.3 cc. *Wine*, 10 p. c., \mathfrak{m} v–20 (.3–1.3 cc.). *Chlorodyne* (morphine hydrochloride .5 Gm., water 2 cc, diluted hydrochloric acid 2, chloroform 6, tincture of cannabis 4, diluted hydrocyanic acid 1, alcohol 16, oil of peppermint 1, oleoresin of capsicum .05, \mathfrak{m} v–15 (.3–1 cc.), in water—poisonous. *Compound Powder of Morphine* (Tully's Powder, 1.5 p. c., gr. v–10 (.3–6 Gm.). *Injectio Apomorphinæ Hypodermica* (Br.), 1 p. c. *Injectio Morphinæ Hypodermica* (Br.), 2.5 p. c. *Liquor Morphinæ Sulphatis* (U. S. P. 1870, $\frac{1}{4}$ p. c., $\frac{5}{8}$ j–2 (4–8 cc.). *Liquor Morphinæ Acetatis* (Br.), 1 p. c. *Liquor Morphinæ Hydrochloridi* (Br.), 1 p. c. *Liquor Morphinæ Tartratis* (Br.), 1 p. c. *Majendie's Solution of Morphine*, 4 p. c. (adding $\frac{2}{3}$ p. c. of benzoic acid or phenol prevents spoiling and hypodermic irritation), \mathfrak{m} v–10 (.3–6 cc.). *Oleate of Morphine*, 10 p. c. (oleic acid 90 p. c.)—use externally. *Suppositoria Morphinæ* (Br.), $\frac{1}{4}$ gr. (.017 Gm.). *Syrupus Codeinæ Phosphatis* (Br.), .5 p. c. *Troches of Morphine and Ipecac*, $\frac{1}{40}$ gr. (.0016 Gm.) + ipecac $\frac{1}{13}$ gr. (.005 Gm.). *Trochiscus Morphinæ* (Br.), $\frac{1}{32}$ gr. (.002 Gm.).

PROPERTIES.—Narcotic, sedative, anodyne, antispasmodic, hypnotic, diaphoretic, chiefly due to morphine. Codeine—hypnotic,

tetanic, less constipating and active than morphine, often contaminated with other alkaloids; used for bronchial coughs, diabetes, etc. Narcotine—antiperiodic, tetanizing, hypnotic without being narcotic, hence name should have been anarcotine. Narceine resembles morphine, but is more hypnotic, with less after-effects—headache, constipation, etc. Apomorphine—stimulant to brain (vomiting) centers, heart; our most useful emetic (hypodermically) in narcotic poisoning, removing foreign bodies from bronchi, etc., sedative expectorant; large amounts depress, produce tetanic convulsions. Diacetylmorphine—sedative, respiratory depressant, slows and deepens respiration more than morphine and develops its habit, neither analgesic or hypnotic, nor does it stupify or constipate; excessive cough, postoperative pain, uremic dyspnea, catarrhal coughs, phthisis, angina, bronchitis, asthma, whooping-cough, hay fever. *Poisoning*: Syncope, suppressed vision, myosis, abnormal temperature have been produced by gr. 3 (.2 Gm.)—antagonize by hypodermic camphor, caffeine, and hot coffee by stomach. Cotarnine—hemostatic, analgesic, uterine sedative, styptic; dysmenorrhea, hemorrhages (bladder, nose, extraction of teeth, etc.), menorrhagia, etc. Thebaine (paramorphine)—soporific, spinal excitant, tetanizer, resembling strychnine. Dose, gr. $\frac{1}{2}$ – $\frac{3}{4}$ (.03–.05 Gm.). Papaverine—hypnotic, sedative; diarrhea of children. Dose, gr. $\frac{1}{2}$ – $\frac{1}{2}$ (.005–.03 Gm.).

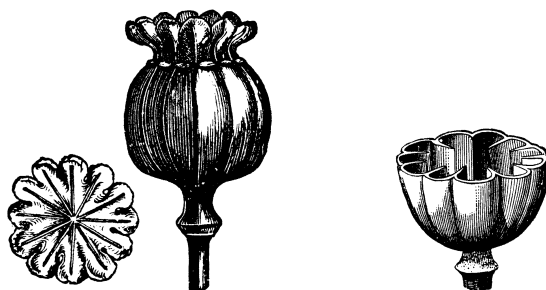


FIG. 146.—Poppy capsule, showing internal septa.

Opium in full doses, gr. 1–3 (.06–.2 Gm.), produces dry mouth, thirst, stimulates brain by increasing blood supply, arrests digestion by reducing bile, gastric and pancreatic juice secretion; causes nausea, vomiting, sweating, depressed circulation and respiration, lower temperature, contracted pupil, retention of urine, profound sopor, or, instead, coma-vigil and delirium with delightful dreams. After-effects are nausea, depression, constipation, headache, vertigo, nasal pruritus.

USES.—To relieve pain, except in acute inflammation of the brain; to cause sleep in insomnia of low fevers; to allay irritation, to check secretions—diarrhea, dysentery, diabetes; to support system in low fevers, etc.; also for peritonitis, cerebrospinal meningitis, cholera mor-

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bus, delirium tremens, mania spasms, melancholia, sciatica, neuralgia, cancer, renal and hepatic colic from calculi, cough without secretion; to lock bowels when required by inflammation, hemorrhages, dyspnea, angina pectoris, cerebral anemia; morphine hypodermically for consumption, chronic catarrh, asthma, diabetes, typhoid fever, dysenteric tenesmus, epilepsy, hysteria, croup, bronchitis, dysmenorrhea. Externally opium applied in poultices for gout, rheumatism, ophthalmia, odontalgia, periodontitis, inflamed gums and mucous membrane of mouth. Young children are very susceptible to its narcotic effects, to whom it should be given cautiously, women are affected much easier than men, and some individuals possess idiosyncrasy toward it, being on the one hand easily, on the other with difficulty, brought under its influence; others cannot tolerate the smallest dose, while many animals accept it *ad libitum*—ducks, chickens, pigeons, monkeys, etc.

Poisoning: Have mental excitement, increased heart action, slow, irregular, stertorous breathing, cold, clammy sweats, headache, deep sleep, contracted pupils, face reddened, then bluish, slow pulse and dilated pupils as the end approaches, lost reflexes; jaw falls, muscular relaxation, coma, death finally by paralyzed respiration; the more contracted the pupils, the more serious, while vomiting and free perspiration are favorable symptoms. In apoplexy pupils are unequal, in alcoholism they are normal or dilated, in chloroform widely dilated; the odor of breath and vomited matter will often aid diagnosis. Give tannic acid or vegetable astringents (strong coffee or tea), then evacuate the stomach (pump, apomorphine, zinc sulphate, ipecac, etc.), or wash it out with a warm solution of potassium permanganate (using twice the amount of salt as of morphine ingested), then atropine (strychnine), caffeine, cocaine, digitalis, brandy, spirit of nitrous ether, amyl nitrite) to maintain circulation and respiration; faradization, cold douches, ambulation, flagellation; it is eliminated by the kidneys, consequently catheterize the bladder often to prevent reabsorption, and keep the patient awake.

Incompatibles: Alkalies, alkaline carbonates, lime water, tannic acid and vegetable preparations containing it, salts of lead, iron, copper, mercury, and zinc, Fowler's solution, atropine, strychnine, coffee, caffeine, tartar emetic, digitalis; with morphine: iodine, iodides, bromine, bromides, sodium borate.

Synergists: Alcohol, chloral hydrate, belladonna, cocaine, ipecac.

Opium-habit (Disease): To this, thousands of weak and strong-minded have fallen prey, including such eminent characters as Coleridge, Robert Hall, John Randolph, De Quincey, Wilkie Collins, etc. By some thought to be a habit, which may be cured by gradually lessening the quantity or by stopping off abruptly, substituting for a time tonics, hyoscine and stimulants—ginger, capsicum, black pepper, quassia, calumba, diluted phosphoric acid, tincture lupulin, etc. Others consider it a disease amenable to systematic systemic treat-

ment in hospitals, etc., where mainly hygiene, tonics, strychnine, atropine, quinine, iron and gold salts are relied upon. Decoction of Sumatra climber, *Combretum sundaicum*, is claimed to be valuable.

Opium-test: Heat the gum, which, becoming fluid, runs when tilted from dung, mineral and vegetable matters, evaporate heavy liquid to a powder; of this take 25 gr. (1.6 Gm.) + water \mathfrak{z} iv (15 cc.), triturate, if stiff or mucilaginous—starch, flour, gum, salep; add water \mathfrak{z} ij (60 cc.), filtrate should be wine-yellow—no extract glycyrrhiza; mixture should be acid—no ashes, chalk, litharge; evaporate to \mathfrak{z} j (30 cc.), add potassium ferrocyanide or twice quantity alcohol, should get no precipitate—no heavy metal or gums; the insoluble residue should be 10–11.5 gr. (.6–.7 Gm.), or 100 parts should yield 55–60 parts of aqueous extract.

Allied Products:

1. *Papaveris Capsulae*, *Poppy Capsules*, *Papaver*, *Poppy*.—The nearly ripe capsules, U.S.P. 1840–1870. These are collected in August–September, when nearly ripe, inverted to keep the juice from escaping, and dried in kilns for about 12 hours; from these, deprived of seed, may make an extract and syrup, and, including the seed, a decoction. Capsules or heads are the size of a hen's egg to one's fist, and contain morphine .2–2 p. c.; syrup (*syrupus papaveris*), 10 p. c.—coughs, etc.; decoction—demulcent to sprains, bruises, etc.



FIG. 148.—*Papaver Rhæas*.

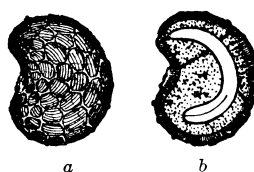


FIG. 147.—Poppy seed, magnified 12 times: *a*, the outside; *b*, longitudinal section showing embryo.

2. *Seed*.—When black called *maw* seed; not narcotic, yield 40–60 p. c. fixed oil, which is used as food, for burning in lamps, by painters, instead of olive oil; expressed (oil) cake for cattle, seed for birds.

3. *Exhausted gum*.—For poultices as anodyne applications.

Allied Plants:

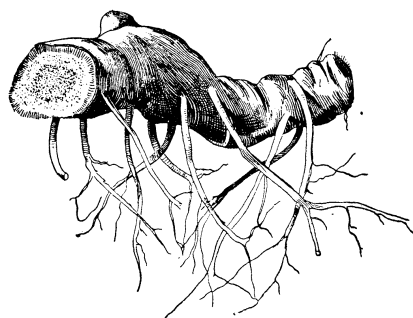
1. *Papaver Rhæas*, *Rhæados Petala*, *Red Poppy Petals* (Br.).—Europe; flowers large, beautiful red, petals mainly used for their coloring matter, which is yielded to water; its milky juice is sedative, demulcent, mild anodyne, probably due to *rhæadine*, also contains two coloring principles—*rhæadic* and *papaveric* acids. *Syrupus Rhæados* (Br.), 26 p. c. Dose, \mathfrak{z} ss–1 (2–4 cc.).

2. *Sanguina'ria canadensis*, *Sanguinaria*, *Blood Root*, *N.F.*—The dried rhizome and roots with not more than 2 p. c. of foreign organic matter; N. America. Perennial herb, in early spring puts forth a rounded palmate 5–9-lobed leaf and a slender scape 10–20 Cm. (4–8')

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high, bearing a large, single white flower; fruit, June, capsule (pod), oblong, many-seeded. Rhizome horizontal, occasionally branched, subcylindrical, flattened, 2-7 Cm. ($\frac{4}{5}$ -3') long, 5-15 Mm. ($\frac{1}{5}$ - $\frac{3}{5}$ ') thick, dark brown, slightly annulate, few stem-scars, many broken filiform roots; odor slight; taste persistently acrid and bitter. Powder,

brownish-red, sternutatory — numerous starch grains resembling those of wheat, latex cells with brownish resin masses, few tracheal fragments; solvents: alcohol, diluted acetic acid, water; contains chelerythrine, sanguinarine, protopine, β -homochelidonine, resin, starch, ash 8 p. c. Systemic emetic, stimulating expectorant, sialagogue, alterative, tonic, acro-narcotic poison; chronic bronchitis, croup, asthma, gastro-intestinal catarrh, jaundice, dyspepsia, torpid liver. *Poisoning*: Wash out the stomach, give diffusible stimulants, amyl nitrite, morphine, atropine. Dose, expectorant, gr. 1-8 (.06-.5 Gm.); emetic, gr. 15-30 (1-2 Gm.); 1. *Fluidextractum Sanguinariae* (1st menstruum: hydrochloric acid

FIG. 149.—*Sanguinaria canadensis*.FIG. 150.—*Sanguinaria* rhizome, showing cross-section.

5 cc., water 20, alcohol 75, 2d: 75 p. c. alcohol); 2. *Tinctura Sanguinariae*, 10 p. c., dose, m-v-60—3j-2 (.3-4;—4-8 cc.); 3. *Syrupus Pini Albæ Compositus*, $\frac{4}{5}$ p. c. *Acetum*, 10 p. c.; *Infusion*, 5 p. c., 3ss-4 (15-120 cc.).

3. *Chelidonium majus*, *Chelidonium*, *Celandine*.—The entire plant, collected when beginning to flower, U.S.P. 1880-1890; Europe, N.

America. Perennial light green plant, .6 M. (2°) high, emitting when wounded a saffron-yellow, opaque juice; leaves pinnate, 10–20 Cm. (4–8') long; flowers yellowish; root reddish-brown, several-headed, branching; fruit capsule, linear, 2-valved; seed numerous; odor unpleasant when fresh; taste acrid; contains chelerythrine, chelidonine, α - and β -homochelidonine, chelidoxanthin, sanguinarine, protopine, chelidonic (jervic) acid, chelidoninic (ethylenesuccinic) acid, gum, chlorophyll; solvents: water, alcohol. Cathartic, diuretic, diaphoretic, expectorant; used by ancients as now for jaundice, dropsy, intermittent fever, scrofula, skin diseases; externally—warts, corns, eczema, urticaria, itching eruptions; fresh herb in amenorrhea, as a vulnerary. Dose, dried plant, gr. 15–60 (1–4 Gm.); fresh plant, ʒj–2 (4–8 Gm.).

4. *Dicentra canadensis* or *D. Cucullaria*, *Corydalis*, Turkey (Squirrel) Corn, N.F.—The dried tubers with not more than 3 p. c. of foreign organic matter; N. America, Canada to Ky. Low glaucous perennial herb, leaves dissected, scapes several, each with 4 greenish-white, purple-tinged flowers. Tubers spheroidal, ovoid, 10–15 Mm. ($\frac{2}{3}$ – $\frac{3}{4}$ ') thick, single, clusters 2–3, smooth or pitted, grayish-brown, translucent; fracture hard, horny, whitish, waxy interior, or granular and tough; nearly odorless; taste bitter. Powder, yellowish—numerous starch grains, few tracheæ, stone cells, few calcium oxalate rosette crystals; contains corydaline, fumaric acid, bitter extractive, resin, starch. Tonic, diuretic, alterative; syphilitic, scrofulous and cutaneous affections. Dose, gr. 10–30 (.6–2 Gm.); 1. *Fluidextractum Corydalis* (75 p. c. alcohol): Prep.: 1. *Elixir Corydalis Compositum*, fldext. 6 p. c., + fldexts. stillingia 6, xanthoxylum 3, blue flag 9, potassium iodide 5, dose, ʒj–2 (4–8 cc.). 2. *Fluidextractum Stillingiæ Compositum*, 25 p. c.



FIG. 151.—*Chelidonium majus*: showing fruit, flowers, ovary, and seed.

5. *Glaucium Glaucium* (luteum), *Yellow Horned Poppy*, and *G. corniculatum*.—Both are similar to chelidonium; contain yellow juice and nearly identical alkaloids, hence used for about the same purposes.

6. *Argemone mexicana*, *Prickly Poppy*.—Capsules and leaves contain berberine, protopine (macleine, fumarine), but no morphine; seed have a bland, light yellow fixed oil 36 p. c.; substitute for castor oil. Dose, ʒxv–45 (1–3 cc.).

27. CRUCIFERÆ. Mustard Family.

Kru-sif'e-re. L. *Crucifer*, fem. pl. fr. *cru(x)c*, a cross, + *ferre*, to bear—i. e., flowers (petals) arranged in shape of maltese cross. Herbs,

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shrubs. Distinguished by pungency or acrid juice, cruciform flowers, tetradynamous stamens, fruit a silique or silicle, 2-celled; sepals 4; petals 4; stamens 6, of which 2 are shorter and inserted lower down; pistil 1, compound, superior; seeds albuminous; temperate, frigid, and tropical climates; antiscorbutic, pungent, acrid (fixed and volatile oils).

Genus: **1. Brassica.**

SINAPIS NIGRA. BLACK MUSTARD, *U.S.P.*

Brassica	{	nigra , (<i>Linné</i>) <i>Koch</i> ,	{	The dried ripe seed, with not more than 5 p. c. other seeds or other foreign organic matter, yielding not less than .6 p. c. volatile oil (allyl isothiocyanate).
		junceæ , <i>Linné</i> (<i>Cosson</i>), and related varieties.		

Habitat. Asia, S. Europe, Africa, cultivated in gardens; wild in United States.

Syn. 1. Sinap. Nig., Brown Mustard, Cadlock, Kerlock; Sinapis Nigræ Semina; Fr. Moutarde noire (grise); Ger. Semen Sinapis, Schwarzer Senf, Senfsamen. 2. Sarepta, Indian or Russian Mustard.

Si-na'pis. L. fr. Gr. (σι)ναπι, Celtic *nap*, a turnip.

Bras'si-ca. L. for cabbage, fr. Celtic *bresic*, cabbage—*i. e.*, the fruit resemblance.

Jun'ce-a. L. *juncus*, a rush, reed—*i. e.*, from resemblance to rush (bulrush).

Nigra. L. *niger*, black—*i. e.*, the seed.

Mus'tard. L. *mustrum*, must—*i. e.*, seeds were once pounded with must or vinegar.

PLANTS.—*Brassica nigra*, erect annual, 1.3 M. (4°) high, smooth above, branched; leaves irregularly pinnatifid, faintly toothed; flowers 6 Mm. ($\frac{1}{4}$ ') broad, yellow, racemes; fruit silique, 18 Mm. ($\frac{3}{4}$ ') long, 1 Mm. ($\frac{2}{5}$ ') broad, appressed, somewhat quadrangular, beak short, tapering, 3–7-seeded; *B. juncea*, glabrous or pubescent, glaucous, upper leaves oblong, subentire, attenuate at the base, lower lyrate, pedicels slender spreading, smaller than preceding; flowers 1.2–1.8 Cm. ($\frac{3}{5}$ – $\frac{4}{5}$ ') broad, not appressed; fruit (pod) 2–5 Cm. ($\frac{4}{5}$ –2') long. **SEED**, spheroidal, irregularly spheroidal, 1–1.6 Mm. ($\frac{1}{25}$ – $\frac{1}{16}$ ') broad; testa dark reddish-brown, sometimes yellowish-brown, with grayish tinge, minutely pitted or reticulate; embryo greenish-yellow, dark yellow, oily, 2 large cotyledons; odor slight (dry); when crushed and moistened, very irritating, strongly pungent, characteristic; taste strongly pungent, acrid. **POWDER**, light brown, greenish-brown—tissues of embryo, the cells containing small aleurone grains and fixed oil, the latter forming in large globules on adding chloral hydrate T. S.; fragments of seed-coat conspicuous, with yellow areas and small yellowish stone cells, few or no starch grains. In preparing powdered black mustard, some of its fixed oil may be removed to facilitate reduction. Should be kept, when powdered, in tightly-closed containers. *Solvents*: water; alcohol slightly. **Dose**, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—**SEEDS**: Those of allied species—radish, turnip, rape, the latter most common, but easily recognized by larger size and

peculiar bluish-red tint; **POWDER:** Flour, starchy substances (blue with iodine), turmeric—rendering white mustard whiter (reddish-brown with borax or boric acid), red pepper (increasing pungency), sawdust (microscope); out of 27 samples examined only 8 were free of admixtures; white mustard recognized by not giving pungent fumes when mixed with water unless heated; **OIL:** Alcohol, carbon disulphide, castor oil, petroleum, artificial allyl isosulphocyanate, etc.

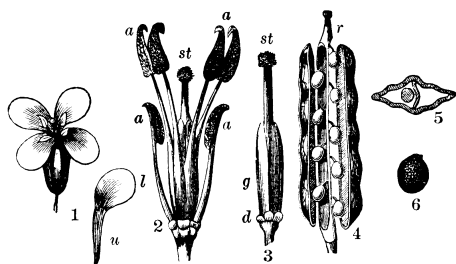


FIG. 152.—*Brassica nigra*: 1, flower; 2, pistil and stamens; 3, pistil; 4, silique; 5, cross-section of same; 6, seed; *a*, stamen; *st*, stigma; *g*, pistil carpels; *d*, nectar tubes; *r*, replum.

Commercial.—Plants are cultivated largely in England, United States, etc., and grow wild—the *white* (*Sinapis alba*), occasionally, the *black* commonly. The seed of each on grinding and sifting yield a yellow powder of characteristic odor and taste, and by mixing equal quantities of the two we obtain *mustard*, *flour of mustard* (*Sinapis*, Br.), which by trituration with water (vinegar) and spices yields the semi-solid *French mustard*.

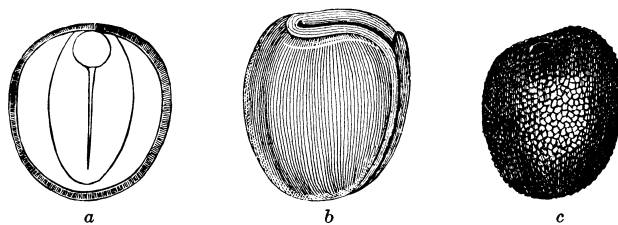


FIG. 153.—*Sinapis*, magnified: *a*, transverse section; *b*, embryo; *c*, entire seed.

CONSTITUENTS.—Fixed oil 30–35 p. c., Sinigrin (potassium myronate) .7–1.3 p. c., Sinapine sulphocyanide, lecithin, albumin 30 p. c., gum and mucilage 20 p. c. (mainly in testa), myrosin, other proteins, starch 1–2.5 p. c., ash 4–9 p. c.

Fixed Oil.—Usually termed “oil of mustard” is obtained by crushing seeds and expressing; it is yellowish-green, non-drying, sp. gr. 0.916, congeals at -18° C. (0° F.), slight odor, bland, mild taste; consists of glycerides of oleic, stearic, erucic (brassic) and behenic acids.

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Sinapine.—Alkaloid, here only as sulphocyanide, in colorless, bitter prisms, soluble in water, alcohol. Sinapine boiled with alkalies gives choline or sinkaline, $C_5H_{15}O_2N$, and sinapic acid, $C_{11}H_{12}O_5$.

Myrosin.—This ferment is an albuminoid body that becomes inert at $70^\circ C.$ ($158^\circ F.$), hence mustard heated to this point will not yield the volatile oil, owing to which the plasters should not be moistened with water warmer than the body temperature.

Sinigrin, $C_{10}H_{18}KNS_2O_{10}$.—Silky, white needles, or golden-yellow crystals, soluble in water, slightly in alcohol, insoluble in ether, chloroform; with water and the ferment myrosin it splits into glucose, acid potassium sulphate, and allyl sulphocyanide (isosulphocyanate—volatile oil of mustard) .5–1 p. c.

Oleum Sinapis Volatile. Volatile Oil of Mustard, U.S.P.—(Syn., Ol. Sinap. Vol., Mustard Oil, Oleum Sinapis Æthereum, Oil of Mustard; Fr. Essence de Moutarde; Ger. Oleum Sinapis, Senföl, Ätherisches Senföl.) This oil, like oil of bitter almond and to a great extent oil of gaultheria, does not preëxist in the plant, being obtained by macerating with warm water the crushed black mustard seeds (*B. nigra*, *B. juncea*), after the removal of fixed oil by expression, when a reaction (fermentation) sets in between sinigrin (potassium myronate) and myrosin (albuminoid ferment), provided the temperature does not exceed $70^\circ C.$ ($158^\circ F.$), at which the ferment becomes inert and ceases to act— $C_{10}H_{16}KNS_2O_9$ (sinigrin) + $H_2O = C_3H_5CNS$ (volatile oil of mustard) + $C_6H_{12}O_6$ (glucose) + $HKSO_4$; also have formed allyl cyanide, carbon disulphide, allyl thiocyanate, and higher boiling compounds, which are always in the oil; when fermentation is completed the mixture is distilled with steam; this oil also is produced to a large extent synthetically by decomposing allyl iodide, C_3H_5I , with potassium sulphocyanate in alcoholic solution. It is a colorless, pale yellow, strongly refractive liquid, very pungent, irritating odor, acrid taste (in both exercise great caution, examining it only when highly diluted), optically inactive, sp. gr. 1.017, soluble in alcohol, carbon disulphide, volatile at $150^\circ C.$ ($302^\circ F.$); contains at least 93 p. c. of allyl isothiocyanate (isosulphocyanate), with traces of allyl cyanide, carbon disulphide, etc. *Tests*: 1. Distils completely between 148 – $154^\circ C.$ (298 – $310^\circ F.$), first and last 10 p. c. portions have nearly the same sp. gr. as original oil (abs. of alcohol, chloroform, petroleum, fatty oils). 2. Dilute 1 cc. of oil with alcohol (5) + 1 drop of ferric chloride T. S.—no blue color (abs. of phenols). The label must indicate definitely its specific source, whether from black mustard or made synthetically. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\mathfrak{m}\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 cc.).

PREPARATIONS.—SEEDS: 1. *Emplastrum Sinapis*. Mustard Plaster. (Syn., Emp. Sinap., Mustard Paper; Charta Sinapis, Fr. Papier moutarde (sinapisé), Moutarde en feuilles; Ger. Charta sinapisata, Senf papier.)

Manufacture: Percolate black mustard 100 Gm. with petroleum benzin until percolate gives no greasy stain on blotting paper, dry the powder; dissolve rubber 10 Gm. in petroleum benzin and carbon disulphide each 100 cc., and with this mix the purified mustard to produce a semi-liquid magma, spread on paper, cotton cloth, or other fabric; it is a uniform mixture of black mustard, deprived of its fixed oil, and a solution of rubber, spread on paper, cotton cloth, or other fabric; 100□Cm. contain 2.5 Gm. of black mustard deprived of its fixed oil. Before applying to the skin moisten thoroughly with tepid water, when it will produce a decided warmth and redness within 5 minutes. Should be kept in tightly-closed containers.

OIL: 1. *Linimentum Sinapis Compositum*, N.F., 3 p. c. + fldext. mezereum 20 p. c., camphor 6, menthol 2, castor oil 15, alcohol q. s. 100. 2. *Spiritus Sinapis*, N.F., 2 p. c., + alcohol q. s. 100. 3. *Unguentum Sinapis*, N.F., 2 p. c., + white wax 15, lard 83.

Unoff. Preps.: SEED: *Infusion*, 5 p. c., dose, *ad libitum*. OIL: *Linimentum Sinapis* (Br.), 3.5 p. c.

PROPERTIES.—Stimulant, emetic, tonic, diuretic, laxative, rubefacient, irritant, epispastic, carminative, condiment, vesicant; dilates the vessels, causing redness, warmth, and irritates sensory nerves, giving burning pain.

USES.—Atonic dyspepsia with constipation, delirium tremens, atonic dropsy, hiccough, narcotic poisoning. Externally—rheumatism, gout, atrophy, neuralgia, colic, gastralgia, inflammation of throat or lungs, toothache, earache, headache, vomiting, diarrhea, dysentery, amenorrhea, dysmenorrhea, stimulant to heart, respiration, and vascular system.

For mild action: Dilute mustard with equal quantity of flaxseed meal or flour, and make with water into a pasty plaster—poultice, cataplasm, or sinapism; should be applied enveloped in very thin muslin to prevent sticking, and is superseded almost entirely by the whole- and half-strength *mustard leaves*, which, in order to use, should be dipped into warm water for 15 seconds and applied for $\frac{1}{2}$ –1 hour. The volatile oil may be used locally, well diluted (3ss; 2 cc.) + Stokes' liniment, alcohol, or almond oil 3ij; 60 cc. Good in scabies, hysteria, swooning convulsions.

Mustard foot-baths, valuable in headache, cerebral and other internal congestion, pneumonia, amenorrhea, for diaphoresis.

The infusion, made by stirring a tablespoonful to a cream with warm water, is a popular emetic in poisoning, etc., giving the entire mixture.

Allied Plants:

1. *Sinapis alba*. *White (Yellow) Mustard*, U.S.P. 1830–1910.—Plant and habitat similar to official. Seed, 1–2 Mm. ($\frac{1}{5}$ – $\frac{1}{2}$ ') thick, subglobular, testa yellowish, minutely pitted, embryo yellowish, oily, with curved hypocotyl, 2 conduplicate cotyledons; inodorous; taste mildly pungent, acrid; powder contains few or no starch grains; contains

CRUCIFERÆ

fixed oil 20–25 p. c., sinalbin, sinapine sulphocyanide, lecithin, albumin 28 p. c., gum and mucilage 19 p. c. (mainly in testa), myrosin, other proteins, ash 4 p. c. Used for flavoring, etc., similar to the official, but milder in action as allyl isothiocyanate is not developed by macerating with water, but a weaker compound—acrinyl isosulphocyanide.

2. *Brassica arvensis* (*Sinapis'trum*), *Charlock*, *Wild Mustard*.—Europe, United States; an annual, troublesome weed; seed smoothish, dark brown, smaller and less pungent, than our official black mustard. *B. oleracea*, *Cabbage*, Europe; leaves large, smooth, glaucous, very different from cultivated varieties. *B. campestris*; Europe, Russia, Asia. Wild annual, .3–.6 M. (1–2°) high, flowers bright yellow; of this we have several cultivated varieties which give edible roots and seeds of some value, thus: (a) var. *Na'pus*, *Turnip*—seed larger than

official black mustard, 1.6–2 Mm. ($\frac{1}{16}$ – $\frac{1}{12}$) thick, brown or black, finely pitted, slightly acrid; (b) var. *Ra'pa*, *Rape*, *Colza*—seed larger than mustard or turnip, 2–2.5 Mm. ($\frac{1}{12}$ – $\frac{1}{10}$) thick, finely pitted, blue-black, slightly acrid; both yield a bland, yellow fixed oil under the names of turnip-seed oil and rape-seed oil; (c) var. *Rutaba'ga*, *Swedish Turnip*—seed also small and contain oil and pungency.

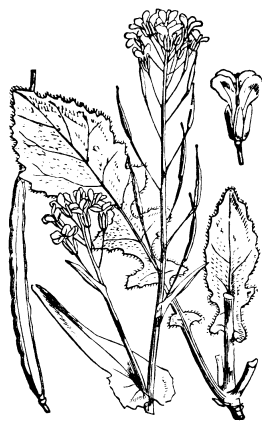


FIG. 154.—*Brassica campestris*.

3. *Rori'pa* (*Cochlea'ria*) *Armoracia*, *Armoracia Radix*, *Horseradish Root* (Br.—U.S.P. 1820–1850).—The fresh root collected from cultivated plants; E. Europe, naturalized elsewhere. Plant .6–1 M. (2–3°) high, in most places; leaves 20–30 Cm. (8–12') long, 10–12.5 Cm. (4–5') wide, toothed; flowers white; fruit 2-celled pod, each 4–6-seeded; root 30 Cm. (12') long, 12–25 Mm. ($\frac{1}{2}$ –1') thick, conical, yellowish, scaly, warty, inside white, many stone cells, central pith, pungent odor when bruised; taste sharp, acrid; contains volatile oil .05 p. c. (isomeric with mustard oil, C_3H_5CNS), resin. Condiment, rubefacient, stimulant, diuretic; dyspepsia, rheumatism, dropsy, palsy, scurvy, hoarseness, vomiting; in infusion, spirit (*Spiritus Armoraciae Compositus* (Br.), 12.5 p. c.), cataplasm. Dose, gr. 20–30 (1.3–2 Gm.); spirit, ʒj–2 (4–8 cc.).

4. *Raph'anus Raphanis'trum*, *Wild Radish*, *Jointed Charlock*, and *R. sati'vus*, *Garden Radish*.—Both contain a fixed oil resembling that from mustard, but the sulphuretted volatile oil of the latter differs in some respects.

5. *Dro'sera rotundifo'lia*, or *D. an'glica* and *D. longifo'lia*, *Drosera*, *Sundew*, *N.F.*—*Droseraceæ*. The air-dried flowering plant of the former, frequently mixed with the two latter closely allied species, or

at times wholly replaced by them with not more than 5 p. c. of foreign matter, yielding not more than 10 p. c. of acid-insoluble ash; N. Temperate zone, N. America. Small moss-like plant, glittering in sunshine when covered with dew. Matted or broken leaves, stems and fibrous black rootlets, reddish throughout; leaves mostly basal, petiolate; blade orbicular, 15 Mm. ($\frac{3}{4}$ ') broad, reddish glandular tentacles above, scape filiform, smooth, 10–30 Cm. (4–12') long, few 5-parted, small white fugacious flowers, raceme. *D. anglica*—leaves linear, obovate, glabrous or sparsely hairy petioles; *D. longifolia*—leaves spatulate, blades 2–3 times longer than broad, petioles and scape smooth; odorless; taste faintly bitter, acidulous. Powder, reddish-brown—oval-headed tentacles, few glandular hairs, stomata, fibrovascular bundles, tracheæ, parenchyma containing reddish substance, few starch grains; solvent: 67 p. c. alcohol; contains resin (acrid, odorous, greenish-brown), glucose, citric, malic acid, ferments (converts

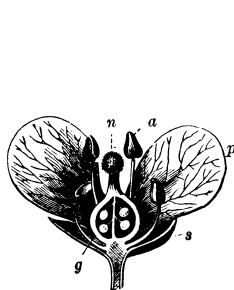


FIG. 155.—*Roripa Armoracia*: flower: *s*, calyx; *p*, corolla; *a*, stamen; *g*, fruit carpel; *n*, stigma.

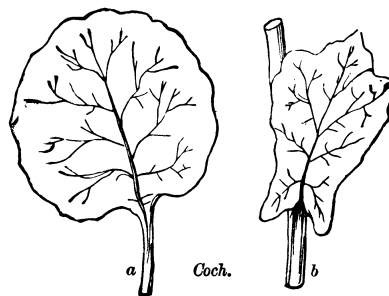


FIG. 156.—*Roripa Armoracia*: leaves; *a*, radical; *b*, cauline.

albumin into peptone), ash 30 p. c. Stimulant, expectorant; chronic bronchitis, whooping cough, tuberculosis—of doubtful efficacy. Dose, $\overline{3}$ ss–1 (2–4 Gm.); 1. *Fluidextractum Droseræ* (67 p. c. alcohol). Tincture 10 p. c.

28. HAMAMELIDACEÆ. Witch Hazel Family.

Ham-a-me-li-da'se-e. L. *Hamamel(is)-id* + aceæ, fr. Gr. ἄμα, together with, + μηλον, fruit (apple)—*i. e.*, flowers and fruit together on the tree. Shrubs, trees. Distinguished by fragrant balsamic properties; ovary inferior, 2-celled, consisting of 2 pistils united below, forming 2-beaked, 2-celled, woody capsule; ovules 1 in each cell, pendent from cell apex, becoming bony seed; stamens 8, 4 perfect, 4 scale-like, sterile; flowers, heads or spikes, sometimes apetalous; calyx and petals 4–5; temperate climates, tropics; bitter, astringent, acrid, balsamic.

Genus: 1. **Liquidambar.**

STYRAX. STORAX, U.S.P.

Liquidambar { **orientalis**, *Miller*,
Styraciflua, *Linné*. } A balsam obtained from the trunk.

Habitat. 1. Asia Minor—Southwestern portion near coast, forming entire forests; 2. United States—Atlantic coast southward.

Syn. Liquid Storax; 1. Levant Storax; 2. American Storax, Copalm Balsam; Oriental Sweet Gum, Storax Tree; Gum Tree, Sweet Gum, Alligator Tree, Lordwood; Br. *Styrax Præparatus*, Prepared Storax, Balsamum *Styracis*; Fr. *Styrax liquide* (purifié, dépuratus); Ger. *Styrax depuratus*, Gereinigter Storax.

Liquidambar. *L. liquidus*, liquid, fluid, + *Ar. ambar*, amber—*i. e.*, the color or fragrant, terebinthinate juice or resin (balsam) resembles liquid amber.

O-ri-en-ta-lis. *L.* oriental, pertaining to the Orient, or East—*i. e.*, its habitat.

Styraciflua. *L. styrax*, storax, + *fluo, fluere*, to flow—*i. e.*, storax sufficiently fluid at times to flow or exudate.

Styrax. *L.* for storax, Gr. *στυράξ*, altr. of *Ar. assithi'rak*, sweet-smelling exudation—*i. e.*, a tree producing it.

PLANTS.—Trees 6–15 M. (20–50°) high, resembling maples; bark purplish-gray; leaves palmately 5–7-lobed, each division obscurely 3-lobed, 5–7.5 Cm. (2–3') long, 10–12.5 Cm. (4–5') wide, margin serrate, bright green, smooth; flowers monœcious, in yellowish solitary heads; fruit, globular capsule, 2.5 Cm. (1') broad, woody. **BALSAM** (storax), a semi-liquid, grayish, grayish-brown, sticky, opaque mass, depositing on standing a heavy dark brown layer (Levant); or a semi-solid, sometimes a solid mass, softened by gently warming (American); thin layers transparent; odor and taste characteristic; heavier than water and insoluble in it; soluble (usually incompletely) in warm alcohol (1), also in acetone, carbon disulphide, ether (some insoluble residue usually remaining). *Tests:* 1. 2 Gm. dried 2 hours at 100° C. (212° F.)—loses 20 p. c. moisture. 2. Dissolve 10 Gm. in hot alcohol 40 cc.—undissolved residue 5 p. c.; evaporate filtrate—yellow to brown residue 70 p. c. (purified storax). *Solvents:* alcohol; ether. Dose, gr. 10–30 (.6–2 Gm.).

ADULTERATIONS.—Turpentine, sand, ashes, bark, mineral matter 13–18 p. c., water 10–40 p. c.

Commercial.—The balsam is not a physiological, but a pathological, secretion of the sapwood, existing only in injured trees as a result of wound stimulation—Nature's method of securing antiseptics and healing. To obtain 1, *Levant* storax in quantity—the outer bark on one side of the tree is bruised, resulting shortly thereafter in filling the cambium with rows of balsam glands and the inner bark with their exudation. The dead outer bark is taken off and rejected, while the inner is removed and boiled in sea-water—the balsam being skimmed from the surface with final expression of the boiled bark. It was once believed to be produced in the inner bark, which was collected and thrown into pits, to allow partial exudation, and ultimately subjected to pressure in strong horse-hair bags. Liquid storax is then put into barrels, goat skins, etc., and forwarded to Constantinople, Smyrna, Syria, Alexandria, Bombay, and Trieste. To obtain 2, *American* storax—incisions are made through the bark, or, in the absence of these,

during spring and summer, it exudates through natural fissures, from which it may readily be scraped. The greatest demand comes from India and China, the English-speaking people using little of it. The residual bark when dried (*Cortex Thymiamatis*) is employed for fumigation.

CONSTITUENTS.—A variable mixture chiefly of volatile oil, resins, cinnamic acid esters, and water—Styrol, Styracin, Phenylpropyl Cinnamate, Storesin, Cinnamic Acid, 5–15 p. c., benzoic acid, ethyl cinnamate, $C_9H_7(C_2H_5)O_2$, ethyl vanillin, water 10–40 p. c., other impurities, ash 1 p. c.

Styrol, Styrene, Styrolene (*cinnamene, phenyl-ethylene*), C_8H_8 .—Hydrocarbon (volatile oil) obtained by distilling with water; it is a colorless fragrant oily liquid, sp. gr. 0.906, boils at $145^\circ C.$ ($293^\circ F.$), and when heated to $200^\circ C.$ ($392^\circ F.$) is converted into solid meta-cinnamene.



FIG. 157.—*Liquidambar orientalis*.

Styracin, Cinnamyl Cinnamate, $C_9H_7(C_9H_9)O_2$.—This is obtained in faint yellow crystals by alcohol, ether, or hot benzene from the resin after removal of cinnamic acid; with concentrated potassium hydroxide solution yields *styrone* (cinnamic alcohol), $C_9H_{10}O$, yellowish oily refractive aromatic liquid.

Phenylpropyl Cinnamate, $C_9H_7(C_9H_{17})O_2$.—This is a thick inodorous liquid.

Storesin, $C_{36}H_{58}O_3$.—This, the most abundant constituent, is amorphous, readily soluble in benzin, melts near $145^\circ C.$ ($293^\circ F.$), or near $165^\circ C.$ ($329^\circ F.$); the latter variety gives with potassium hydroxide a compound crystallizing in needles.

Cinnamic Acid, $C_9H_8O_2$.—Chiefly in free state, obtained by treating with solution of sodium carbonate, precipitating with hydrochloric acid.

PREPARATIONS.—1. *Tinctura Benzoini Composita*, 8 p. c.

Unoff. Prep.: *Ointment* (salve), 50 p. c., with lard or olive oil.

HAMAMELIDACEÆ

PROPERTIES.—Stimulant, expectorant, diuretic, antiseptic, disinfectant. Acts locally and remotely like benzoin, copaiba, balsams of Peru and tolu. Styacin is antiseptic, and should be dissolved in 6–12 parts of oil or water to render it non-irritating as a dressing.

USES.—Chronic bronchitis and catarrhs of genito-urinary passages, gonorrhea, gleet, amenorrhea, leucorrhea, phthisis, asthma. Externally in ointment as a detergent for indolent ulcers, frost-bites, as a parasiticide for scabies, phthiriasis (pediculi), etc.

Allied Product:

1. *Styrax Calamita*.—Resinous exudation from *Styrax officinalis*, in agglutinated tears resembling benzoin, wrapped in leaves; a factitious variety consists of the ground, exhausted bark or sawdust mixed with liquid storax, formed into reddish-brown cylindrical cakes, brittle, friable, soft and unctuous to the touch; contains many crystals of styacin, and has storax odor.

Allied Plants:

1. *Hamamelis virginiana*; *Hamamelidis Folia*, *Hamamelis Leaves*, *Witch Hazel Leaves*, N.F.—The dried leaves with not more than 5 p. c. of stems nor 2 p. c. of other foreign organic matter; N. America, thickets, ponds, ditch banks. Woody shrub 1.5–4.5 M. (5–15°) high, 7.5–15 Cm. (3–6') thick; stem crooked. Bark and twigs, in irregular quilled, bent pieces, 1–2 Mm. ($\frac{1}{2}$ – $\frac{1}{2}$ ') thick, grayish-brown, many lenticels, or reddish-brown, with short transverse ridges or scars, or somewhat scaly in old bark, thin corky layer easily removed from pale cinnamon-color middle bark, inner surface pale cinnamon, yellowish, smooth, finely striate, fracture short (young) or tough (old) in the bast layer. Leaves short, petiole 1–1.5 Cm. ($\frac{2}{3}$ – $\frac{3}{4}$ ') long, lamina broadly elliptical, inequilateral, 8–12 Cm. ($3\frac{1}{2}$ –5') long, acute, rounded, acuminate, slightly cordate and oblique, sinuate-dentate, pale or brownish-green with few stiff hairs above, lighter underneath, hairy, midrib and veins prominent; odor slight; taste astringent, aromatic, bitter. Powder, light-green—elliptical stomata, numerous stellate hairs and tracheæ, wood fibers, calcium oxalate prisms, crystal and bast-fibers; solvents: 33 p. c. alcohol, boiling water; contains tannin, volatile oil, bitter principle, extractive, ash 6 p. c. Astringent, hemostatic, styptic, sedative, tonic; external inflammations, congestion, sore throat (gargle), hemorrhages of nose, uterus, gums; piles, tumors, diarrhea. Dose, 5ss–1 (2–4 Gm.); 1. *Fluidextractum Hamamelidis Foliorum* (leaves), 1st menstruum: glycerin 10, alcohol 30, water 50, 2d: 33 p. c. alcohol. 2. *Aqua Hamamelidis*, *Distilled Extract of Witch Hazel* (twigs), 100 p. c.; macerate 24 hours in water 200, distil 85, add alcohol 15; it is clear, colorless, characteristic odor and taste, neutral, faintly acid; must be free from mucoid or fungous growths, acetous odor, formaldehyde, acetone, methanol, dissolved impurities. Should be kept cool, in tightly-closed containers.

2. *Hydrangea arborescens*, *Hydrangea*, *Seven-barks*, N.F.—Saxifragaceæ. The dried rhizome and roots with not more than 3 p. c. of foreign organic matter; N. America, on rocky banks near streams;

.3–2.5 M. (1–8°) high, stem grayish, bark exfoliates into thin layers (7), glabrous; leaves ovate, serrate, pale green beneath; flowers cymes, flat, greenish; fruit 2-celled, 2-beaked, many-seeded capsule. Rhizome, usually in pieces 3–10 Cm. ($1\frac{1}{5}$ –4') long, 3–20 Mm. ($\frac{1}{8}$ – $\frac{4}{5}$ ') thick, yellowish-brown, wrinkled, lenticels, stem-scars above, fibrous roots beneath; fracture tough, whitish, wood radiate—pith; roots 25 Cm. (10') long, 2 Mm. ($\frac{1}{12}$ ') thick—no pith; inodorous; taste sweetish, acrid. Powder, yellowish—tracheæ, tracheids, stone cells, numerous calcium oxalate raphides, starch grains; solvent: 60 p. c. alcohol; contains hydrangin (glucoside) 1 p. c., volatile oil, fat, resin, starch, ash 3 p. c. Diuretic, narcotic; renal and cystic calculi. Dose, gr.

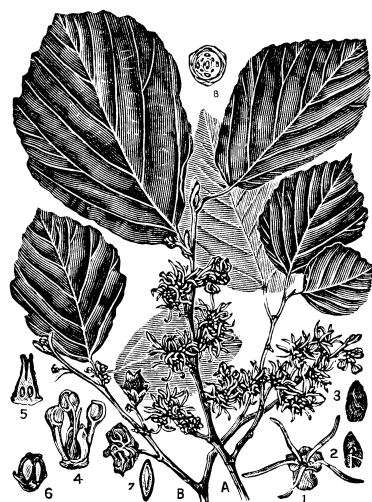


FIG. 158.—*Hamamelis virginiana*: A, flowering twig; B, fruit-bearing twig; 1, flower, magnified; 2, sepal and stamen; 3, sepal, outer surface; 4, essential organs; 5, pistil; 6, fruit; 7, seed (four last longitudinal sections); 8, floral diagram.

15–30 (1–2 Gm.); 1. *Fluidextractum Hydrangæ* (60 p. c. alcohol). 2. *Elixir Hydrangæ et Lithii*, 40 p. c., + lithium benzoate and salicylate $\bar{a}\bar{a}$ 2.6 p. c. Dose, $\bar{z}\bar{j}$ –2 (4–8 cc.).

3. *Heu'chera america'na*, *Alum Root*.—The rhizome, U.S.P. 1820–1870; United States. Plant viscid, pubescent, .6–1.3 M. (2–4°) high; leaves 5–7.5 Cm. (2–3') wide, crenate; flowers purplish-white; root 15 Cm. (6') long, 12 Mm. ($\frac{1}{2}$ ') thick, several-headed, many thin radicals, brownish-purple; bark thin, inodorous, astringent, bitter; contains tannin 18–20 p. c., starch 5–16 p. c. Astringent, tonic; diarrhea, menorrhagia, aphthæ, ulcers, hemorrhoids. Dose, gr. 15–30 (1–2 Gm.), in decoction.

[Note: Pages 62-63 are missing from the original text. This appears to be a publishing omission in the original manuscript rather than an omission due to damage of the text. DM]

ROSACEÆ

29. ROSACEÆ. Rose Family.

Ro-za'se-e. L. *Ros'a* + aceæ, fem. pl. *rosace-us*, rose-like, fr. *rosa*, a rose. Trees, shrubs, herbs. Distinguished by astringency, succulent edible fruits, prickles and warts on woody surfaces; flowers regular, 5's; stamens inserted on calyx-tube, perigynous; calyx 4-5-lobed—when 5 the odd lobe posterior; anthers 2-celled; pistil 1-many, usually distinct; fruit often edible; seeds exalbuminous. The yellow and white flowers resemble Ranunculaceæ, where, however, the stamens and pistils are inserted on the torus, but in Rosaceæ on the calyx; temperate climates; astringent, tonic, anthelmintic; fruit edible.

Genus: 1. **Rosa**.

ROSA. ROSE, U.S.P.

Rosa gallica, { The dried petals, collected just before the expansion of
Linné. { the flower.

Habitat. W. Asia, S. Europe; cultivated (England, Holland, France, United States, etc.).

Syn. Rosa Gallica, Red Rose, Rosa Gall., French Rose, Provins Rose; Br. Rosæ Gallicæ Petala, Red Rose Petals, Flores Rosarum Rubrarum; Fr. Rose rouge—de Provins, Roses rouges; Ger. Französische Rose, Essigrosen-(blätter), Zucker-rose.

Rō'sa. L. fr. Gr. *ῥόδον*, Eng. rose, fr. Celtic *rhos*, red—*i. e.*, the prevailing color of the flowers.

Gal'li-ca. L. *gallicus*, of or pertaining to Gaul, now France—*i. e.*, country where once it flourished extensively—French rose.

PLANT.—Bushy shrub, .6-1 M. (2-3°) high, stems numerous, covered with prickles and a few sharp spines; leaves alternate, imparipinnate, 2 pairs opposite leaflets, these nearly sessile, ovate, rounded at base, acute at apex, serrate, stiff, keeled, rugose, with veins, pale, hairy below, leaf-serratures not edged with glands; flowers large, on long stalks, petals 5 in the wild state, more when cultivated, rich-crimson; fruit (hip) scarlet to orange-red, oblong, containing many 1-seeded achenes, calyx persistent. **PETALS**, either separate or imbricated in small cones, broadly ovate, summit rounded, deeply notched, margin entire, somewhat recurved, base obtuse, purplish-red except the light brown claw; texture velvety; when dry brittle; odor agreeable; taste astringent, slightly bitter. **POWDER**, reddish-brown—epidermal cells with purplish-red content (sap), fragments of fibro-vascular bundles, spiral tracheæ, rectangular cells with purplish content (sap). *Solvents*: boiling water; diluted alcohol. Dose, gr. 15-60 (1-4 Gm.).

Commercial.—Plant, in its many species and varieties, very largely cultivated domestically as well as commercially; petals are obtained by circumcising with a sharp knife the unopened corolla-buds, leaving the stamens behind on the calyx; or the entire blooms are cut off with knives or scissors, dried carefully but rapidly by stove heat (in order to preserve astringency and color), sifted, if necessary, from stamens,

etc., and marketed; early collection is more astringent and of better color, qualities impaired by slow drying. It is claimed that 1000 flower-buds yield 50 pounds (23 Kg.) of fresh petals, which when dried become 5 pounds (2.3 Kg.).

ADULTERATIONS.—Petals of various red roses.

CONSTITUENTS.—Volatile oil (trace), mucilage, tannin (rosatannic acid, quercitannic acid?), gallic acid, anthocyanin—sap pigment, quercitrin, quercetin (astringent and coloring), sugar, ash 3.5 p. c.

PREPARATIONS.—1. *Fluidextractum Rosæ*. Fluidextract of Rose. (Syn., Fldext. Ros., Fluid Extract of Rose; Fr. Extrait fluide de Rose rouge; Ger. Essigrosenfluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st. menstruum: alcohol 50 cc., water 40 cc., glycerin 10 cc.; 2d: diluted alcohol. Dose, ℥xv–60 (1–4 cc.).

Preps.: 1. *Mel Rosæ*. Honey of Rose. (Syn., Mellitum Rosatum; Fr. Mellite de Roses rouges, Miel Rosat; Ger. Mel rosatum, Rosenhonig.)

Manufacture: 12 p. c. Mix fluidextract of rose 12 cc. with honey q. s. 100 Gm. Dose, ʒj–2 (4–8 cc.).

Prep.: 1. *Massa Hydrargyri* (33 p. c.)—32 p. c.

2. *Syrupus Rosæ*, N.F., 12.5 p. c., + diluted sulphuric acid 1 p. c.

2. *Aqua Rosæ Fortior*. Stronger Rose Water. (Syn., Aq. Ros. Fort., Triple Rose Water, Aqua Rosæ; Fr. Eau distillée fort de Rose; Ger. Stärkeres Rosenwasser.)

Manufacture: The saturated aqueous distillate from fresh flowers of *Rosa centifolia*. It is colorless, clear, strong, pleasant odor and taste of fresh rose blossoms, free from empyreuma, mustiness, or fungoid growths; neutral, slightly acid; evaporate 100 cc.—residue .001 Gm.; no reaction with hydrogen sulphide T. S., or sodium sulphide T. S. (abs. of metallic substances). Dose, ʒij–8 (8–30 cc.).

Preps.: 1. *Aqua Rosæ*. Rose Water. (Syn., Aq. Ros., Aqua Rosarum; Fr. Eau distillée de Rose; Ger. Rosenwasser.)

Manufacture: Mix, immediately before using, stronger rose water, and distilled water, each 1 volume. Dose, ʒij–8 (8–30 cc.).

2. *Unguentum Aquæ Rosæ*. Ointment of Rose Water. (Syn., Ung. Aq. Ros., Cold Cream; Fr. Crème froide; Ger. Unguentum leniens—emolliens.)

Manufacture: Melt, in fine pieces, spermaceti 12.5 Gm., white wax 12 Gm., add expressed oil of almond 56 Gm., stir, heat until uniform; add gradually stronger rose water 19 Gm., previously warmed and having dissolved in it sodium borate .5 Gm., stir rapidly and continuously until congealed and uniform; must be free from rancidity, and if chilled should be warmed slightly before incorporating other ingredients. Should be kept in pure tin, collapsible tubes.

3. *Confectio Rosæ*, N.F., rose 8 Gm., sucrose 64, honey 12, stronger rose water 16, Dose, ʒss–1 (2–4 Gm.).

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3. *Infusum Rosæ Compositum*, N.F., 1.3 p. c., + diluted sulphuric acid .9, sucrose 4, boiling water q. s. 100. Dose, 3 ss–2 (15–60 cc.). 4. *Pilulæ Aloes et Mastiches*, *Lady Webster Dinner Pills*, N.F., $\frac{1}{2}$ gr. (.03 Gm.).

Unoff. Preps.: *Infusion*, 3.5 p. c. *Infusum Rosæ Acidum* (Br.) 2.5 p. c., + diluted sulphuric acid 1.25, water q. s. 100.

PROPERTIES.—Similar to tannin; tonic, mild astringent, carminative.

USES.—Uterine and other hemorrhages, aphthæ, ulcers of mouth, ears, anus, inflamed eyes, chapped hands, burns, flavoring vehicle, perfumery; ointment—soothing, emollient application to the skin, chapped hands and lips, abrasions, ulcers, frost-bite, etc.

Allied Plants:

1. *Rosa centifo'lia*, *Pale Rose*.—The petals, collected after expanding, U.S.P. 1820–1890; W. Asia. Plant erect, 1–2 M. (3–6°) high, similar to but larger than *Rosa gallica*; stems covered with prickles, larger ones hooked; leaves imparipinnate, 2 pairs of opposite leaflets; flowers large, double, calyx persistent; fruit (hip) scarlet to orange-red, oblong, containing many 1-seeded achenes. Petals numerous, roundish-obovate, retuse, or obcordate, pink, fragrant, sweetish, slightly bitter, faintly astringent; contain volatile oil, mucilage, sugar, tannin, malates, phosphates (quercitrin?). This, although often mistaken for the Damask rose, is no doubt the most anciently cultivated variety of *R. gallica*, and exists in many hybrid forms which are employed indiscriminately. Used as mild carminative, for distilling the oil and U.S.P. stronger rose water—the latter being of fine flavor, and more used in this country, owing to prevalence and cheapness, than the imported. Dose, gr. 15–60 (1–4 Gm.). *R. cani'na*, *Dog Rose*, United States; leaflets 5–7, ovate, serrate, flowers pink, white; *R. blan'da*, *R. nit'i-da*, also employed.



FIG. 159.—*Rosa canina*.

2. *R. damasce'na*, *Damascus Rose*.—The volatile oil distilled from fresh flowers, U.S.P. 1840–1900; India, N. Africa, S. France, Bulgaria (Roumelia). Plant, prickly, resembling the ordinary rose bush, cultivated in hedge-like rows on southern slope of Balkan Mountains. Oil (otto, attar, essence of rose) pale yellow, transparent liquid, fragrant rose odor, mild sweetish taste, sp. gr. 0.860, alcohol (70 p. c.) precipitates stearoptene but dissolves eleoptene, congeals at 18–22° C. (64–72° F.); consists of solid portion (stearoptene) 12–14 p. c., being a mixture of odorless hydrocarbons, $C_{20}H_{42}$, etc., and a liquid portion (eleoptene) composed of (1) geraniol (rhodinol), $C_{10}H_{18}O$, 75 p. c., most fragrant, oxidized into aldehyde, citral (rhodinal), readily soluble in alcohol, (2) citronellol, $C_{10}H_{20}O$, small amount; when congealed should

be liquefied by warming before dispensing. *Adulterations*: Spermaceti, paraffin (crystallize in opaque crust), fixed oils, volatile oils of guaiac-wood, palmarosa, rose geranium, etc.—having one or more similar ingredients (geraniol, etc.), recognized by congealing point and saponification value (10–17); synthetic rose oils—now largely manufactured as a substitute. Stimulant, carminative, aromatic; chiefly in perfumery, flavoring.

3. *Ru'bus villo'sus*, *R. nigrobac'cus*, *R. cuneifo'lius*, + *Eubatus* section, *Rubus*, *Blackberry Bark*, *N.F.*—The dried bark of the rhizome and roots with not more than 10 p. c. of adhering wood nor 3 p. c. of other foreign organic matter; N. America, fields, thickets, cult. Pubescent perennials; stems angular, woody, with stout recurved prickles; leaflets 3–5, ovate, cuneate, petiolate, serrate, rough above, pubescent beneath, 2.5–10 Cm. (1–4') long; flowers white, racemes; fruit (aggregate drupe—carpels 20 +), 12–25 Mm. ($\frac{1}{2}$ –1') long, black, pulpy, delicious. Bark of rhizome 1–2 Mm. ($\frac{1}{2}$ – $\frac{1}{2}$ ') thick, in long, tough, flexible bands or quills, 3–6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') broad, brownish, grayish-brown, smooth or

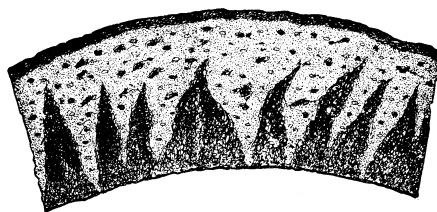


FIG. 160.—*Rubus villosus*: transverse section of bark, magnified 15 diam.

scaly, inner surface yellowish, coarsely striate, fracture tough-fibrous, readily splitting; inodorous; taste strongly astringent, bitterish. Powder, dark brown—cortical parenchyma, calcium oxalate rosettes, many simple and compound starch grains, cork tissue; solvents: boiling water, diluted alcohol; contains tannin 12–17.5 p. c., gallic acid .4 p. c., villosin (saponin) .8 p. c., resin 7 p. c., volatile oil, fixed oil, wax, ash 3 p. c. Astringent, tonic, similar to tannin; diarrhea—children and adults in summer. Dose, \mathfrak{z} ss–1 (2–4 Gm.); 1. *Fluidextractum Rubi* (diluted alcohol), dose, \mathfrak{m} x–60 (.6–4 cc.); Prep.: 1. *Syrupus Rubi*, 25 p. c., dose, \mathfrak{z} j–4 (4–15 cc.). Decoction, 5 p. c. (water or milk), \mathfrak{z} j–2 (30–60 cc.); Syrup of fruit (juice 100, sucrose 200—heat); Wine; Brandy.

4. *R. Idæ'us*, or *R. strigo'sus*; *Rubi Idæi Fructus*, *Raspberry*, *N.F.*—The fresh, ripe fruit of several varieties; Europe, N. Asia, N. America. Shrub 2 M. (6') high, glaucous, spinose; leaves imparipinnate, 1–3 pairs, sessile, ovate, serrate, whitish, downy leaflets; flowers white, 5's. Fruit, deprived of conical receptacle (hollow base), globular, hemispherical, composed of 20–30 small, rounded, polygonal, succulent drupelets (aggregate fruit), pericarps red, numerous non-globular hairs,

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mesocarps fleshy, juice red, parenchyma with calcium oxalate rosettes, endocarps small stones, wrinkled; odor characteristic, aromatic; taste pleasant, sweet, acidulous. Black Raspberries, the fresh ripe fruit of varieties of *R. occidentalis*, may be substituted for pharmaceutical purposes, either in part or wholly for Red Raspberries; most of these plants grow wild and under cultivation throughout N. America, supplying fruit that is in great demand, and a juice that ferments into wine, which upon distillation yields brandy more or less popular in bowel affections; contains volatile oil (trace), citric acid, malic acid, sugar 5 p. c., pectin, coloring matter. Refrigerant, mild laxative, dietetic; used as edible fruit and for preparing syrup; 1. *Syrupus Rubi Idæi*; add to every 100 cc. of clear, boiled, filtered juice, 200 Gm. sucrose:

FIG. 161.—*Rubus Idæus*.

Preps.: 1. *Elixir Bromidorum Quinque*, 15 p. c. 2. *Elixir Gentianæ Glycerinatum*, 6 p. c.

5. *Quilla'ja Saponaria*, *Quillaja*, *Soap (Tree) Bark*, N.F.—The dried inner bark with not more than 5 p. c. of outer bark nor 1 p. c. of foreign organic matter; Chile, cult. in N. Hindustan. Tree 15–18 M. (50–60°) high; leaves oval, evergreen, coriaceous; flowers white, monœcious; fruit capsule with persistent calyx, many seeded. Bark in flat pieces of variable length, 3–8 Mm. ($\frac{1}{8}$ – $\frac{1}{3}$) thick, or small chips, brownish-white, often with cork patches, nearly smooth, occasional depressions, conical projections or channels; inner surface yellowish-white; fracture uneven, strongly fibrous; odor slight, taste acrid. Powder, pinkish-white, very sternutatory—elongated calcium oxalate prisms, irregular crystal-fibers with thick lignified walls, medullary rays, stone cells, starch grains, cork cells with brownish walls; solvents:

alcohol, hot water; contains saponin (quillajic acid, $C_{19}H_{30}O_{10}$ + quillaja-sapotoxin, $C_{17}H_{25}O_{10}$), $C_{32}H_{56}O_{18}$, 9 p. c., starch, gum, sucrose, calcium oxalate and sulphate. Stimulant, diuretic, expectorant, irritant, sternutatory, detergent, local anesthetic, antipyretic, paralyzant to heart and respiration, irritant to respiratory passages, poison to voluntary muscles; like senega; bronchitis, coryza, rhinitis, emulsifying agent, eruptions, scalp sores, fetor of feet, hair tonics, washing silks. Dose, gr. 15–30 (1–2 Gm.); 1. *Tinctura Quillajæ*, 20 p. c. (boiling water, then 35 p. c. alcohol); dose, ʒss–1 (2–4 cc.); 2. *Liquor Picis Carbonis*, 10 p. c. Fluidextract, Mv–15 (.3–1 cc.).

6. *Hage'nia abyssin'ica*, *Brayera*, *Kousso*, *Cusso*, N.F.—The dried panicle of the pistillate flowers with not more than 10 p. c. of staminate flowers or other foreign organic matter, yielding not more than 5 p. c. of acid-insoluble ash; stems over 3 Mm. ($\frac{1}{8}$) thick and all binding material must be rejected before powdering or using; Abyssinia, tablelands,



FIG. 162.—*Quillaja Saponaria*.

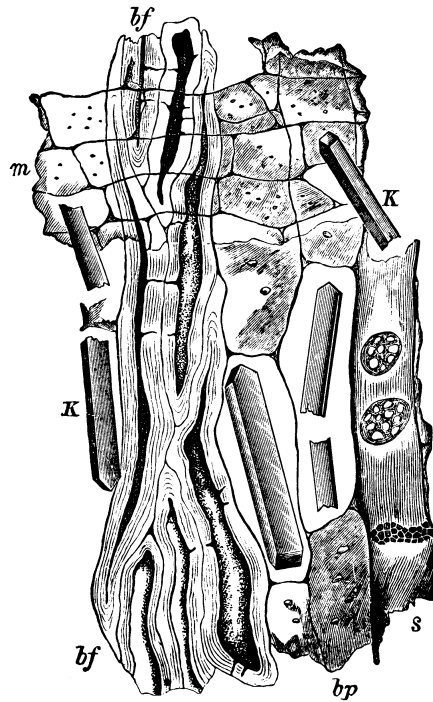


FIG. 163.—*Quillaja Saponaria*, longitudinal section: *bf*, bast-fiber; *bp*, sieve-parenchyma; *s*, sieve-tube; *m*, medullary ray; *K*, crystal.

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mountains. Ornamental tree, 6–12 M. (20–40°) high; leaves 25–30 Cm. (10–12') long, imparipinnate, leaflets 3–6 pairs, 7.5–10 Cm. (3–4') long, sessile, serrate; flowers monœcious—staminate (Kouso-esels) greenish-yellow, with 20 fertile stamens. Pistillate (Red kouso) in reddish-brown rolls, flattened bundles, 25–50 Cm. (10–20') long, or more or less loose and stripped from larger portions of the panicles, branches cylindrical, flattened, furrowed, light brown, yellowish, tomentose, glandular; cork brownish, fibro-vascular bundles in wedges, pith large, nodes with scar or branch, internodes 1–2 Cm. ($\frac{2}{3}$ – $\frac{4}{5}$ ') long;



FIG. 164.—*Hagenia Abyssinica*: A, branch of panicle; B, staminate flower; and C, pistillate flower, magnified 4 diam.

flowers with bracts, calyx turbinate, purple-veined bractlets; petals 5, caducous, usually absent in drug, carpels 2, stigmas broad, hairy, fruit achene, 2 Mm. ($\frac{1}{12}$ ') thick; odor slight, taste bitter. Powder, brownish—non-glandular hairs, glandular hairs, tracheæ, pith, stomata, calcium oxalate rosettes, prisms, pollen grains; solvents: alcohol, boiling water; contains kosin (amorphous resins) 6.25 p. c., volatile oil, tannin 24 p. c., kosidin, protokosin, kosotoxin, ash 5–9 p. c. Anthelmintic, tæniifuge. Dose, \mathfrak{z} ij–6 (8–24 Gm.); 1. *Infusum Brayeræ*, 6 p. c., dose, \mathfrak{z} ij–8 (60–240 cc.). Fluidextract (alcohol); kosin (koussin, brayerin—amorphous impure best), gr. 5–30 (.3–2 Gm.).

7. *Ge'um riva'le*, *Purple (Water) Avens*.—The rhizome, U.S.P. 1820–1870; N. America. Perennial plant .3–.6 M. (1–2°) high, stem purple; leaves 3-foliate or 3-lobed; flowers purplish-orange. Rhizome 5–7.5 Cm. (2–3') long, 6 Mm. ($\frac{1}{4}$ ') thick, tuberculate, wrinkled, brownish-red; bark thin, wood-wedges white, pith large; aromatic, astringent, bitter; contains volatile oil, tannin, bitter principle. Astringent, tonic; diarrhea, hemorrhage, leucorrhea, phthisis, scrofula, rheumatism, intermittents, dyspepsia, menstrual derangements; decoction, infusion, tincture. Dose, gr. 15–30 (1–2 Gm.).

8. *Potentilla Tormentil'la*, *Tormentil*.—The rhizome, U.S.P. 1820–1870; Europe. Plant resembles *P. canadensis*, *Cinquefoil*, perennial, 25–30 Cm. (10–12') high, green or reddish leaves, trifoliate; leaflets cuneate; flowers yellow; fruit achenes, reniform. Rhizome 5 Cm. (2') long, 12 Mm. ($\frac{1}{2}$ ') thick, tuberculate, brownish-red; bark thin, wood-wedges small, distant; pith large, inodorous, astringent; contains tannin 25 p. c., red coloring matter (tormentil-red),

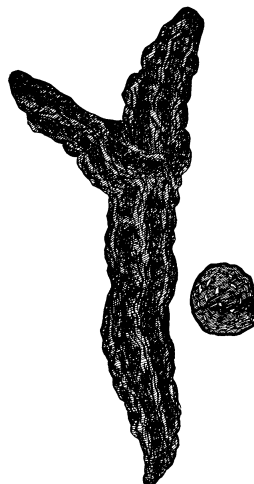


FIG. 165.—*Potentilla Tormentilla*: rhizome and transverse section.



FIG. 166.—*Porteranthus stipulatus*.



FIG. 167.—*Porteranthus trifolius*: rootlets, natural size.

kinovic acid, ellagic acid. Astringent, tonic like kino and catechu; diarrhea, dysentery, spongy gums (gargle), ulcers, gleet; decoction, infusion. Dose, gr. 10–30 (.6–2 Gm.).

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9. *Spiræ'a tomento'sa*, *Hardhack*.—The root, U.S.P. 1820–1870; N. America; shrub, .6–1 M. (2–3°) high, stem ferruginous, tomentous, leaves dark green, but rusty-white beneath; flowers purple; fruit 1-seeded pod; root consists of brown, bitter, astringent bark, and hard, white, tasteless wood; contains tannin, bitter principle, volatile oil. Astringent, tonic; diarrhea, cholera infantum, hemorrhages, gonorrhea, ulcers, etc.; infusion, decoction, extract. Dose, ʒss–1 (2–4 Gm.).

10. *Porteran'thus stipula'tus* (*Gille'nia stipula'cea*), *Indian Physic*, and *P. trifolia'tus* (*G. trifolia'ta*), *American Ipecac*.—The root, U.S.P. 1820–1870; United States; shrubs .6–1 M. (2–3°) high, stems reddish-brown, leaves trifoliate; leaflets 5–10 Cm. (2–4') long, pubescent; flowers white, pink; root (rhizome) 12–25 Mm. ($\frac{1}{2}$ –1'), thick, with thin bark and many fissured rootlets, 3–6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') thick, bitter; contains gillenin, resin, tannin. Emetic (substitute for ipecac), purgative, tonic; infusion, decoction, tincture; very popular with North American Indians. Dose, emetic, gr. 15–30 (1–2 Gm.); tonic, gr. 2–5 (.13–.3 Gm.).

30. DRUPACEÆ. Plum Family.

Dru-pa'se-e. L. *Drup-a* + aceæ, fr. Gr. *δρῦς*, tree, + *πέπτειν*, ripen, *δρυνεπής*, ripened on the tree—*i. e.*, the stone fruit. Trees, shrubs. Distinguished by bark and seeds containing hydrocyanic acid (poisonous), the former exuding gum, bitter; calyx 5-lobed, campanulate; petals 5, on calyx, stamens many; pistil 1, ovary 1-celled, 2-ovuled; fruit drupe; temperate climates; tonic, astringent, sedative, nutritious, lumber.

Genera: 1. *Prunus*. 2. *Amygdalus*.

PRUNUS VIRGINIANA. WILD CHERRY, U.S.P.

Prunus serotina, Ehrhart. { The stem-bark collected in autumn and carefully dried. Borke (ross—sloughing dead tissues), if present, should be removed.

Habitat. N. America (Can. to Fla., to Minn., Neb., Kan., La., to Texas), in woods.

Syn. Prun. Virg., Wild Black Cherry Bark, Cabinet (Rum, Whisky, Black-choke, Wild) Cherry; Br. Pruni Virginianæ Cortex, Virginian Prune Bark; Fr. Écorce de Cérissier de Virginie; Ger. Wildkirschenrinde.

Prunus. L. fr. *πρῦνη*, a plum tree; *prunum*, a plum—*i. e.*, classic name.

Se-rot'i-na. L. *serotinus*, fr. *serus*, late—*i. e.*, the latest of the genus to bloom and fruit.

Vir-gin-i-a'na. L. of, or belonging to Virginia—*i. e.*, Virginian.

PLANT.—Large tree 9–24 M. (30–80°) high; trunk regular, straight, with blackish, rugged outside bark, that of young branches smooth, red or purplish; leaves 5–12.5 Cm. (2–5') long, oval, petiolate, serrate, teeth glandular, glabrous, shining, bright green, with 2 small glands on the margin at the base; flowers May–June, appearing after the leaves,

small, white, racemes; fruit August, drupe, size of a pea, purplish-black, pulpy, sweet, acidulous, slightly astringent and bitter—bitter cherries; seed subglobular bitter almond flavor, containing bland, yellowish-green fixed oil 25 p. c. BARK, usually in transversely curved pieces, 2.5–8 Cm. ($1-3\frac{1}{5}'$) long, 12–25 Mm. ($\frac{1}{2}-1'$) broad, .5–8 Mm. ($\frac{1}{50}-\frac{1}{3}'$) thick; outer surface (rossed bark) light brown, greenish-brown, smooth, except numerous lenticel-scars (unrossed bark), reddish-brown, glossy, smooth, with light colored, transversely elongated lenticels, roughened, flaky with gray lichens; inner surface light brown, with delicate, reticulate striations, numerous minute fissures; fracture short, granular; odor distinct, resembling bitter almond when macerated in water; taste astringent, aromatic, agreeable bitter. POWDER, light brown—fragments of yellow-brown cork, stone cells, few bast-fibers, not greatly elongated, frequently accompanied by crystal-bearing fibers, calcium oxalate prisms, rosette aggregates, starch grains .002–.015 Mm. ($\frac{1}{12500}-\frac{1}{1665}'$) broad. Young, thin bark best, and that from very large or small branches should be rejected. Should be kept dark, in tightly-closed containers. Solvents: hot or cold water. Dose, $\overline{5}$ ss–1 (2–4 Gm.).

ADULTERATIONS.—Unrossed bark, that of old stems, also that of choke cherry, which closely resembles the official, but as a rule is either thinner or thicker, and breaks with a very tough fracture like slippery elm.

Commercial.—The Latin official name, from its long usage, has been retained, although misleading; *Prunus virginiana* was given early by Linnæus to Choke Cherry, a shrub 2.5–3 M. (8–10°) high, having more sharply-toothed leaves, shorter racemes, and astringent, dark red, crimson fruit, size of wild cherry. It has received various names at different times, as *Prunus ru'bra*, *P. obova'ta*, *P. virginiana*, *P. serotina*, *Cerasus serotina*, *C. virginiana*. The true official *Prunus serotina* grows in fertile soil in fields, woods, along fences, seldom in clusters; wood is valuable for furniture, being hard, red, fine-grained, and easily polished. Bark after collection is (rossed) deprived of outside layer (periderm or ross—cork and parenchymatous cells), exposing green phelloderm, and then dried; while that from all portions of the tree is used, that from the root is strongest, yet it all soon deteriorates, consequently only the fresh-dried should be employed; the average bark collected in April yields most starch, but least tannin, and hydrocyanic acid—.0478 p. c.; in June—.0956 p. c.; in Oct.—.1436 p. c. or $\frac{1}{7}$ gr. (.009 Gm.) from 100 gr. (6.5 Gm.) bark, which equals 7–8 m (.5 cc.) of 2 p. c. acid; some bark reverse these seasonal percentages; young bark may yield of acid .183–.250 p. c., old bark .159–.335 p. c.



FIG. 168.—*Prunus serotina*.

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CONSTITUENTS.—Amygdalin, Emulsin, Bitter principle, tannin 2–4.5 p. c., gallic acid, resin, starch, (volatile oil, hydrocyanic acid, benzoic acid from oxidation of benzaldehyde?).

Amygdalin.—Cyanogenetic glucoside, similar to laurocerasin (prunlaurasin) obtained by the action of alcohol; it is bitter, non-crystalline, and not precipitated by ether, hence in this differs from that in bitter almond.

Emulsin.—Enzyme or ferment, identical with emulsin or synaptase, extracted by water; white powder when pure, and by its action on amygdalin, in the presence of water, develops hydrocyanic acid and the volatile oil of bitter almond, neither of which, as such, existed previously in the bark. These two are obtained also by distilling the seed with water, when they come over more or less mixed. The poisonous property of the oil depends largely upon the amount of acid present, and when freed of this, the oil becomes a bland, colorless liquid resembling that from bitter almond. Some think the ferment neither emulsin nor synaptase, but a closely analogous compound.

Bitter Principle.—Obtained by mixing soft aqueous extract with alcohol, shaking with milk of lime, evaporating filtrate, boiling residue with alcohol, evaporating, getting brown, bitter, gelatinous mass, which is insoluble in ether, soluble in alcohol, brownish-red with sulphuric acid.

PREPARATIONS.—1. *Syrupus Pruni Virginianæ*. Syrup of Wild Cherry. (Syn., Syr. Prun. Virg.; Br. Syrup of Virginian Prune; Fr. Sirop d'Écorce de Cerisier; Ger. Wildkirschenrindensirup.)

Manufacture: 15 p. c. Mix glycerin 5 cc. with water 20, moisten wild cherry bark 15 Gm. with 10 cc. of mixture, pack in percolator, add remainder of mixture, and enough water to saturate and leave stratum above, macerate for 24 hours, percolate with water into sucrose 80 Gm. q. s. 100 cc., dissolve by agitation without heat. Should be kept cool, in non-metallic, tightly-closed containers, as it rapidly loses hydrocyanic acid under favorable conditions. Dose, ʒj–4 (4–15 cc.); mainly for flavoring.

2. *Fluidextractum Pruni Virginianæ*, N.F., moisten, 100 Gm., with glycerin 20 cc. + water 40, pack, macerate 24 hours; percolate with alcohol 25 cc. + water 15, finally with 25 p. c. alcohol q. s., 100 cc. Dose, ʒss–1 (2–4 cc.): Prep.: 1. *Elixir Taraxaci Compositum*, N.F., 3.5 p. c.

3. *Syrupus Pini Albæ Compositus*, N.F., 8.5 p. c.

Unoff. Preps.: *Infusion*, 4 p. c., dose, ʒss–2 (15–60 cc.). *Tinctura Pruni Virginianæ* (Br.), 20 p. c. + alcohol 62.5 p. c., finally add glycerin 10 p. c., dose, ʒss–1 (2–4 cc.).

PROPERTIES.—Sedative, pectoral, aromatic bitter tonic, astringent; increases appetite, digestion. Volatile oil—local stimulant on alimentary canal like cascarrilla, serpentaria, etc. Hydrocyanic acid—sedative, nervine, large doses decrease heart action. Tannin is astringent.

USES.—Consumption, cough, bronchitis, scrofula, heart palpitation, stomach atony, dyspepsia, hectic fever, debility; cold infusion in ophthalmia. It is much inferior to cinchona in intermittents.

Allied Plants:

1. *Prunus domes'tica*, *Prunum*, *Prune*, *N.F.*—The partly dried ripe fruit, with 30–35 p. c. of natural moisture when used for pharmaceutical purposes; W. Asia, cult. in S. France, California. Tree, 4.5–6 M. (15–20°) high; leaves 5 Cm. (2') long, dentate, ovate, pubescent beneath; flowers whitish. Fruit (drupe), 3–4 Cm. (1½–1¾') long, ellipsoidal, brownish-black, shriveled, sarcocarp sweet, acidulous, putamen hard, smooth or ridged; seed almond-shaped, but smaller, bitter almond taste. Of the several varieties, the St. Catherine and Greengage are finer as a dessert, and Prune de St. Julian (France) as a medicine; contains sugar 12–25 p. c., pectin, albumin, malic acid, tartaric acid, salts; seed—fixed oil, amygdalin, emulsin. Nutritive, laxative, demulcent; constipation—skins indigestible; fermented and distilled for brandy, which contains alcohol 40 p. c. Should be kept cool, in air-tight containers. Dose, *ad libitum*; 1. *Confectio Sennæ*. 7 p. c.



FIG. 169.—*Prunus Laurocerasus*.

2. *P. Laurocer'asus*, *Cherry Laurel*, *Laurocerasi Folia* (Br.).—Fresh leaves; W. Asia. Ornamental shrub or tree, 3–6 M. (9–20°) high; leaves 15 Cm. (6') long, obovate, oblong, serrate, coriaceous; bitter almond odor; aromatic, bitter taste; contains prulaurasin, $C_{40}H_{67}O_{30}N$ (similar to amygdalin), emulsin, tannin, sugar, fat, wax, phyllic acid (crystalline, occurring also in leaves of almond, apple, maple, peach); yields hydrocyanic acid .12 p. c., and oil of bitter almond (benzaldehyde) .5 p. c., in which spring leaves are richest. Sedative, narcotic; used to make cherry laurel water (*Aqua Laurocerasi*, Br.) by distilling 400 cc. from leaves 320 Gm. + water 1000 cc. Dose, ʒss–2 (2–8 cc.).

AMYGDALA AMARA. BITTER ALMOND.

Oleum Amygdalæ Amaræ. Oil of Bitter Almond, U.S.P.

<p>Amygdalus communis (var. amara), <i>Linne</i>, or other kernels containing amygdalin.</p>	{	<p>A volatile oil from the dried ripe kernels (deprived of fixed oil) obtained by macera- tion with water and subsequent distilla- tion with steam.</p>
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Habitat. W. Asia, Persia, Syria, Barbary, Morocco; naturalized in Mediterranean Basin; cultivated in Europe; unsuccessfully in United States.

Syn. Greek Nuts; Ol. Amygd. Amar., Bitter Almond Oil, Oleum Amygdalarum (Amararum) Æthereum; Fr. Amande amère; Essence d'Amande amère; Ger. Amygdalæ Amaræ, Bittere Mandeln; Bittermandelöl.

A-myg'da-lus. L. fr. Gr. *αμβροσω*, to lacerate—*i. e.*, its fissured shell.

Com-mu'nis. L. common, general—*i. e.*, the ordinary or common species.

A-ma'ra. L. *amarus*, bitter—*i. e.*, the fruit.

PLANT.—Small tree, 5–6 M. (15–20°) high, bark purplish; leaves bright green; flowers pale pink or white; fruit drupe, ovate, 5 Cm. (2') long, 2.5 Cm. (1') broad, sarcocarp green, leathery, splitting into two halves when ripe, and falling from the stone. This remaining stone is the commercial almond, and may be sold as such or may be bleached by sulphur dioxide, thereby also killing any attached insects. By cracking off hard shell the kernel, or, properly, the seed, is left, which, when deprived of papery endocarp by hot water, constitutes the more desirable blanched almond. Seed (almond), 2.5 Cm. (1') long, oblong-lanceolate, flattish; testa cinnamon-brown, thin, finely downy, marked by about 16 lines radiating from broad scar at blunt end; embryo straight, white, oily, with 2 plano-convex cotyledons; taste bitter, oleaginous; triturated with water yields milk-white emulsion, emitting odor of hydrocyanic acid.

ADULTERATIONS.—SEED: Sweet almonds chiefly (Valencia) and peach seed—both cheaper; the bitter differs from the sweet in flavor, odor with water, containing amygdalin, being shorter, broader, thinner, less plump and darker, and from peach seed by being much larger; OIL: Alcohol, oil of turpentine, nitrobenzene, impure benzaldehyde from toluene (chlorine), etc.

Commercial.—There are several varieties of these (*French, Sicily, Barbary*, in the order of value), being exported chiefly from Mogador, in Morocco.

CONSTITUENTS.—KERNELS: Fixed oil 46 p. c., Amygdalin 1–3 p. c., Emulsin, mucilage 3 p. c., proteins (myosin, vitellin, conglutin) 24–30 p. c., precipitated by acetic acid, sugar 6 p. c., ash 3.5 p. c.—K, Ca, Mg—phosphates; yield volatile oil 1 p. c.; hydrocyanic acid .25 p. c.

Amygdalin, $C_{20}H_{27}O_{11}N$.—A crystalline cyanogenetic glucoside obtained from expressed cake (deprived of fixed oil) by boiling in alcohol, distilling to syrup, adding water and yeast, and then allowing fermentation; after this, filter, evaporate to syrup, add alcohol to precipitate amygdalin and gum, from which boiling alcohol takes up the former, depositing it upon cooling.

Emulsin (*symaptase*).—A ferment (enzyme) coagulated by heat, precipitated by alcohol, but not by acetic acid, and in the presence of water, acts upon amygdalin, forming glucose, $C_6H_{12}O_6$, hydrocyanic acid, HCN (1 part being formed from 17 of amygdalin), and benzaldehyde, C_7H_6O —oil of bitter almond 1–4 p. c.; $C_{20}H_{27}O_{11}N + 2H_2O = 2(C_6H_{12}O_6) + HCN + C_7H_6O$.

Oleum Amygdalæ Amaræ. Oil of Bitter Almond.—This volatile oil, like volatile oil of mustard, oil of gaultheria, and methyl salicylate,

does not preëxist in the kernels (seeds), but results from macerating with water for 12 hours the expressed cake of bitter almonds, wherein amygdalin undergoes fermentation, then distilling the oil formed by passing steam through the mixture; kernels of the peach (*P. Persica*) and apricot (*P. armeni'aca*) yield much of the commercial oil, which may also be prepared synthetically from toluene (see benzaldehydum, page 278). It is a clear, colorless, yellowish, strongly refractive liquid, characteristic odor and taste of benzaldehyde, soluble in

alcohol, ether, slightly in water, forms clear solution in 70 p. c. alcohol (2); sp. gr. 1.038–1.060, optically inactive or dextrorotatory; at first neutral, but becomes acid from the formation of benzoic acid; yields not less than 85 p. c. of benzaldehyde, C_6H_5CHO , and 2–4 p. c. of hydrocyanic acid, HCN (sometimes as much as 8–10 p. c.); when freed from

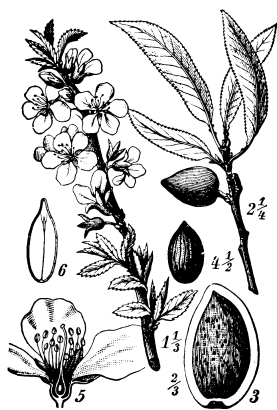


FIG. 170.—*Amygdalus communis*: 1, flowering twig; 2, twig, with fruit; 3, fruit hull cracked off; 4, seed deprived of hull; 5, vertical section of flower; 6, longitudinal section of seed.

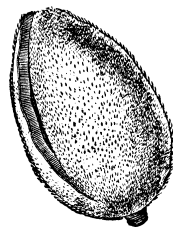


FIG. 171.—*Amygdalus communis*: fruit in the act of opening.

this latter it is less poisonous, but even then has a marked physiological action on the nervous system. *Impurities*: Nitrobenzene, chlorinated products, heavy metals. The label must indicate definitely its specific source, as this is intended for medicinal use, and not for flavoring foods. Should be kept dark, cool, in small, well-stoppered, completely filled, amber-colored bottles, and when showing crystals (benzoic acid) must not be dispensed. Dose, $\mathfrak{m}\frac{1}{4}$ –1 (.016–.06 cc.).

PREPARATIONS.—OIL: 1. *Elixir Amygdalæ Compositum*, N.F., $\frac{1}{20}$ p. c.: Preps.: 1. *Elixir Bromidorum Trium*, N.F., q. s. 2. *Emulsa*—as flavoring when preferred. 3. *Spiritus Amygdalæ Amara*, N.F., 1 p. c., Dose, $\mathfrak{m}\text{xv}$ –30 (1–2 cc.). Preps.: 1. *Elixir Anisi*, N.F., 1.2 p. c. 2. *Elixir Terpinæ Hydratis*, N.F., $\frac{1}{2}$ p. c.

Unoff. Preps.: Water (oil $\frac{1}{10}$ p. c.), $\mathfrak{z}\text{j}$ –3 (4–12 cc.). Syrup (spt. of bitter almond 1, orange flower water 10, syrup q. s. 100), $\mathfrak{z}\text{ij}$ –4 (8–15 cc.).

PROPERTIES.—Demulcent, nutrient, sedative; often produces urticaria.

USES.—Coughs, pulmonary troubles, flavoring.

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Poisoning: Here have hydrocyanic acid symptoms; hence give emetics to induce vomiting, galvanism, brandy, whisky, ammonia to nostrils, etc.

Allied Products:

1. **Benzaldehydum. Benzaldehyde**, C_6H_5CHO , *U.S.P.*—(Syn., Benzald., Oleum Amygdalarum Æthereum (Artificiale)-sine Acide Prusico, Synthetic Oil of Bitter Almond; Fr. Aldehyde benzoïque; Ger. Kunstliches Bittermandelöl.) An aldehyde produced synthetically or from oil of bitter almond, containing not less than 85 p. c. of benzaldehyde.

Manufacture: 1. Shake oil of bitter almond (peach, apricot, etc.) with concentrated solution of acid sodium sulphite (3) to form crystalline sodium benzalhydroxysulphonate, wash with cold alcohol, treat with strong sodium carbonate solution, rectify by distillation with steam. 2. Treat boiling toluene, C_7H_8 , with chlorine, heat resulting benzyl chloride with barium nitrate and water, while passing carbon dioxide through the mixture, the benzyl nitrate formed decomposes into benzaldehyde and oxides of nitrogen. It is a colorless, yellowish, refractive liquid, bitter almond-like odor, burning aromatic taste, soluble in water (350), miscible with alcohol, ether, fixed or volatile oils; sp. gr. 1.045; differs from oil of bitter almond in having no hydrocyanic acid. *Tests:* 1. Shake .5 cc. with distilled water 5 cc., + sodium hydroxide T. S. .5 cc., + ferrous sulphate T. S. .1 cc., warm gently, + excess of hydrochloric acid—no greenish-blue color or blue precipitate within 15 minutes (abs. of hydrocyanic acid). 2. Dissolve 1 cc. in alcohol (20), + distilled water until turbid, evolve hydrogen 1 hour by adding zinc and diluted sulphuric acid, filter, evaporate to 20 cc.; of this boil 10 cc. + a drop of potassium dichromate T. S.—not violet (abs. of nitrobenzene). *Impurities:* Hydrocyanic acid, chlorinated compounds, nitrobenzene. Should be kept dark, in small, well-stoppered bottles. Dose, \mathfrak{m}_4^1 –1 (.016–.06 cc.).

PROPERTIES AND USES.—Similar to oil of bitter almond; largely as a flavoring agent, having the advantage of the oil in being devoid of hydrocyanic acid, and not being poisonous except in large quantities.

2. **Nitrobenzene, Nitrobenzol, Oil of Mirbane.**—False artificial oil of bitter almond is obtained by acting on benzene with nitric acid. It is very poisonous, has the true bitter almond oil odor, owing to which substitution has been made with fatal results; should not be taken internally—used for flavoring soaps, making aniline, etc.

AMYGDALA DULCIS. SWEET ALMOND.

Oleum Amygdalæ Expressum. Expressed Oil of Almond, U.S.P.

Amygdalus communis { A fixed oil obtained from the kernels of several varieties.
(var. **dulcis**), *Linné*.

Habitat. W. Asia, Persia, Syria, Barbary, Morocco; naturalized in Mediterranean Basin; cultivated in Europe, S. California.

Syn. Jordon Almond, Malaga, Paper-shell, Greek Nuts; Fr. Amande(s) douce(s); Ger. Amygdalæ dulces, Susse Mandeln; Ol. Amygd. Exp., Oil of Sweet Almond, Oleum Amygdalæ Dulcis; Br. Oleum Amygdalæ, Almond Oil; Fr. Huile d'Amande (douce); Ger. Oleum Amygdalorum, Mandelöl.

Dulcis. L. sweet—*i. e.*, the fruit without bitterness.

PLANT.—Small tree, 5–6 M. (15–20°) high, bark purplish; leaves bright green; flowers pale pink or white; fruit drupe, ovate, 5 Cm. (2') long, 2.5 Cm. (1') broad, sarcocarp green, leathery, splitting into two halves when ripe, and falling from the stone. This remaining stone is the commercial almond, and may be sold as such or may be bleached by sulphur dioxide, thereby also killing any attached insects. By cracking off hard shell the kernel, or, properly, the seed, is left, which, when deprived of papery endocarp by hot water, constitutes the more desirable blanched almond. Seed (almond), 17–25 Mm. ($\frac{3}{4}$ –1') long, 10–13 Mm. ($\frac{3}{8}$ – $\frac{1}{2}$ ') broad, 4–7 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') thick, oblong-lanceolate; seed-coat light brown with numerous parallel veins, thin, easily removed by soaking in water; embryo straight, white, 2 plano-convex cotyledons; taste bland, sweet; triturated with water—milk-white, non-acid emulsion having no odor of benzaldehyde, or hydrocyanic acid (abs. of bitter almond). Powder, creamy-white—numerous small and large oil globules, crystalloids, globoids, fragments of parenchyma of endosperm and seed-coat, aleurone grains, spiral tracheæ; no starch grains.

Commercial.—Of these there are several varieties (*Jordan, Valencia, Sicily, Barbary*, in the order of value), imported chiefly from Spain, S. France, via Marseilles or Bordeaux (*soft-shelled*; var. *fragilis*), and Malaga (*Jordan* or *long*) or Valencia (*hard-shelled*), being larger and longer than the var. *amara*, with more convex sides. The *Jordan* only, owing to easy recognition, are used in the Br. P. To preserve almonds, should keep dry, thereby preventing decomposition of amygdalin and fixed oil; when rancid the embryo has changed into gum bassorin, which renders them unfit for medicinal use.

CONSTITUENTS.—Fixed oil 56 p. c., Emulsin (mucilage 3 p. c., sugar 6 p. c., proteins (myosin, vitellin, and conglutin) 24–30 p. c., precipitated by acetic acid, ash 3–5 p. c.—K, Ca, Mg—phosphates); the *testa* of both varieties contain tannin.

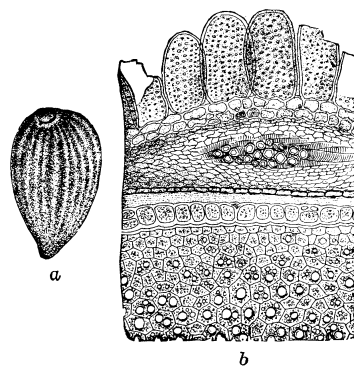


FIG. 172.—*Amygdalus communis*: a, seed-kernel; b, section through seed-coats and portion of cotyledon.

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Oleum Amygdalæ Expressum. Expressed Oil of Almond.—This fixed oil is obtained from both varieties of almonds (sweet and bitter) by grinding or bruising in an iron or stone mortar the clean and perfect kernels, enclosing mass in canvas bags and subjecting them to hydraulic pressure of 350 atmospheres between polished steel plates slightly heated (30° C.; 86° F.); the expressed turbid oil is set aside in a cool place, decanted from sediment and filtered; most of the commercial oil is from the bitter almonds prior to preparing the volatile oil. It is a clear, pale straw-colored, colorless, oily liquid, almost odorless, bland taste; slightly soluble in alcohol, miscible with ether, chloroform, benzene, petroleum benzin; sp. gr. 0.912; contains triolein 75–85 p. c., tripalmitin, trilinolein. *Tests:* 1. Clear at –10° C.; 14° F., congeals at –20° C.; –4° F. (abs. of olive, cottonseed, sesame, lard oils, congealing at –5° C.; 22° F., apricot and peach oils remaining fluid at –20° C.; –4° F.). 2. Shake vigorously oil (2), fuming nitric acid (1), distilled water (1)—the mixture is not more than colored (abs. of peach and apricot oils—red color, sesame and cottonseed oils—brown color). Should be kept cool, in well-closed containers. Dose, ʒj–2 (30–60 cc.).

ADULTERATIONS.—Olive, arachis (ground-nut), lard, cottonseed, sesame, poppy, apricot and peach oils; apricot kernels yield 25–38 p. c. of oil, which, with peach oil, is substituted often (in part or entire) for the pure article.

PREPARATIONS.—1. *Unguentum Aquæ Rosæ*, 56 p. c. 2. *Emulsum Petrolati*, N.F., 22.5 p. c. 3. *Oleum Phosphoratum*, N. F., 90 p. c. 4. *Unguentum Veratrinæ*, N.F., 6 p. c.

Unoff. Preps.: *Emulsion* (seed 6 p. c., + acacia 1, sucrose 3, water q. s. 100), ʒij–4 (8–15 cc.). *Pulvis Amygdalæ Compositus* (Br.)—seed 60 parts, + sucrose 30, acacia 10.

PROPERTIES.—Demulcent, nutrient, laxative.

USES.—The meal of the expressed cake as a toilet powder, and since it contains no starch it may readily be made into bread, cake, puddings, etc., which is excellent for diabetics. Seed very popular as a confection. Expressed oil, employed like olive oil, also for pulmonary trouble.

Allied Plants:

1. *Amygdalus* (*Prunus*) *Per'sica*, *Peach*.—Persia, cultivated largely in the United States, etc. Fruit edible, abounding in sugar, juice ferments, and upon distillation yields peach brandy; kernels poisonous from yielding HCN, often substituted for bitter almonds, also contain fixed oil resembling that of almond, for which it is an adulterant; leaves mild sedative in doses of gr. 15–30 (1–2 Gm.), in infusion.

2. *Cydo'nia* (*Py'rus*) *Cydonia*, *Quince*.—Pomaceæ. The seed; U.S.P. 1850–1880; W. Asia. Tree 2.5–6 M. (8–20°) high, with crooked, straggling branches; leaves like pear leaves; flowers white or purplish; fruit pear-shaped; seed 6 Mm. ($\frac{1}{4}$ ') long, ovate, triangular, brown, covered with whitish, mucilaginous, epithelium causing seed of each cell to adhere; swell with water, forming heavy mucilage; 2 cotyledons,

white, oily, bitter-almond taste; very similar to apple seed. Contain mucilage (cydonin) 20 p. c. (not precipitated by borax or potassium silicate, soluble in cold and hot water), fixed oil, proteins; used as demulcent, protective; fruit astringent. *Mucilago Cydonii* (1 part + water 50), U.S.P. 1880; may use rose water, or camphor water—externally.

3. *Ma'hus* (*Pyrus*) *Malus*, *Apple*; *Succus Pomorum*, *Fresh Apple Juice*, N.F.—The freshly expressed juice of sound, ripe, sour apples, the fruit of cultivated varieties. Plant resembles quince; fruit edible, laxative; bark tonic, febrifuge. Dose, gr. 15–60 (1–4 Gm.); 1. *Extractum Ferri Pomatum*, 100 p. c., dose, gr. 10–30 (.6–2 Gm.): Prep.: 1. *Tinctura Ferri Pomata*, 10 p. c., dose, ʒj–2 (4–8 cc.).



FIG. 173.—*Cydonia* (*Pyrus*) *Cydonia*.



FIG. 174.—*Malus* (*Pyrus*) *Malus*.

31. MIMOSACEÆ. Mimosa Family.

Mi-mo-sa'se-e. L. *Mimos-a* + aceæ, fr. L. *mimus*, Gr. *μῖμος*, a mimic—i. e., the leaves often mimic or imitate animal sensibility, moving by slight impulse, partly closing when touched, etc. Herbs, shrubs, trees. Distinguished by leaves compound, 2–3 pinnate (sometimes phyllodia); calyx 3–6-toothed or lobed, corolla 3–6's, stamens distinct or monadelphous, ovary 1-celled, ovules several; fruit, legume; tropics, temperate climates; tonic, astringent, demulcent, nutritive, dye.

Genus: 1. **Acacia.**

ACACIA. ACACIA, U.S.P.

<p>Acacia Senegal. Willdenow, or some other species.</p>	{	<p>The dried, gummy exudation from the stems and branches, yielding not more than 1 p. c. of water- insoluble residue, nor 15 p. c. of moisture.</p>
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Habitat. E. and W. Africa, Senegal, Kordofan, Egypt, Abyssinia, India, Nubia, Upper Nile.

Syn. Acac., Gum Arabic, Gum Senegal, Egyptian Thorn, Indian Gum Tree, Babla(c)h Pods, Acacia bambolah, Gummi Africanum or Mimoseæ; Br. Acaciæ Gummi, Gum Acacia; Fr. Gomme arabique du Sénégal; Ger. Gummi arabicum, Arabisches Gummi.

A-ca'cia. L. fr. Gr. *ἀκασία*, a thorny Egyptian tree, fr. *ἀκή*, a point—*i. e.*, tree studded with thorns.

Sen'e-gal. L. belonging to Senegal, a country and river in W. Africa—*i. e.*, the plant's original and present habitat.

Ar'abic—misnomer, as Arabia produces little and exports none.

PLANT.—Shrubby tree, 6 M. (20°) high; stem tortuous with terete branches, nodes with 3 short, black-tipped spines subtending the leaves; bark smooth, grayish-brown; leaves alternate, bipinnate, paripinnate, 2.5–4 Cm. (1–1½') long; pinnæ 3–5 pairs; leaflets sessile, 10–20 pairs, grayish-green, 4 Mm. (¼') long; flowers yellow, spikes; fruit (pod), loment, compressed, smooth, pale, 7.5–10 Cm. (3–4') long, 18 Mm. (¾') broad, 2–6-seeded. **GUM** (acacia), in spheroidal tears, angular fragments up to 32 Mm. (1½') in diameter, yellowish-white, light-amber, translucent, brittle; fracture glassy, sometimes iridescent; almost odorless; taste mucilaginous; insoluble in alcohol, slowly and almost completely soluble in water (2), forming mucilaginous liquid of slight, characteristic odor and acid reaction. **POWDER**, whitish—in angular microscopic fragments with but slight traces of starch or vegetable tissue. *Tests:* 1. Aqueous solution (1 in 10) 10 cc., + basic lead acetate T. S. (.2)—gelatinous precipitate. 2. With iodine T. S.—not blue (abs. of starch), nor red (abs. of dextrin). 3. Aqueous solution (2 p. c.) 10 cc. + ferric chloride T. S. .1 cc.—no blackish coloration or blackish precipitate (abs. of tannin-bearing gums). Dose, *ad libitum*.

ADULTERATIONS.—**GUM:** Inferior, dark colored, opaque and insoluble gums, bdellium, rock salt, ligneous and earthy substances, sand, dirt, dextrin in lumps; **POWDER:** Flour, rice flour, starch, dextrin—all recognized by solubility, viscosity, the microscope, and iodine test. The gum from quince seed, flaxseed, Irish moss, etc., often used as a substitute.

Commercial.—Plants grow associated with little other vegetation in sandy soil, deserts, forming entire forests. Gum, a degenerative product, the result of "gummosis"—transformation of cell contents (cellulose) in the cambium, cortex, and adjacent parenchyma, a process favored in dry hot seasons and unhealthy trees—exudes as a thick juice through fissures caused by dry winds after the rainy season, or artificial incisions, and sooner or later, whereby depends color, hardens on the bark similar to our cherry, apple, or plum gum. It is collected Oct.–Dec., some in March, by the Moors and negroes, who in caravans enter the acacia forests and gather it in leather sacks, detaching adherent lumps with wooden axes and picking up fallen pieces from the ground. It enters market in bags, boxes, casks, skins, mostly from Egypt, via Cairo, Alexandria, Trieste, where it is received as unas-

sorted acacia, "acacia in sorts"—the aggregated product of various species, assorted into "first picked," "second picked," etc., down to sorts (unworthy of assorting)—there being recognized at Trieste thirty-two grades. Acacia is known by the natives as *Verek* (Senegal) or *Hashabi* (E. Africa), the best being white, opaque, and chiefly from *A. Senegal* (*Ve'rek*) and *A. arabica* (*vera*), which grow promiscuously with other species and contribute the several varieties: 1, *Turkey* (*Arabian, Egyptian*), which includes (a) Kordofan (*A. Senegal*, *A. Verek*), from west of White Nile, once constituting the bulk of the superior gum, (b) Sennaar (*A. fis'tula*, *A. stenocar'pa*), from east of

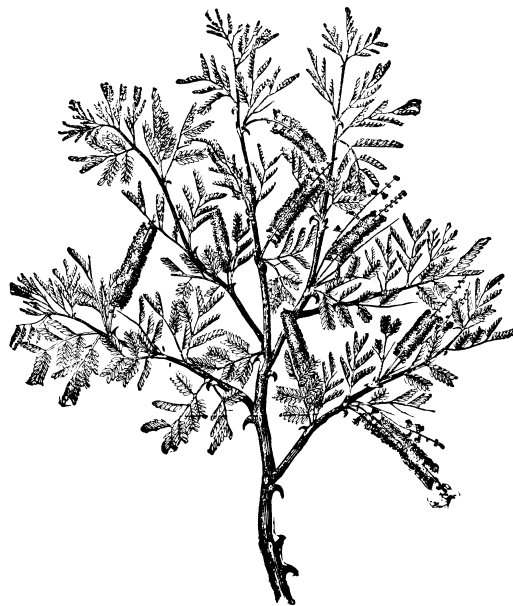


FIG. 175.—*Acacia Senegal*.

White Nile, inferior, mucilage sours quickly, (c) Suakin (Talca—*A. stenocarpa*, *A. Se'yal*), from near Red Sea, mixture of white and brown pieces, very brittle, usually semi-pulverulent, only soluble with alkali; 2, *Senegal* (*A. Senegal*), from north of Senegal River, W. Africa, being controlled by France and shipped to Bordeaux; larger than Turkey gum, some nodules the size of a pigeon egg, less brittle, more yellow or reddish, with fewer cracks and more conchoidal fracture, not amber-yellow when heated with potassium hydroxide, as are Turkey gum and dextrin solutions; 3, *Barbary* (*Morocco, Mogador*—*A. nilot'ica*, *A. arabica*), collected July–August, consisting of two kinds that enter Mogador, one from Morocco (resembling Turkey), the other from Tim-

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buctoo (resembling Senegal), both in more or less brownish, roundish tears, brittle, soluble in water; 4, *India* (*Persian*—*A. arabica*, +), from Somali districts, E. Africa, conveyed by Arab vessels to Bombay; resembles somewhat Turkey and Senegal gums, however, much mixed and often containing Bassora gum or allied substances (insoluble, swelling and softening with water into viscid mass), also resinous products resembling turpentine; deprived of these the variety is well suited for general use.

Gums are produced also by other *Acacia* species in Morocco, Cape Colony, Australia (Wattle gum), Brazil (Para, Angico gum), etc.; Mesquite gum (*Prosopis juliflora*), Texas, California, New Mexico, Chile, resembles acacia, but is yellow, brown, and not precipitated by lead subacetate, ferric chloride, borax; also considerable gum from plants of different genera and family, darker color but resembling the official.

Powdered acacia occurs in two forms: 1, *Granulated (sanded)*, produced by heating the gum until deprived of 2 p. c. of moisture; 2, *Finely powdered (dusted)*, produced by heating the gum until deprived of 10 p. c. of moisture—a process rendering it more lumpy and less soluble in water.

CONSTITUENTS.—Arabic acid, $C_{12}H_{22}O_{11}$, combined with Ca, Mg, K—arabates; sugar (trace), moisture 14 p. c., ash 3–4 p. c.

Arabic Acid (*gummic acid, arabin*).—A glucoside obtained by adding alcohol to acidified (HCl) mucilage. After drying, it swells with water, but dissolves only upon the addition of an alkali, boiled with acids yields arabinose (arabin sugar, pectinose, pectin sugar), $C_5H_{10}O_5$, in prismatic crystals, sweet, but not directly fermentable, and possibly also galactose, granular and less sweet.

PREPARATIONS.—1. *Mucilago Acaciæ*. Mucilage of Acacia. (Syn., Mucil. Acac., Mucilage of Gum Arabic; Fr. Mucilage de Gomme; Ger. Mucilago Gummi arabici, Gummischleim.)

Manufacture: 35 p. c. Wash acacia 35 Gm. in a tared bottle (flask) with sufficient cold water, discard washings, drain, add warm distilled water, in which sodium benzoate .1 Gm. has been dissolved, q. s. 100 cc.; after corking, lay bottle on its side, rotating it occasionally, and when acacia dissolved, strain mucilage. Must be made frequently and not dispensed if sour or moldy. When cold or hot water employed alone acetic acid is formed from the acid calcium arabate, which may be neutralized by lime water (35 p. c.), or retarded by sodium benzoate ($\frac{1}{1000}$ p. c.), alcohol (6 p. c.), glycerin (10 p. c.), acetanilid (.4 p. c.), or chloroform (.5 p. c.). Dose, *ad libitum*.

2. *Emulsum Olei Morrhuæ*, 12.5 p. c. 3. *Emulsum Olei Terebinthinæ*, 5 p. c. 4. *Pilulæ Phosphori*, $\frac{1}{2}$ gr. (.03 Gm.). 5. *Pulvis Cretæ Compositus*, 20 p. c. 6. *Emulsum Olei Morrhuæ cum Hypophosphitibus*, N. F., 12.5 p. c. 7. *Emulsum Olei Ricini*, N. F., 9 p. c. 8. *Emulsum Petrolati*, N. F., 12.5 p. c. 9. *Mistura Copaibæ*, N. F., 3.5 p. c. 10. *Mistura Copaibæ et Opii*, N. F., 6.5 p. c. 11. *Pilulæ Ferri Iodidi*, N. F., $\frac{1}{6}$ gr. (.01 Gm.). 12. *Trochisci Eucalypti Gummi*, N. F., 2 gr. (.13 Gm.).

Unoff. Preps.: Syrup, 10 p c, + sucrose 80, distilled water q. s. 100. *Emulsions, Pills, Troches*, etc.

PROPERTIES.—Demulcent, emollient, protective, nutritive. Forms often the food of Hottentots and camels. By its viscosity sheaths inflamed surfaces; as a diluent, lessens acrimony of irritating medicines.

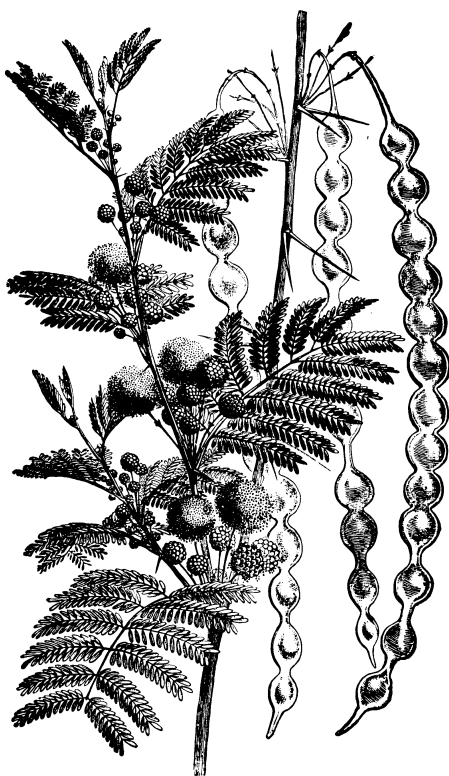


FIG. 176.—*Acacia arabica*.

USES.—Coughs, laryngitis, gastritis, typhoid fever, dysentery, diarrhea. Fine powder locally stops slight hemorrhage; thick mucilage protects burns, ulcers, etc. In pharmacy used to suspend insoluble substances in water—emulsifying oleoresins, fixed and volatile oils, for adhering pills, troches, etc.; in arts for giving luster to fabrics, silks, thickening colors, mordants, suspending iron tannate in ink, etc. The bark of tree for dyeing, tanning, as it contains tannic and gallic acids.

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Allied Plants:

1. *Acacia Cat'echu*, *Catechu*; *Catechu Nigrum* (Br.).—An extract prepared from the heart-wood, U.S.P. 1820–1890; India, Hindustan. Plant crooked, shrubby tree, 4.5–12 M. (15–40°) high, 15–45 Cm. (6–18') thick, bark brown, wood whitish and reddish, leaves paripinnate, pinnæ in 10–20 pairs, with a pair of hooked, brown prickles at each base, leaflets 20–30 pairs in each pinna, flowers yellow, fruit,

FIG. 177.—*Acacia Catechu*.

pod (loment), brown, flat, 5–12.5 Cm. (2–5') long, seed 3–10, brown, shining; extract (catechu) in irregular masses, dark brown, brittle, porous, fracture conchoidal, little glossy, inodorous, taste sweetish, astringent. It is prepared by removing bark and sapwood, and boiling in water, for about 12 hours, the reddish-black heart-wood, cut in chips, straining, evaporating, stirring frequently and vigorously to improve the product—over-boiling being injurious, as it converts catechin into

catechu-tannic acid; when of syrupy consistency it is cooled somewhat and poured into clay molds or on leaves, mats, etc., previously dusted with cow-dung ashes; by morning it is hard, brittle, when it is broken up into suitable pieces for market; contains catechu-tannic acid 35 p. c., catechin 13–34 p. c., quercetin, gum, extractive. There are several varieties: 1, Plano-convex (Cake); 2, Pegu; 3, Quadrangular (Cake), Bengal; 4, Ball, Bombay. *Adulterations*: Largely with leaves, mats, cloths, sticks, sand, dried blood, ashes, clay, starch, ferrous carbonate, sometimes to 65 p. c.; artificial variety made from roasted mahogany, walnut, etc. Astringent, tonic, similar to tannic acid—much more harsh than gambir, owing to which it is used chiefly for tanning, arts, etc.; diarrhea, leucorrhea, gonorrhea, chronic sore throat, relaxed uvula, spongy gums (mouth wash), hemorrhages, bronchitis. Dose, gr. 5–30 (.3–2 Gm.); compound tincture, 10 p. c. (diluted alcohol), dose, 5ss–2 (2–8 cc.); fluidextract; infusion. *A. arabica (vera)* and *A. decurrens*, bark (*Acacia Cortex*—Br.) rusty-brown, blackish, striated, spines and fruit long; contains tannin, mucilage: *Decoctum*, 6 p. c.; *A. gummifera*, *A. Ehrenbergia'na*, *A. Adanso'nia*, *A. tortilis*, *A. Fis'tula*, and several others give valuable gums. *A. Su'ma* differs from *A. Catechu* only in its white bark, more leaflets, shorter corolla, and stronger spines; S. India, E. Africa (forests), S. America once furnished most of the commercial catechu, and still some; the bark used in tanning. *A. arabica*, *Babul Bark*, India; furnishes good extract; the fruit contains tannin 22 p. c.

2. *Ar'eca Cat'echu*, *Areca* or *Betel Nut*.—Palmaceæ (see page 100). Palm tree cultivated in India. Extract made by evaporating decoction of the powdered nuts.

32. CÆSALPINIACEÆ. Senna Family.

Ses-al-pin'i-a'se-e. L. *Cæsalpin-us(-i)* + aceæ, after Andreas Cæsalpinus (1519–1603), a noted Italian botanist and physician. Trees, herbs, shrubs. Distinguished by leaves compound, bipinnate, stipulate, stems often prickly; flowers yellow, red, calyx 5's, petals 5, upper one enclosed by lateral ones in bud; fruit legume, dehiscent; tropics; astringent, cathartic, tonic, diuretic, dye.

Genera: 1. **Copaiba**. 2. **Cassia** (*Cathartocarpus*).

COPAIBA. COPAIBA, U.S.P.

Copaiba, Miller, }
one or more S. } An oleoresin.
American species. }

Habitat. Brazil (Venezuela, Colombia), Amazon valley, banks of the Orinoco River.

Syn. Copaib., Balsam of Copaiba, Copaiva, Balsam Capivi; Fr. Copahu, Oleo-résine (Baume) de Copahu; Ger. Balsamum Copaivæ, Copaivabalsam.

Co-pai'ba. L., Sp., and Port., fr. Brazil. *cupauba*—i. e., native name of the tree and its product.

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PLANT.—Handsome tree, 4.5–18 M. (15–60°) high, much branched, bark brown, rather smooth; leaves alternate, paripinnate; leaflets opposite, 3–5 pairs, 2.5–5 Cm. (1–2') long, ovate, entire, glabrous, coriaceous, pellucid-punctate; flowers small, white; sepals 5; apetalous; stamens 10; pod small, 2.5 Cm. (1') long, orange-brown, dehiscent into 2 valves, 1-seeded. OLEORESIN (copaiba), pale yellow, brownish-yellow, viscid liquid, without fluorescence or with only slightly greenish fluorescence; odor peculiar, aromatic; taste persistent, bitter, acid; soluble in chloroform, ether, carbon disulphide, fixed or volatile oils, petroleum benzin (1), any addition producing a flocculent precipitate, partly soluble in alcohol, more completely in dehydrated alcohol, insoluble in water; sp. gr. 0.940–0.995. Tests: 1. Heat 2 Gm. on water-bath—no odor of oil of turpentine, and residual resin should be hard, brittle, and weigh 36 p. c. of original copaiba taken (abs. of oil of turpentine, paraffin, fatty oils). 2. Float 3–4 drops of oil of copaiba on a mixture (nitric acid 1 drop + glacial acetic acid 3 cc.)—no reddish zone; shake, no reddish or purple liquid (abs. of gurjun balsam). 3. Shake 5 cc. + 15 cc. alcohol, boil 1 minute, cool—no oil separates after standing 1 hour (abs. of paraffin oils). 4. Not over 5 p. c. insoluble in dehydrated alcohol. Dose, m̄x–60 (.6–4 cc.).

ADULTERATIONS.—OLEORESIN: Those of allied species, that partially deprived of oil, oil of turpentine, volatile oils, rosin, rosin oil, paraffin, paraffin oils, fatty oils (linseed, castor, etc.), Venice turpentine, African copaiba, gurjun balsam, alcohol—often evinced through different odors on slowly heating. OIL: Gurjun balsam oil, increasing specific gravity, African copaiba oil—insoluble in equal volume of alcohol.

Commercial.—Much was written concerning copaiba during 1625–1638, but Marcgrav and Piso first described its collection, also the tree, 1648; Jacquin studied the genus, 1760, as did Desfontaines some years later, while Hayne, 1827, Bentham, 1870, Baillon, 1877, separated by the varying foliage 11 species in Brazil alone, all having similar flowers, fruit, and valuable, hard, strong, tough, durable wood. However, most of copaiba comes from 7 species: Brazil—*C. Langsdorffii*, *C. confertiflora*, *C. coriacea*, *C. oblongifolia*; N. W. Orinoco Valley—*C. officinalis*; Amazonian region—*C. guianensis*, *C. multijuga*. It is a pathogenic product, possibly an antiseptic protective, occurring in schizogenic ducts (cavities differing greatly in size), from which it is obtained by making large auger holes or boxes, square or wedge-shape, into the center of the tree, near the base, whence it usually flows at once, demanding alertness to avoid loss, often giving 12 pounds (5.5 Kg.) in 3 hours; if none should appear the aperture is closed with clay or wax and reopened in 2 weeks, when, as a rule, the discharge is abundant. The flow at first is thin, clear, colorless, but soon becomes thicker and yellowish, as it does also with age. A tree may yield 10–12 gallons (38–45 L.), in 2–3 annual flows, and when abandoned, the ducts, some the length of the stem, occasionally fill and, acting as high liquid columns, furnish sufficient pressure to burst

the trunk with a cannon-like report. It is exported in casks, demijohns, cans, jugs, the value depending upon the amount of contained volatile oil. There are several varieties: 1, *Para*, most limpid, palest; contains volatile oil 60–90 p. c.; 2, *Maranhã*, denser, consistence of olive oil, odor slightly different; contains volatile oil 40–60 (rarely 80) p. c.; 3, *Rio Janeiro*, resembles closely the Maranhã—these three (Brazilian) form clear mixtures with one-third to one-half their weight of ammonia water, but milky if more alkali or fixed oil present; 4, *Surinam* (*C.*



FIG. 178.—*Copaiba Langsdorffii*.

guianensis), rather thin, light yellow, soluble in ether, chloroform, alcohol (4–5 parts, turbid with equal portion), violet with bromine (1) + chloroform (20); contains volatile oil 70–80 p. c.; 5, *Maracaibo*, the thickest, turbid, dark yellow; solidifies with magnesium oxide, not clear with ammonia water; contains volatile oil 20–40 p. c., and owing to large amount of resin is well adapted for Massa Copaibæ, *N.F.*, as it combines with magnesium oxide forming resin soap, which gradually becomes dry and hard; Para and other varieties may

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be used but sufficient volatile oil must be evaporated to render residue viscid upon cooling. Copaiba is exported not only from the above ports, but also from Angostura, Cayenne, W. Indies, Trinidad, C. America, etc.

CONSTITUENTS.—Volatile oil, Resin, bitter principle, copaivic acid, $C_{20}H_{32}O_2$ (oxycopaivic acid, $C_{20}H_{28}O_3$, from Para, metacopaivic acid, $C_{22}H_{34}O_4$, from Maracaibo—all three acids crystalline). Has no benzoic or cinnamic acid, hence the name balsam is misapplied.

Oleum Copaibæ. **Oil of Copaiba**, $C_{15}H_{24}$ (Br.—U.S.P. 1850–1900).—This volatile oil is distilled from copaiba with water or steam, and upon it most of the medicinal properties of the oleoresin depend. It is a pale yellowish liquid, oxidizing by exposure, characteristic odor of copaiba, aromatic, bitter, pungent taste; consists chiefly of caryophyllene, $C_{15}H_{24}$; sp. gr. 0.900, increasing with age; soluble in 2 volumes alcohol; that from Maracaibo dark blue with hydrochloric acid gas. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, \mathfrak{m} v–15 (.3–1 cc.), in emulsion, capsule, or on sugar.

Resina Copaibæ. **Resin of Copaiba**.—(Acidum Copaibicum). The residue left after distilling off the volatile oil from copaiba. It is brownish-yellow, brittle, slight odor and taste of copaiba, to which the resin returns when mixed with the volatile oil of copaiba; soluble in alcohol, ether, chloroform, benzene, volatile oils; contains copaivic, or metacopaivic acid, mixed with neutral resin. Dose, gr. 5–15 (.3–1 Gm.).

PREPARATIONS.—1. *Massa Copaibæ, Solidified Copaiba*, N.F., 94 p. c. + magnesium oxide 6 p. c., water q. s. to dampen, heat. Dose, gr. 15–30 (1–2 Gm.). 2. *Mistura Copaibæ, Lafayette Mixture*, N.F., 12.5 p. c. 3. *Mistura Copaibæ et Opii, Chapman's Mixture*, N.F., 25 p. c. + tinct. opii 3.2, sp. æth. nitrit. 25, +. Dose, \mathfrak{z} j–2 (4–8 cc.).

Unoff. Preps.: Capsules. Emulsion. Electuary. Pills. Suppositories.

PROPERTIES.—Similar to turpentine; diuretic, stimulant, expectorant, laxative, nauseant, disinfectant; acts mainly on the mucous membranes (genito-urinary), by which, and also skin, it is eliminated; increases quantity as well as solids of the urine, and imparts odor to urine, sweat, milk, breath; sometimes erupts the skin—roseola, urticaria, etc.

USES.—Gonorrhea, cystitis, bronchitis, dysentery, diarrhea, hemorrhoids, psoriasis, dropsy, leprosy; volatile oil is not so valuable for gonorrhea, gleet, etc., as the oleoresin, but better for throat affections. Externally—chilblains, sore nipples, anal fissures, often added to varnishes and *vice versa*. Long usage may cause indigestion and renal irritation.

Poisoning, Incompatibles, Synergists: Same as for turpentine.

Allied Products:

1. *Copaiba Mar'tii*, *C. cordifolia*, *C. Jus'siewi*, *C. Jac'quini*, *C. nitida*—all furnish oleoresin, usually poor in the amount of volatile oil.

2. *Hardwick'ia pinna'ta*.—E. India. Tree yields dark brown oleoresin, containing volatile oil 20–40 p. c., resin, no copaivic acid.

3. *Dipterocarpus alatus*.—India. Tree yields gurjun balsam or wood oil—an oleoresin resembling copaiba, containing gurjunic (metacopaivic) acid.

4. *Copal, Gum Copal*.—A fossil resin of Zanzibar or exuding from many leguminous plants of Africa, S. America, W. Indies. Occurs in yellowish-brown masses, wrinkled surface, conchoidal fracture, glossy, odorless, tasteless; when melted becomes soluble in alcohol, ether, and oil of turpentine. Same medicinal properties as copaiba, only weaker; used mainly in preparing varnishes.

Allied Plants:

1. *Tamarindus indica*, *Tamarindus*, *Tamarind*, *N.F.*—The partially dried ripe fruit, deprived of the brittle outer portion of the pericarp and preserved in sugar (sucrose) or syrup, containing not more than 2 p. c. of foreign organic matter; India, Africa, nat. in W. Indies.

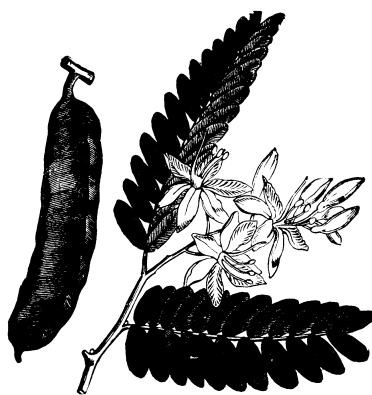


FIG. 179.—*Tamarindus indica*.

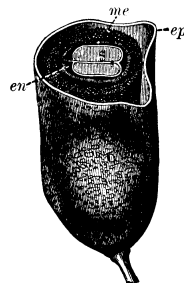


FIG. 180. — Tamarind fruit: cross-section: *ep*, epicarp; *me*, mesocarp; *en*, endocarp; *s*, seed.

Handsome tree, 18–24 M. (60–80°) high; bark rough, ash color; leaves paripinnate, leaflets 8–16 pairs, sessile, 12–25 Mm. ($\frac{1}{2}$ –1') long, 6 Mm. ($\frac{1}{4}$ ') broad; flowers yellow, racemes; fruit indehiscent legume, compressed, 7.5–15 Cm. (3–6') long, 2.5 Cm. (1') broad, curved, nearly smooth, yellowish-brown, pericarp thin, brittle, corky. Pulp—a pulpy mass, light reddish-brown, darker with age, containing some branching fibers and numerous reddish-brown, smooth, oblong, quadrangular, compressed seed, each in a tough membrane; pulp with parenchyma cells containing few starch grains, calcium oxalate rosettes and crystal-fibers with prisms; odor distinct; taste sweet, agreeably acid. Bright iron in contact with moist pulp 30 minutes should not show reddish deposit (abs. of copper from evaporating vessels). There are three varieties: 1, W. Indian (Brown, Red), the once official kind, cakes kneaded with sugar or hot syrup, or alternate layers of pulp and sugar; 2, E. Indian (Black), masses simply pressed together and dried in the

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sun; 3, Egyptian, cakes, flat, round, black, acrid, often moldy; contains tartaric acid 5–9 p. c., citric acid 4–6 p. c., potassium bitartrate 5–6 p. c., malic acid, acetic acid (mostly as potassium salts), sugar, pectin, tannin (in seed testa), insoluble matter 12–20 p. c. Laxative, refrigerant; febrile diseases, combined with other laxatives (senna, etc.) as a flavoring. Dose, ʒss–5 (2–20 Gm.); 1. *Confectio Sennæ*, 10 p. c.

2. *Erythrophlæ'um guineen'se*, *Sassy*, *Mancona*, or *Ordeal Park*.—The dried bark; W. and C. Africa. Large tree with spreading branches, doubly pinnated leaves. Bark flat or curved, 5 Mm. ($\frac{1}{5}$ ') thick, warty, fissured, hard, dull red with whitish spots, brittle, transverse cut shows fawn-colored spots, inodorous, astringent; contains erythrophlœine (heart tonic, anesthetic, poisonous), manconine, tannin. Cardiac tonic, local anesthetic, astringent, diaphoretic, narcotic, sternutatory; occasions slow, strong pulse. Dose of erythrophlœine hydrochloride, gr. $\frac{1}{32}$ – $\frac{1}{16}$ (.002–.004 Gm.).

SENNÆ. SENNA, U.S.P.

Cassia	$\left\{ \begin{array}{l} \text{Senna,} \\ \text{Linné,} \\ \text{angustifolia,} \\ \text{Vahl.} \end{array} \right.$	$\left\{ \begin{array}{l} \text{The dried leaflets, with not more than 10 p. c. of} \\ \text{stems, nor 2 p. c. of pods or other foreign or-} \\ \text{ganic matter, yielding not more than 3 p. c. of} \\ \text{acid-insoluble ash.} \end{array} \right.$
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Habitat. E. and C. Africa, India.

Syn. Senn.; Br. Sennæ Folia, Senna Leaves: 1. Senna Alexandrina, Alexandrian (Nubian, Tripoli) Senna; Fr. Séné—d'Alexandrie; Ger. Alexandrinische Senna. 2. Senna Indica, East Indian (Arabian, Bombay, Mecca, Mocha, Tinnevely) Senna; Fr. Séné de l'Inde—de Tinnevely, Feuilles de Séné; Ger. Folia Sennæ, Sennesblätter, Indische Senna.

Cas'si-a. L. fr. Gr. *κασσία*, *κασία*, fr. Heb. *qetsi-oth*, *qalsa*, to cut off, to peel off—*i. e.*, bark of some species cut off and used; classical name of a bark allied to cinnamon.

Sen'na. L. fr. Ar. *sana*, *sena*. Hind, *sena*—*i. e.*, native Arabian plant name; this is the subgenus of *Cassia*, but should have held full generic rank.

An-gus-ti-to-li-a. L. *angustus*, narrow, + *folium*, leaf—*i. e.*, leaves narrow.

PLANTS.—*Cassia Senna*, small shrub, .6–1 M. (2–3°) high; stem erect, woody, branching, whitish; flowers large, yellow, axillary raceme; fruit few, legume, 5 Cm. (2') long, 18 Mm. ($\frac{3}{4}$ ') broad, thin, broadly elliptical, reniform, dark green, membranous, smooth, indehiscent, 6–7-celled, each with a cordate, ash-colored seed; leaves alternate, 4–5 pairs, paripinnate, footstalks glandless, 2 small-pointed stipules at base; *Cassia angustifolia*, small shrub similar to preceding, except fruit a trifle longer and narrower, 8-seeded; leaves sessile, 5–8 pairs. LEAFLETS (*C. Senna*): *Alexandria*, 2–3.5 Cm. ($\frac{4}{5}$ –1 $\frac{2}{5}$ ') long, 6–10 Mm. ($\frac{1}{4}$ – $\frac{2}{5}$ ') broad, inequilaterally lanceolate, lance-ovate, short, stout petiolules, acutely cuspidate, entire, subcoriaceous, brittle, pale grayish-green; hairs short, appressed, few on upper surface more numerous on lower, spreading on the midrib; usually unbroken, occasionally in fragments; odor characteristic; taste mucilaginous, bitter; (*C. angusti-*

folia): *Tinnevely*, 2–5 Cm. ($\frac{4}{5}$ –2') long, 6–15 Mm. ($\frac{1}{4}$ – $\frac{3}{5}$ ') broad, yellowish-green, smooth above, paler beneath, slightly hairy, more abruptly pointed than, but odor and taste resembling closely the preceding. POWDER, light green—fragments of veins with lignified tracheæ and crystal-fibers, isolated hairs, masses of palisade and mesophyll parenchyma, stomata, calcium oxalate rosettes, prisms; hairs more numerous in *C. Senna*. *Tests*: 1. Boil for 2 minutes .5 Gm. with



FIG. 181.—*Cassia Senna*: half natural size; A, leaflets; B, legumes.

alcoholic solution of potassium hydroxide (1 in 10) 10 cc., add water 10 cc., acidify filtrate with hydrochloric acid, shake with ether, then shake the ethereal layer with ammonia T. S. 5 cc.—latter pinkish-, bluish-red color. *Solvents*: water or diluted alcohol extracts the active constituents (*emodin*, *chrysophanic acid*); water-soluble constituents 28 p. c.; a decoction made by long boiling is inert, being rendered more so by the addition of an alkali or acid; leaves by percolation with alcohol

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are deprived of their griping (resinous) content, odor, taste, and color, but still retain, slightly lessened, their pleasant cathartic power. Dose, ʒss-3 (2-12 Gm.).

ADULTERATIONS.—*Alexandria*: 1. *C. obovata*, leaflets, called by Arabs *Senna Baladi* (Wild Senna), and considered in Egypt less valuable than *Senna Jebeli* (Mountain Senna, *C. Senna*). 2. *Solenostem'ma Ar'gel*, leaves which have lateral veins indistinct, leathery, wrinkled, bitter; flower buds present; fruit pear-shaped. 3. *Crac'ca* (*Tephro'sia*) *Apollin'ea*, leaflets, S. Europe, uneven base, obovate, emarginate (poisonous). 4. *Coria'ria myrtifo'lia*, leaves (poisonous), and *Colu'tea arbores'cens*, leaflets formerly used. 5. Leaves of *Ailan'thus glandulo'sa*, *Tree of Heaven*, easily recognized, even in the powder. 6. *Pods, leaf-stalks, branches*. All these now are garbled out carefully. The Arabians preferred the pods, as they contain 25 p. c. more cathartic principle than the leaflets, and no resin or volatile oil, hence do not gripe. Six or eight pods infused in ʒij (60 cc.) of water will purge an adult.

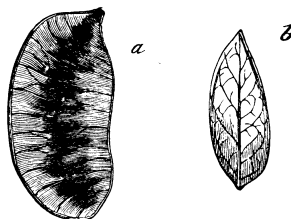


FIG. 182.—*Cassia Senna*: a, legume; b, leaflet, about natural size.

Commercial.—Plants yield two annual crops of leaflets, the larger (best) in September, at the end of the rains, the smaller in April, during the dry season; the entire plants are cut down (by natives), exposed on rocks to the hot sun until dry, stripped of leaflets, which are packed in palm-leaf bags for transportation on camels to the market ports, where, after being garbled, the drug is put into large bales for exportation. There are several varieties: 1. *Alexandrian* (*Nubian*), chiefly from Nubia (Sennaar, Kordofan), some from Timbuctoo, being forwarded usually via Assouan, Darao, thence by the Nile to Cairo and Alexandria; its botanic source has received various synonyms: *Cassia Senna*, *C. acutifolia*, *C. lanceola'ta*, *C. leniti'va*, *C. officinalis*, *C. æthio'pica*, *C. orientalis*, etc.; *Tripoli senna*, from Tripoli (interior Africa), having no doubt the same botanic origin, is conveyed to market ports by caravans, being, as a rule, much broken, discolored, and mixed with legumes, stalks, and earthy matter, but no foreign leaves, and seldom reaches our country; it is restricted by some to *C. æthiopica* (*C. obovata*, *C. ova'ta*), and is not grown in Arabia or India. 2. *Tinnevely* (*Indian, Arabian, Mocha*), originally indigenous to S. Arabia and interior of Africa, but entered market via India (Bom-

bay, Calcutta); its botanic source has received several synonyms: *Cassia angustifolia*, *C. elongata*, *C. medica*; now cultivated extensively, from Arabian seeds, at Tinnevely, S. India, where it becomes most luxuriant; and owing to freedom from legumes, stalks, etc., furnishes the finest and purest leaflets; it is exported mostly from Tuticorin, and Madras; *Bombay (E. India) Senna*, sold frequently as Tinnevely, has the same source, but is dried less carefully, often con-



FIG. 183.—*Cassia angustifolia*: half natural size; A, leaflets; B, legumes.

taining small and discolored leaflets; *Arabian (Mecca) Senna*, sold often as *Bombay*, is collected and dried even with less care, and contains many brown leaflets and legumes.

CONSTITUENTS.—Anthraglucosennin, Emodin 1 p. c., Chrysophanic acid, Glucosennin, Isoemodin, Senna-rhamnetin, Sennanigrin, Kaempferol, Kempferin, gum, resin, catharto-mannite (non-fermentable sugar), isomeric with quercite, sennapicrin, oxalic, malic, tartaric acids,

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combined with calcium, volatile oil (developing after drying), ash 10–12 p. c., of which 3 p. c. is insoluble in hydrochloric acid.

Anthraglucosennin.—Obtained (Tschirch) by evaporating a weak ammoniacal percolate of senna; it is a complex brownish-black powder, partly soluble in ether, acetone, capable of being resolved into components by various solvents; the ether-soluble portion (emodin, chrysophanic acid, glucosennin) when boiled with toluene, to a partial solution, and poured into benzin gives a precipitate—(*senna*-)emodin—trioxymethylantraquinone, melting at 223° C. (434° F.), while in the benzin mother-liquor remains—(*senna*-)chrysophanic acid—dioxymethylantraquinone, obtained by evaporation; the ether-soluble portion insoluble in toluene is an emodin glucoside—*glucosennin*, $C_{22}H_{18}O_8$ (yellow amorphous powder). The ether-insoluble portion (isoemodin, senna-rhamnetin) when treated with acetone and shaken with benzin yields—(*senna*-)isoemodin, $C_{15}H_{10}O_5$ (isomeric with (*senna*-)emodin, but differs in being soluble in benzin); the acetone



FIG. 184.—*Cassia angustifolia*: a, legume; b, leaflet, about natural size.



FIG. 185.—Argel leaf.



FIG. 186.—Coriaria leaf.

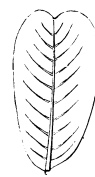


FIG. 187.—Cracca (Tephrosia) leaflet.

solution retains—*senna-rhamnetin* (reddish-brown powder, differing from rhamnetin in not fluorescing in sulphuric acid solution); the anthraglucosennin residue left after treatment with ether and acetone is a black, amorphous powder, which treated with alcoholic potash yields—(*senna*-)emodin and (*senna*-)chrysophanic acid. From an aqueous percolate Tschirch extracted cathartic acid and a crystalline body, $C_{14}H_{10}O_5$, having similar reactions as sennanigrin, but concludes that the cathartic action (peristalsis) is due solely to the emodin and chrysophanic acid, both being oxymethylantraquinones. Formerly senna was believed to contain: cathartic (cathartinic) acid, sennapicrin, sennacrol (resin causing griping), chrysophan and pheretin (yellow coloring matters), sennite (cathartomannite), mucilage, ash 10–12 p. c.

PREPARATIONS.—1. *Fluidextractum Sennæ*. Fluidextract of Senna. (Syn., Fldext. Senn., Fluid Extract of Senna; Liquor Sennæ Concentratus; Fr. Extrait fluide de Séné; Ger. Sennafluidextrakt.)

Manufacture: Similar to Fluidextractum Sarsaparillæ, page 126; menstruum: 33 p. c. alcohol, reserving first 80 cc. Dose, \mathfrak{z} ss–2 (2–8 cc.).

Preps.: 1. *Syrupus Sennæ*. Syrup of Senna. (Syn., Syr. Senn.; Fr. Sirop de Séné; Ger. Sirupus Sennæ, Sennasirup.)

Manufacture: 25 p. c. Mix oil of coriander .5 cc. with fldext. of senna 25, gradually add water 33, let stand 24 hours in cool place, shaking occasionally, filter, pass through filter water q. s. 58 cc., in which dissolve sucrose 63.5 Gm., add water q. s. 100 cc. Dose, \mathfrak{z} ss–4 (2–15 cc.).

2. *Syrupus Sennæ Aromaticus*, *N.F.*, 12.5 p. c., + jalap 5, rhubarb 1.75, +. Dose, \mathfrak{z} j–3 (4–12 cc.). 3. *Syrupus Ficus Compositus*, *N.F.*, 20 p. c.

2. *Pulvis Glycyrrhizæ Compositus*, 18 p. c. 3. *Confectio Sennæ*, *N.F.*, 10 p. c., + cassia fistula 16, tamarind 10, prune 7, fig 12, water 65, digest, strain, add sucrose 55.5, evaporate to 89.5, add senna 10, oil of coriander .5. Dose, \mathfrak{z} j–2 (4–8 Gm.). 4. *Infusum Sennæ Compositum*, *Black Draught*, *N.F.*, senna 6 Gm., manna 12, magnesium sulphate 12, fennel 2, boiling water q. s. 100 cc.; must be recently prepared. Dose,

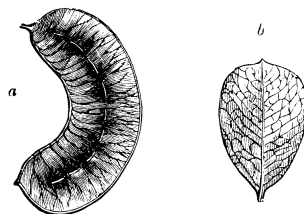


FIG. 188.—*Cassia obovata*: a, legume; b, leaflet, about natural size.

\mathfrak{z} j–3 (30–90 cc.). 5. *Species Laxativæ*, *St. Germain Tea*, *N.F.*, 40 p. c., + sambucus 25, fennel 12.5, anise 12.5, potassium bitartrate 10. Dose, gr. 15–30 (1–2 Gm.).

Unoff. Preps.: Extract, gr. 5–20 (.3–1.3 Gm.). Infusion (Br.), 10 p. c. + ginger .5. Compd. Syrup 13.5 p. c., +. Tinctura Sennæ Composita (Br.), 20 p. c.

PROPERTIES.—Cathartic, acts on nearly the entire intestinal tract (especially colon), increasing peristalsis and intestinal secretion, except biliary; produces in 4 to 6 hours copious yellow stools, with griping and flatulence; does not cause hypercatharsis nor constipation. Large dose vomits, purges, with severe tenesmus, but never poisons; the odor acts as a cathartic on very susceptible persons.

USES.—Arabians used it in skin affections; now employed for habitual constipation, hemorrhoids, fissura ani, fevers. Its smell, taste, tendency to nauseate, injurious effects in hemorrhoids, intestinal hemorrhage, and inflammation, all lessen its popularity; its purgative action is increased by bitters, calumba, etc., while the griping and nausea are diminished by coriander, tamarind, manna, fennel, Epsom

CÆSALPINIACEÆ

or Rochelle salt. If leaves be macerated long in water, or if the mass be pressed tightly, much acrid, resinous principle will be obtained, causing griping, hence should exhaust by rapid percolation.

Allied Plants:

1. *Cassia obovata*.—Leaflets, U.S.P. 1830–1860. This was the first senna known, being introduced by the Moors into Europe as early as the 9th century, where even in the 16th it became very largely cultivated. Grows wild on sandy soil in Egypt, Nubia, Abyssinia,

FIG. 189.—*Cassia Fistula*.FIG. 190.—*Cassia Fistula*.
Part of pod, natural size.

Tripoli, Senegal, Arabia, India; cultivated in Jamaica, being called *Port Royal* or *Jamaica Senna*; leaves 5–7 pairs, leaflets obovate, obtuse. *C. pubescens* (*C. holosericea*), *Aden Senna*, Abyssinia, rarely met with now; leaflets 2.5 Cm. (1') long, ovate, mucronate, hairy, sometimes mixed with Mecca senna. *C. brevipes*, *C. America*; leaflets resemble Indian senna, but have 3 longitudinal veins; infusion non-purgative.

2. *C. marylandica*.—Leaflets, U.S.P. 1820–1870; United States, New England to S. Carolina, west to the Mississippi. Plant 1–1.5

M. (3–5°) high; leaves alternate, leaflets paripinnate, 8 pairs, 2.5–5 Cm. (1–2') long, 12 Mm. ($\frac{1}{2}$ ') wide; flowers August, yellow; fruit pod, 7.5 Cm. (3') long; in sandy soil, river banks, introduced into England in 1723, cultivated for ornament, collected Aug.–Sept.; contains cathartic acid, volatile oil, and is given in one-third larger doses than the official varieties; in infusion.

3. *C. Fis'tula, Purging Cassia, N.F.*—The dried fruit with not more than 2 p. c. of foreign organic matter; E. India, Egypt, nat. in S. America, W. Indies. Handsome tree, 9–15 M. (30–50°) high; bark gray; leaves paripinnate, leaflets 3–7 pairs, 5–15 Cm. (2–6') long, ovate; flowers yellow. Fruit cylindrical, 25–50 Cm. (10–20') long, 20 Mm. ($\frac{4}{5}$ ') thick, chestnut-brown, on one side a longitudinal groove (ventral), on the other a slight ridge (dorsal), indicating the 2 sutures, indehiscent, 25–100 transverse compartments, each with a brown seed, 8 Mm. ($\frac{1}{3}$ ') long, embedded in blackish-brown pulp (30 p. c.) having prune-like odor, mawkish sweet taste; contains (pulp) sugar 60 p. c., mucilage, pectin, albuminoids, tannin, volatile oil, butyric acid, calcium oxalate. Laxative; costiveness, to promote bile flow; usually combined with other drugs (manna, tamarind, salines, etc.). Dose, 3j–2 (4–8 Gm.); 1. *Confectio Sennæ*, 16 p. c.

33. KRAMERIACEÆ. *Krameria* Family.

Kra-me-ri-a'se-e. *L. Krameria*-a + aceæ, in honor of Drs. J. G. H. and W. H. Kramer, German botanists, of the eighteenth century. Pubescent herbs, shrubs. Distinguished by leaves simple, exstipulate; flowers purplish, racemes, sepals large, 4–5, petals 4–5, smaller than sepals, stamens 3–4, monadelphous; ovary 1-celled, ovules 2; fruit spiny, indehiscent, 1-seeded; temperate climates, tropics; astringent, tonic, dye, ornament.

Genus: 1. **Krameria**.

KRAMERIA. KRAMERIA, *U.S.P.*

Krameria { *triandra*, *Ruiz et Pavon*, } The dried root.
 { *argentea*, *Martius*. }

Habitat. 1. Peru, Bolivia. 2. Brazil (in sandy localities of the mountains, elevation 925–2465 M. (3,000–8,000°)).

Syn. Rhatany; Br. *Krameria* Radix; Fr. *Ratanhia*; Ger. *Radix Ratanhiæ*, *Ratanhiawurzel*.

Kra-me'ri-a. L. see etymology, above, of *Krameriaceæ*.

Tri-an'dra. L. fr. Gr. *τρι*, three, + *άνδρoς* man, stamen—*i. e.*, flowers have 3 stamens.

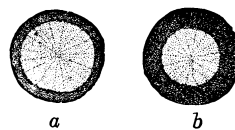
Ar-gen'te-a. L. fr. *argenteus*, silvery, silvered—*i. e.*, leaves, whitish from adpressed silvery hairs.

Rhat'a-ny. Fr. *Peruv. ratana*, native name; Sp. *ratania*, *ratana*, creeping—*i. e.*, the plant's habit.

PLANTS.—Low shrubs with spreading, decumbent branches; bark grayish-brown, when young hoary with erect silky hairs; leaves sessile,

KRAMERIACEÆ

densely covered on both sides with adpressed silvery hairs, 12 Mm. ($\frac{1}{2}$ ') long, obovate, entire; flowers Oct.-Nov., 18 Mm. ($\frac{3}{4}$ ') broad, red; sepals 4, scarlet, in form of a cross; petals 4, dissimilar, red; fruit, size of a pea, 6 Mm. ($\frac{1}{4}$ ') thick, covered with stiff reddish-brown prickles, 1-2-seeded. Root (*K. triandra*): Peruvian, crown knotty, several-headed, branching roots, latter up to 50 Cm. (20') in length, 1 Cm. ($\frac{2}{5}$ ') thick, cylindrical, flexuous, reddish-brown, with darker scaly cork, wrinkled, devoid of transverse fissures; bark one-third of radius, fracture slightly fibrous, of wood tough, splintery; wood yellowish, finely radiate; inodorous; bark astringent, wood nearly tasteless; (*K. argentea*): Para, usually separate from the crown, less flexuous, tapering, tough, internally darker, usually not exceeding 12 Mm. ($\frac{1}{2}$ ') in thickness;

FIG. 191.—*Krameria triandra*.FIG. 192.—*Krameria*: transverse sections: root; a, Peruvian; b, Savanilla.

purplish-brown with numerous fissures, bark one-half the radius. POWDER, reddish-brown—starch grains, central cleft, .003-.035 Mm. ($\frac{1}{8333}$ — $\frac{1}{715}$ ') thick, bast-fibers wavy with attenuated ends, tracheæ, wood-fibers fusiform, calcium oxalate prisms, few microcrystals. *Solvents*: cold water; boiling water; alcohol. Dose, gr. 5-30 (.3-2 Gm.).

Commercial.—We have two important varieties: 1. *Peruvian*, *Payta*, *Red Rhatany* (*K. triandra*).—Abundant around Huanuco and Lima, mainly shipped from Payta. 2. *Para*, *Brazilian*, *Ceara*, *Brown Rhatany* (*K. argentea*). Although darker and less purple, it resembles *K. Ixina*, for which during the past few years it has largely been sold; shipped chiefly from Para. Constituents are mostly in the bark, hence the thick-barked root, with little wood, is preferred. Roots are dug after rains mostly in S. Peru, especially in Arica and Islay provinces.

CONSTITUENTS.—Kramero-tannic acid 20 p. c., Rhatanine-red, rhatanine, starch, sugar, gum, wax, calcium oxalate, ash 5 p. c., aqueous extractive 9 p. c.

Kramero-tannic Acid (*krameria-* or *ratanhia-tannic acid*).—Obtained by treating ethereal extract of bark with alcohol and evaporating this latter solution. It is a red, amorphous powder, precipitated dark green by ferric salts and flesh-colored by gelatin; no precipitate from tartar emetic, but fused with potassium hydroxide yields protocatechuic acid and phloroglucin; alcoholic tincture of Peruvian is reddish, Para and Savanilla yellowish, lead acetate with former gives reddish-brown, with two latter bluish-gray precipitate.

Rhatanine-red (*ratanhia-red*). $C_{26}H_{22}O_{11}$.—Obtained by boiling kramero-tannic acid with diluted sulphuric acid, when it splits into glucose and this coloring principle, which is similar to that found in horse-chestnut and tormentilla.

PREPARATIONS.—1. *Tinctura Krameriae*. Tincture of Krameria. (Syn., Tr. Kramer.; Fr. Teinture de Ratanhia; Ger. Tinctura Ratanhiæ, Ratanhiatinktur.)

Manufacture: 20 p. c. Macerate, percolate similar to *Tinctura Veratri Viridis*, page 104; menstruum: diluted alcohol. Dose, $\mathfrak{m}\text{xv}$ –60 (1–4 cc.).

2. *Extractum Krameriae*, *N.F.* (water). Dose, gr. 5–10 (.3–.6 Gm.).

3. *Fluidextractum Krameriae*, *N.F.* (1st menstruum: glycerin 10, alcohol 50, water 40, 2d: diluted alcohol). Dose, $\mathfrak{m}\text{v}$ –30 (.3–2 cc.).

Prep.: 1. *Syrupus Krameriae*, *N.F.*, 45 p. c. Dose, 5 ss–4 (2–15 cc.).

4. *Fluidglyceratum Krameriae*, *N.F.*, 100 p. c. Dose, $\mathfrak{m}\text{v}$ –30 (.3–2 cc.).
Unoff. Preps.: *Infusion* (Br.), 5 p. c., $\mathfrak{z}\text{ j}$ –2 (30–60 cc.). *Lozenge* (Br.), ext. 1 gr. (.06 Gm.). *Lozenge Krameria and Cocaine* (Br.), ext. 1 gr. (.06 Gm.) + cocaine hydrochloride $\frac{1}{20}$ gr. (.003 Gm.).

PROPERTIES.—Similar to tannic acid, astringent, tonic.

USES.—Chronic diarrhea, stomach and intestinal hemorrhage, leucorrhea, dysentery, gleet, gonorrhea, ozena, menorrhagia, fissure of anus or nipple, incontinence of urine. Externally—gargle for sore throat, mucous membranes of eyes, nose, gums, epistaxis, rectal bleeding, relaxed uvula, tooth powder and wash. Generally used locally by injection, gargle, wash, enema (extract 2 p. c. in water).

Allied Plants:

1. *Krameria Ixi'na*. *Savanilla*, *New Granada*, *Antilles*, *Violet Rhatany*.—This abounds in Colombia, Venezuela, Guiana, Brazil, Haiti, Antigua, Mexico. Similar to Para Rhatany. Of this species we have several varieties collected indiscriminately and so used: 1. Var. *granaten'sis*, which is distinguished solely by its broader leaves. 2. Var. *tomento'sa*; this is an extremely woolly form, and by some deemed deserving of specific rank (*K. tomentosa*), being shipped not only from Savanilla, but also from Carthagena, Santa Marta, etc.—for some years out of market, but now returning; constituents and uses same as the official.

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2. *K. cistroides*. Chile.—Roots resemble Peruvian very closely, wood of tap-root pale reddish in outer layer, brownish-red in the center. *Guayaquil Rhatany* (origin unknown), root large, contorted, bark thin, fibrous, rich in tannin, reddish-brown, striated, warty. *K. secundiflora* (*lanceolata*), *Texas Rhatany*; roots valuable, thin, dark brown, bark thick, rich in tannin; *Florida Rhatany*—same source, and similar to Texas; neither on the market.

3. *Hæmatoxylon campechianum*, *Hematoxylon*, *Logwood*, N.F.—The heartwood with not more than 2 p. c. of foreign organic matter. C. America, nat. in W. Indies. Spreading tree, 7.5–12 M. (25–40°) high, .3–.6 M. (1–2°) thick, knotty, tough; bark dark, rough, white dotted; leaves paripinnate, leaflets 4–5 pairs, obcordate, smooth; flowers yellow, racemes, jonquil odor; fruit legume, 2.5–4 Cm. (1–1½') long, compressed, tapering ends, 2-seeded. Heartwood in logs 1 M.

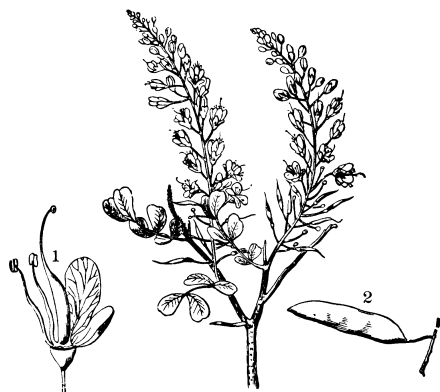


FIG. 193.—*Hæmatoxylon campechianum*: 1, flower; 2, fruit.



FIG. 194.—*Lignum campechianum*; cross-section, magnified 4 diam.

(3°) long, 15 Cm. (6') thick, sp. gr. 1.06, hard purplish-black, internally brownish-red, irregular concentric circles, medullary rays 4 cells wide; odor faint, agreeable; taste sweetish, astringent; colors saliva dark pink. In shops as small chips, occasionally in billets, coarse powder, reddish-brown, freshly cut surface dark yellowish-red. Powder, reddish-brown—wood-fibers, crystal-fibers with calcium oxalate monoclinic prisms, tracheæ with brownish amorphous content; medullary rays, walls of cells with simple pores; pieces with a greenish luster (fermentation or oxidation of hematoxylin into hematein by ammonia in the air) should be rejected. It imparts a yellowish color to slightly acidified water, changed to purple or violet-red by alkalis (red with Brazil wood, no change with red saunders); solvents: boiling water, alcohol; contains hematoxylin 12 p. c., volatile oil, tannin, fat, resin, ash 3.5 p. c. There are four varieties: 1, Campeachy; 2, Honduras; 3,

St. Domingo; 4, Jamaica. Astringent, tonic, antiseptic, similar to tannin; cholera infantum, chronic diarrhea, dysentery, leucorrhea, hemorrhage, dyspepsia; antiseptic in gangrene, ulcers, cancer; chiefly in dyeing violet, blue, gray, black. Dose, ʒss-1 (2-4 Gm.); 1. *Extraction Hæmatoxyli*, 10 p. c. (water), dose, gr. 5-15 (.3-1 Gm.); decoction (Br.) 5 p. c. + cinnamon 1, ʒss-2 (15-60 cc.).

34. PAPILIONACEÆ. Pea Family.

Pa-pil-i-o-na'se-e. L. *Papilio*-n + aceæ, butterfly—*i. e.*, alluding to the corolla being butterfly-shaped. Herbs, shrubs, vines, trees. Distinguished by leaves compound, stipulate; flowers papilionaceous, calyx 4-5-toothed, petals perigynous or hypogynous, upper one enclosing the lateral ones in the bud, stamens usually 10; pistil 1, ovary 1-celled; fruit legume or loment, 1-many-seeded; universal; astringent, antispasmodic, demulcent, sedative, dye, poisonous, timber.

Genera: 1. *Toluidra*. 2. *Astragalus*. 3. *Pterocarpus*. 4. *Glycyrrhiza*. 5. *Vouacarpoua* (*Andira*). 6. *Physostigma*.

TOLU. TOLU, U.S.P.

Toluidra Balsamum, } A balsam.
Linné.

Habitat. S. America (Venezuela, Colombia, Peru); high rolling countries.

Syn. Balsamum Tolutanum, Balsam of Tolu, U.S.P. 1910, Tolu Balsam; Fr. Baume—du Tolu—de Carthagène; Ger. Tolubalsam.

To-lu-if'e-ra. L. *tolu* + *fero, ferre*, to bear, producing tolu or an allied balsam—*i. e.*, it was brought first from Tolu, now Santiago de Tolu in U. S. Columbia.

Bal'sa-mum. L. fr. Gr. *βάλαμον*, for balsam, name of balsam tree—*i. e.*, from its characteristic secretion.

PLANT.—Evergreen tree 24 M. (80°) high, often branchless for 15 M. (50°) above ground, roundish spreading head; bark smooth, yellowish-brown, with numerous white lenticels; leaves having 4-7 leaflets; flowers upon smooth pedicels, dense racemes, 10-12.5 Cm. (4-5') long; calyx broadly tubular upon hispid pedicel, mouth 3-4-lobed; anthers versatile; fruit 10-12.5 Cm. (4-5') long. BALSAM (Tolu) is a yellowish-brown plastic solid, brittle when old, dried, or exposed to cold, transparent in thin layers; odor pleasant, aromatic, vanilla-like; taste mild, aromatic; soluble in alcohol, chloroform, ether, solutions of fixed alkalies, usually leaving insoluble residue; nearly insoluble in water, petroleum benzin; alcoholic solution (1 in 20)—acid. *Tests:* 1. Shake 1 Gm. with carbon disulphide (25), let stand 30 minutes, filter, evaporate 15 cc. to dryness, dissolve residue in glacial acetic acid, + few drops of sulphuric acid—not green; shake remainder of filtrate with equal volume of aqueous solution of copper acetate (1 in 1000)—not green (abs. of rosin, copaiba). Dose, gr. 5-30 (.3-2 Gm.).

ADULTERATIONS.—Turpentine—blackish instead of cherry-red with sulphuric acid, soluble in carbon disulphide; sweet gum—yields styracin

PAPILIONACEÆ

to hot benzin, crystallizing when cold; storax, rosin, copaiba, saponifiable substances, various other resins. A factitious balsam has been found containing storax 63 p. c.

Commercial.—Plant resembles *Toluiifera Pereiræ* in flowers and fruit but differs from it in having shorter leaves, smaller and fewer leaflets, recurved with non-puckered margin, non-hairy rachis and petiole, and less prominent glands. Balsam—a physiological product in very young tissues, thereafter becoming pathological, possibly an antiseptic protec-



FIG. 195.—*Toluiifera Balsamum*: twig one-third natural size, with fruit.

tive against depleting local injury—is collected by making V-shaped incisions through the bark and hollowing out the wood below each to support a small calabash cup for catching the flow, there often occurring 20–30 of these from the ground upward (2.5–3 M.; 8–10°), the higher being cut from ladders or scaffolds. Bleeding continues, July–April, at the rate of filling the cups “each moon,” they being emptied as occasion demands into rawhide flask-shaped bags (carried by donkeys) which when filled are sent to ports along the Magdalena and Orinoco Rivers where the balsam is transferred to cylindrical tins (10–25

pounds; 4.5–11.5 Kg.), formerly calabashes or baked earthen jars, and as such enters commerce via Carthage.

CONSTITUENTS.—Resin 75–80 p. c., Cinnamic and Benzoic acids 18–20 p. c., Volatile oil 1 p. c., Vanillin .05 p. c., benzyl cinnamate and benzyl benzoate—last two form an acid, aromatic oily liquid 7.5 p. c.

Resin, $C_{18}H_{20}O_5$.—Chief constituent, consisting of tolu-resinotannol combined with cinnamic acid and small amount (1.5 p. c.) of benzoic acid; it is amorphous, black, brittle, similar to that of *T. Pereira*, having a portion soluble in carbon disulphide, which upon evaporation yields a crystalline, nearly colorless residue about 25 p. c. of the balsam; a portion of resin sparingly, another readily soluble in alcohol.

Volatile Oil.—Obtained by distilling with water; contains benzyl benzoate, benzyl cinnamate, phellandrene, farnesol, hardens by exposure, odor pleasant, sp. gr. 0.858.

Acids.—Obtained by distillation—benzoic, cinnamic, with benzylic ethers of both, the benzyl cinnamate predominating. Trommsdorf found resin 88 p. c., volatile oil .2 p. c., cinnamic acid 12 p. c., this latter coming over as a heavy oil condensing into white crystalline mass. Dry distillation gives the above acids and ethers, also styrol, phenol, toluol—this latter being found in coal tar, wood tar, organic compounds, balsams (Peru, etc.) and resins; it is a colorless, oily liquid, readily convertible into benzoic acid.

PREPARATIONS.—1. *Tinctura Tolu*. Tincture of Tolu. (Syn., Tr. Tolu, Tinctura Tolutana, Tolu Tincture; Fr. Teinture de Baume de Tolu; Ger. Tolubalsamtinktur.)

Manufacture: 20 p. c. Similar to Tinctura Cardamomi Composita, page 137; menstruum: alcohol. Dose, $\mathfrak{m}\text{x}$ –30 (.6–2 cc.).

Prep.: 1. *Syrupus Tolu*. Syrup of Tolu. (Syn., Syr. Tolu, Syrupus Tolutanus; Fr. Sirop (balsamique)—de Baume de Tolu; Ger. Tolubalsamsirup.)

Manufacture: 1 p. c. Rub tincture of Tolu 5 cc. + magnesium carbonate 1 Gm. + sucrose 6, gradually add with trituration, water 43 cc., filter; dissolve in clear filtrate, gently heating, sucrose 76 Gm., strain syrup (hot), add through strainer, water q. s. 100 cc. Dose, $\mathfrak{z}\text{j}$ –4 (4–15 cc.).

Preps.: 1. *Trochisci Ammonii Chloridi*, q. s. 2. *Emulsum Olei Morrhue cum Vitello*, N.F., 10 p. c. 3. *Mistura Pectoralis*, N.F., q. s.

1. *Pilulæ Phosphori*, q. s. 2. *Tinctura Benzoini Composita*, 4 p. c. 3. *Pilulæ Ferri Iodidi*, N.F., q. s.

Unoff. Preps.: Emulsion. Inhalations (steam—acute laryngitis with aphonia). *Lozenges*.

PROPERTIES.—Stimulant, expectorant, disinfectant, vulnerary, stomachic.

USES.—Much less decided than balsam of Peru, but similar; bronchitis, diphtheritic deposits, catarrh, coughs, flavoring, perfumery.

Incompatibles: Water and aqueous preparations with the tincture.

PAPILIONACEÆ

Synergists: Balsams, aromatic drugs, volatile oils, stimulant expectorants.

Allied Plants:

1. *Myroxylon punctatum*.—The *Quino-quino* tree, and *M. peruiif-erum*, both of Peru; yield balsams resembling official Peru and Tolu.

BALSAMUM PERUVIANUM. BALSAM OF PERU, *U.S.P.*

Toluifera Pereira, } A balsam.
(Royle) Baillon.

Habitat. Central America (San Salvador), in woods near the coast.

Syn. Bals. Peruv., Peru Balsam, Balsamum Peruvianum Nigrum, Balsamum Indicum, Black Balsam; Fr. Baume—du Pérou,—de Sonsonate,—des Indes; Ger. Perubalsam, Indischer Balsam.

Per-ei'rae. L. of Pereira—*i. e.*, in memory of Jonathan Pereira (1804-1853), the author of *Elements of Materia Medica*, and Professor to the British Pharmaceutical Society, who visited S. America to study these and many other plants.

Pe-ru-vi-a-num. L. adj. form, fr. *peruvianus* of or pertaining to Peru—*i. e.*, the secretion.

PLANT.—Handsome tree, 15-25 M. (50-80°) high, branching 2.5 M. (8°) above ground; leaves 6-10, alternate, 15-20 Cm. (6-8') long, imparipinnate; leaflets 5-7.5 Cm. (2-3') long, oblong-ovate, hairy, puckered margin; flowers 12 Mm. (½') long, whitish, tomentose, racemes; fruit 1-seeded legume 10 Cm. (4') long, yellowish-brown. BALSAM (of Peru), is a viscid, dark brown liquid, free from stringiness or stickiness, transparent and reddish-brown in thin layers; odor agreeable, vanilla-like; taste bitter, acrid, persistent, burning sensation in the throat when swallowed; does not harden on exposure; soluble in alcohol, chloroform, glacial acetic acid with slight opalescence, partly soluble in ether, petroleum benzin; agitated with water—latter acid to litmus; sp. gr. 1.145. *Tests:* 1. Shake 1 Gm. with chloral hydrate (3) in distilled water (2)—clear solution (abs. of fixed oils). 2. Shake 1 Gm. with purified petroleum benzin (5), warm 10 minutes, replacing loss by evaporation, evaporate 2 cc.—no turpentine odor, and residue treated with few drops of nitric acid—not green or bluish (abs. of turpentine, rosin). Dose, m̄v-30 (.3-2 cc.).

ADULTERATIONS.—Extract of bark and wood, alcohol, fixed and volatile oils, castor oil, storax, benzoin, gurgjun balsam, copaiba, Canada turpentine, rosin, water.

Commercial.—Plants grow wild in forests, either isolated or in groups, occasionally in apparent rows suggesting original planting, but there is no evidence of regular plantations, do not thrive above 300 M. (1,000°) elevation, bear fragrant flowers, yield mahogany-like wood and balsam after the 25th year continuing for 75 years. Balsam, a pathological product that owes its qualities to neither wood nor bark but to the special treatment of the trees, is collected by the aborigines in a district reserved to them, Sonsonate, Balsam Coast, extending

from Acajutla to La Libertad, San Salvador. After the last rains, Nov.-April, the outer cortical portion is scraped from the trunk and stout branches in alternating strips (or squares, 12'; 30 Cm.) an $\frac{1}{8}$ inch (3 Mm.) deep, exposing the inner layer from which, within 5-8 days, the mature sap begins to flow; after this has continued a week the tender portion is covered with a clean cloth to absorb the sap, and a second irritation effected by carefully applying a burning torch for 5 minutes, and repeating this every 2 months, six changes of cloths



FIG. 196.—*Toluifera Pereira*.

during each interval; a second hacking often follows; cloths are boiled half an hour in kettles with water, expressed (hot) in primitive press, and squeezed—the balsam being caught in large bladders, gourds, or wooden bowls—that in the kettles settles to the bottom and, after pouring off supernatant liquid is mixed with that from the cloths furnishing “crude or raw balsam,” which is refined by heating moderately in a vat, whereby water is evaporated and impurities rise to the surface, straining, when the “clarified balsam” is poured into rectangu-

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lar, screw-top tin canisters, 55 pounds (25 Kg.). As long as the wounds are kept open there usually is some flow, and if the process is conducted carefully the lower ones will heal while the upper and fresher are being worked; the loose bark and wood are ground up and extracted, the extract being added to the other collected portions. When trees have been tapped six consecutive seasons a rest of 2-3 years renders the product more abundant and satisfactory, while a longer period, 5-6 years in every 20, assures a continued yield; each tree averages 2-5 pounds (1-2.5 Kg.) annually. It is exported from Acajutla (Pacific coast) and Belize (Atlantic coast) in jars, metallic canisters, drums, etc. There also is obtained from the fruit by expression a white semi-fluid substance, *Balsamo blanco*, having the odor of Tonka and the appearance of Tolu, but, in spite of containing a crystalline resin, *myroxocarpin*, it is entirely distinct from Tolu or Peru. The natives prepare from the fruit with rum a tincture or alcoholic extract, *Balsamito*, which is used as a stimulant, anthelmintic, diuretic, and externally for indolent ulcers, freckles, etc., while there often exudes from the trees a gum-resin containing 77.4 p. c. of resin, but no aromatic principle or cinnamic acid. Balsam of Peru was considered formerly to be from *Myroxylon peruvianum*, a different tree flourishing in Brazil, Ecuador, Peru, whose product reached Europe via Peru (Callao), hence its name, being a fragrant balsam resembling Tolu and at Rio called *Olea vermelho*.

CONSTITUENTS.—Benzoic acid-benzyl ester, Cinnamein (volatile oil) 56-66 p. c., Resin 16-25 p. c., Cinnamic and Benzoic acids 23 p. c., Vanillin.

Benzoic Acid-benzyl Ester (Benzyl Benzoate).—The chief active constituent is a colorless oily liquid, boiling at 173° C. (344° F.), congealing at 32° C. (90° F.), and may readily be made synthetically.

Cinnamein.—Consists largely of benzoic acid-benzyl ester, and to a small extent of cinnamic acid-benzyl ester (benzyl cinnamate) both esters being separated easily by fractional distillation *in vacuo*, and thus obtained pure possess the characteristics, chemical and therapeutical, of the synthetic esters; the cinnamic acid-benzyl ester boils at 213° C. (416° F.), and congeals at 37° C. (99° F.).

Resin.—Consists of peru-resinotannol combined with benzoic and cinnamic acids, soluble in caustic alkali, and when in solution precipitated by carbon dioxide, insoluble in carbon disulphide; on dry distillation yields benzoic acid, styrol, and toluol, C₇H₈.

PREPARATIONS.—1. *Mistura Oleo-Balsamica*, *Hoffman's Balsam*, *N.F.*, 1.6 p. c., + eugenol, oils of cinnamon, lavender, lemon, myristica, thyme, $\frac{1}{2}$ p. c., alcohol q. s. 100 (nervine). 2. *Solutio Mastiches Chloroformica Composita*, *N.F.*, 30 p. c. *Ointment*. *Syrup*.

PROPERTIES.—Stimulant, expectorant, disinfectant, vulnerary, stomachic. It is eliminated by bronchial mucous membrane, kidneys, and skin, stimulating and disinfecting their secretions.

USES.—Chronic catarrh, asthma, phthisis, gonorrhea, amenorrhea, rheumatism, palsy; externally on indolent ulcers, scabies, ringworm, tonsillar diphtheria, bronchitis, tuberculosis of the skin, bone, or larynx, chilblains, eczema, for masking the odor of iodoform in ointment.

Allied Plants:

1. *Cytisus Scoparius*, *Scoparius*, *Eroom Tops*, *N.F.*—The dried tops with not more than 5 p. c. of stems over 3 Mm. ($\frac{1}{8}$ ') thick nor 2 p. c. of other foreign organic matter; W. Asia, S. Europe, United States. Shrub 1.2–2.4 M. ($4-8^{\circ}$) high, with many pentangular, wand-like branches in close fascicles—suitable for broom-making; leaves downy, trifoliate; leaflets sessile, 6–12 Mm. ($\frac{1}{4}-\frac{1}{2}$ ') long, lanceolate; flowers numerous, large, brilliant yellow, papilionaceous; fruit pod, 4 Cm. ($1\frac{3}{4}$ ') broad, compressed. Tops—stems thin with branched twigs, 1–3 Mm. ($\frac{1}{25}-\frac{1}{8}$ ') thick, angled, winged, dark green, nearly glabrous, many brownish cork patches; internally yellowish; fracture short-fibrous (thin), tough and splintery (thick); leaves scarce; odor slight, on bruising more distinct; taste disagreeable, bitter. Powder, dark green—non-glandular, non-lignified hairs, chlorenchyma, stomata, pith and wood parenchyma, tracheæ, starch grains, pollen grains; solvent: diluted alcohol; contains sparteine (colorless oily liquid alkaloid) .3 p. c., scoparin (diuretic), volatile oil, tannin, fat, wax, sugar, ash 5 p. c. Cardiac stimulant, narcotic, diuretic, poisonous; large doses paralyze respiratory and motor centers, causing convulsions and death by asphyxia; cardiac affections, palpitation—inferior to digitalis, although quicker and without cumulative tendency. *Poisoning*: similar to digitalis in effect and treatment. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Scoparii* (diluted alcohol). *Decoction*, *Infusion*, each 5 p. c., \mathfrak{z} j–2 (30–60 cc.); juice, 75 p. c., + alcohol 25, \mathfrak{z} j–2 (4–8 cc.); sparteine sulphate, gr. $\frac{1}{8}-\frac{1}{2}$ (.01–.03 Gm.); scoparin, gr. 1–10 (.06–.6 Gm.). *Spartium junceum*, *Spanish Broom*—leaves soft, hairy; seed reniform; properties similar to *Cytisus Scoparius*; fibers used for cordage, coarse cloth, etc.



FIG. 197.—*Cytisus Scoparius*: flowering branch.

2. *Baptisia tinctoria*, *Baptisia*, *Wild (False) Indigo*, *N.F.*—The dried root with not more than 10 p. c. of stem-bases and overground parts nor 2 p. c. of other foreign organic matter; N. America. Plant

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.6–1 M. (2–3°) high, smooth, succulent, glaucous, disagreeable odor, when bruised—repellent to insects, etc.; flowers yellow. Root (most active), fleshy, .5–4 Cm. ($\frac{1}{3}$ – $1\frac{2}{3}$ ') thick, usually cut into elongated cylindrical pieces; crown 5–8 Cm. (2– $3\frac{1}{5}$ ') thick, warty, stem-scars, dark brown, wrinkled, corky layer, few branching rootlets; fracture tough, whitish, radiate, porous; nearly odorless, bark bitter, acrid, wood nearly tasteless. Powder, light grayish—numerous starch grains, tracheæ, lignified fibers, medullary ray tissue, parenchyma, cork cells; solvent: 75 p. c. alcohol; contains cytisine (baptitoxine—acrid, poisonous), baptisin (non-active bitter glucoside), baptin (purgative glucoside), ash 5 p. c. Hepatic, nervous and intestinal stimulant, antipyretic, emeto-cathartic—death by respiratory paralysis; typhus, enteric and scarlet fevers, epidemic dysentery; locally—aphthous stomatitis, chronic ulcers, gangrene. Dose, gr. 5–15 (.3–1 Gm.); 1. *Fluidextractum Baptisæ* (75 p. c. alcohol): Prep.: 1. *Dentifricium*, .875 p. c. Infusion, Tincture, Baptisin, gr. 2–6 (.13–4 Gm.).

3. *Melilotus officinalis*, *Melilotus*, (Yellow) *Melilot*, *Yellow Sweet Clover*, *N.F.*—The dried leaf and flowering top with not more than 3 p. c. of stems over 3 Mm. ($\frac{1}{8}$ ') thick or other foreign organic matter; Europe, United States. Plant 1–1.5 M. (3–5°) high; stems mostly less than 30 Cm. (12') high, slender, leafy below, terminating in yellow racemes, pubescent; leaves trifoliate, leaflets 1–3 Cm. ($\frac{2}{5}$ – $1\frac{1}{5}$ ') long, oval, serrate; corolla papilionaceous; legumes 2.5–3.5 Mm. ($\frac{1}{10}$ – $\frac{1}{4}$ ') long, obovate, 1-seeded; odor aromatic, tonka-like; taste sweetish, slightly pungent, bitter. Powder, light green—non-glandular hairs, epidermal cells of leaf tissue, stomata, chlorenchyma, fibro-vascular tissue, crystal-fibers with calcium oxalate prisms, tracheæ, pollen grains, occasional glandular hairs; solvent: diluted alcohol; contains coumarin, melilotic acid, coumaric acid, melilotol (fragrant volatile oil), ash 10 p. c. Locally—to allay pain in abdomen, joints, diarrhea, dysmenorrhea, rheumatism; 1. *Species Emollientes*, 20 p. c. Decoction, Infusion, Ointment, Plasters.

4. *Trifolium pratense*, *Trifolium*, *Red Clover Blossoms*, *N.F.*—The dried inflorescence with not more than 2 p. c. of foreign organic matter; Europe, naturalized in N. America. Well-known fodder-plant. Heads ovoid, 12–25 Mm. ($\frac{1}{2}$ –1') long and broad, shriveled, purplish, brownish on drying, consisting of many small papilionaceous flowers crowded together, stipules green; leaves trifoliate; odor faintly aromatic, tea-like, taste sweetish, slightly bitter. Powder, greenish-brown—non-glandular hairs, pollen grains, epidermis with stomata, polygonal cells (corolla) with rhombohedron of calcium oxalate; solvent: diluted alcohol; contains isorhamnetin, pratol, tannin, pratensol, trifolin (glucoside). Alterative, deobstruent, sedative; whooping-cough, spasmodic affections. Dose, ʒss–1 (2–4 Gm.); 1. *Fluidextractum Trifolii* (diluted alcohol); 2. *Fluidextractum Trifolii Compositum*, 21.5 p. c., + glycyrrhiza 21.5, berberis, cascara amara, lappa, phyto-lacca, stillingia, āā 10.8, xanthoxylum 3, (33 p. c. alcohol), dose, ʒj–2

(4–8 cc.): Prep.: 1. *Syrupus Trifolii Compositus*, 30 p. c., +, dose, 5j–2 (4–8 cc.).

5. *Gale'ga officina'lis*, *Galega*, *European Goat's Rue*, *N.F.*—The dried flowering herb with no stems over 4 Mm. ($\frac{1}{8}$ ') thick or more than 3 p. c. of foreign organic matter; S. Europe. Small perennial; stem smooth, 15–45 Cm. (6–18') long, usually cut and broken; leaves imparipinnate, leaflets bright green, lanceolate, 2–5 Cm. ($\frac{4}{5}$ –2') long, 2–6 Mm. ($\frac{1}{12}$ – $\frac{1}{4}$ ') broad; flowers white, violet, racemes; odor indistinct; taste mucilaginous, slightly bitter, astringent—colors saliva yellowish-green. Powder, yellowish-green—stomata, non-glandular hairs, tracheæ, crystal-fibers with calcium oxalate monoclinic prisms, isodiametric parenchyma, pollen grains, few or no starch grains; solvent: diluted alcohol; contains bitter principle, tannin, ash 12 p. c. Galactagogue, diuretic, diaphoretic, vermifuge. Dose, 5ss–1 (2–4 Gm.); 1. *Fluidextractum Galegæ* (diluted alcohol).

6. *Trigonell'a Fæn'um-græ'cum*, *Fenugreek*.—The seed; India, Europe; cultivated in France, Germany, etc. Annual herb, .3 M. (1°) high, leaves trifoliate, leaflets dentate, flowers yellowish, fruit compressed legume containing 16 seed; seed 3 Mm. ($\frac{1}{8}$ ') long and broad, 2 Mm. ($\frac{1}{12}$ ') thick, rhombic, flattened, brownish-yellow, large diagonal groove; strong aromatic, to some pleasant, odor; taste mucilaginous, bitter; contains volatile oil, fixed oil 6 p. c., mucilage 28 p. c., proteins 22 p. c., bitter principle, choline, trigonelline .13 p. c. Powder sometimes adulterated with ground amylaceous seeds. Used similar to flaxseed, elm, althea; emollient cataplasms, enemata, ointments, plasters, decoction, 5 p. c. (usually thick and slimy); demulcent in veterinary condition-powders.

TRAGACANTHA. TRAGACANTH, *U.S.P.*

***Astragalus gummifer*, *Labillardière*,** } The dried gummy exudation.
or other Asiatic species.

Habitat. W. Asia—Asia Minor, Armenia, Kurdistan, Persia, Syria, Greece; mountainous districts.

Syn. Trag., Gum Tragacanth, Goat's Thorn Gum, Doctor's Gum, Hog Gum; Fr. Gomme Adragante; Ger. Traganth.

As-trag'a-lus. L. fr. Gr. ὀστέον, bone, + γάλα, milk—*i. e.*, the milky then horny exudation, or from the seed squeezed into a square-like form similar to vertebrae (αστραγάλος) in some species.

Gum'mif-er. L. *gummi*, gum, + *ferre*, to bear—*i. e.*, plant produces gum.

Trag-a-can'tha. L. fr. Gr. τράγος a goat, + ἀκανθα, thorn—a goat thorn—*i. e.*, plant thorny like goat's head, and hedges made of it resist their onslaughts.

Trag'a-can'th, natively called first: "gum adragant," then "gum dragant," next "gum dragan," finally "gum dragon."

PLANT.—Shrub .6–1 M. (2–3°) high; stem naked with many straggling, much ramified branches; bark reddish-gray, rough, and marked with leaf-scars, young twigs woolly; leaves 3 Cm. (1 $\frac{1}{8}$ ') long, closely placed, pinnate, rachis hard, stiff, persistent for some years as a woody

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spine, yellow, very sharp-pointed; leaflets 10–15 pairs, 3 Mm. ($\frac{1}{8}$ ') long, obovate, grayish-green; flowers small, pale yellow; stamens 10, upper one free, others united in a sheath; fruit small, oblong pod, covered with white hairs; seed 1, reniform, smooth, pale brown. GUM (tragacanth), in flattened, lamellated, frequently curved fragments, straight or spirally twisted pieces, .5–2.5 Mm. ($\frac{1}{50}$ – $\frac{1}{10}$ ') thick, whitish, brownish, translucent, horny; fracture short, rendered more easily pulverizable by heat (50° C.; 122° F.); inodorous; taste insipid, mucil-



FIG. 198.—*Astragalus gummifer* (natural size of branch).

aginous. POWDER, whitish, forming with water a translucent mucilage—numerous starch grains, .003–.025 Mm. ($\frac{1}{8325}$ – $\frac{1}{1000}$ ') broad, occasional 2–4 compound, many swollen and more or less altered, due to excessive heat used in drying before powdering, by which it loses 15 p. c. *Tests*: 1. Add 1 Gm. to 50 cc. of distilled water—swells and forms a smooth, nearly uniform, stiff, opalescent mucilage free from cellular fragments (Indian gum—uneven mucilage with few reddish-brown fragments, separating on stirring in coarse, uneven strings).

2. Shake 2 Gm. with 100 cc. of water, when fully swollen and free from lumps add 2 Gm. of powdered sodium borate, shake until dissolved—mucilage does not lose transparency, change consistency, or appear slimy or stringy on pouring, even after standing 24 hours (abs. of foreign gums). 3. Boil 1 Gm. with water 20 cc. until a mucilage results, add hydrochloric acid 5 cc. boil for 5 minutes—no pink or red color develops (abs. of Indian gum). *Solvents*: hot water; cold water best. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—*Cherry Gum* (cherry, almond, plum, etc.)—in irregular brownish nodules, insoluble portion not identical with bassorin; *Indian (Bassora, Kutera, Hogg) Gum*, Persia—broken up in Smyrna and mixed with tragacanth; occurs in yellowish-brown (sometimes whitened with lead carbonate), angular, tasteless masses, swelling with water; *Cashew Gum*—brownish-yellow, translucent, iridescent, partly soluble in water.

Commercial.—Tragacanth is not a simple plant juice, but a degenerative product due to the transformation of the cell-walls of pith and medullary rays in the stem and older branches, and exudes spontaneously, July–August, through natural, or artificial punctures, longitudinal and transverse incisions (near the base of stem) into the medullary part which alone yields juice; it only flows at night, the shape of opening and rate determining its final congealed outline, the time of hardening for collection (1–2 weeks, dry weather 3–4 days) governing its color—white if congealed rapidly, yellow to brown if slowly, from long exposure to changeable weather—heavy rains darkening and washing it off upon the ground causing admixture of impurities; the surface lines indicate the daily concretion while the whiter and more translucent possess greatest value. There are several varieties: 1. *Flake (Leaf, Smyrna)*, usually in broad, thick, yellowish flakes, prominently ridged; the ribbon-like and white flakes are produced in Kurdistan, Persia, often being designated as Syrian; 2. *Vermiform (Vermicelli)*, in very narrow contorted string-like pieces, or confluent coils; 3. *Common (Sorts)*, called in Europe *traganton*, being the result of spontaneous exudation and incidental collection while gathering higher grades; occurs in tear-like pieces, rounded or irregular, brownish, waxy, and, like the preceding varieties, encloses starch. Enters commerce from ports of Asia Minor (Smyrna, Constantinople), Persian Gulf, Bagdad, etc.

CONSTITUENTS.—Cellulose, Soluble gum, Bassorin (traganthin, adraganthin), $C_{12}H_{10}O_{10}$, Polyarabinantrigalactan-geddlic acids, Starch, nitrogenous matter, α -tragacanthan-xylan-bassoric acid, xylan-bassoric acid, bassoric acid, β -tragacanthan-xylan-bassoric acid, ash 3.5 p. c. (more than one-half being calcium carbonate).

Cellulose.—The portion of gum insoluble in boiling water, in cold diluted acids and alkalies; when treated with boiling diluted sulphuric acid yields arabinose, and a cellulosic residue which is soluble in ammonia and bromine.

Soluble Gum.—Not identical with arabin, although its solution is precipitated by alcohol and ammonium oxalate; yields a series of gum acids having the nature of the “geddic acids,” but are levorotatory, whereas geddic acids are dextrorotatory.

Bassorin.—This is an acid—soluble in hydrochloric acid, ammonia water; when acted upon by an excess of alkali yields a barium salt and two isomeric acids— α - and β -tragacanthan-xylan-bassoric acid, the former soluble in cold water and yielding sparingly soluble salts of barium, calcium, and silver; when digested with diluted sulphuric acid yields tragacanthose and xylan-bassoric acid, which when further acted on by 5 p. c. sulphuric acid yields xylan and bassoric acid.

PREPARATIONS.—1. *Mucilago Tragacanthæ*. Mucilage of Tragacanth. (Syn., Mucil. Trag.; Fr. Mucilage de Gomme Adragante; Ger. Traganthschleim.)

Manufacture: 6 p. c. Mix glycerin 18 Gm. with water 75 cc. in a tared vessel, heat to boiling, remove heat, add tragacanth 6 Gm., macerate 24 hours, stirring occasionally, add water q. s. 100 Gm., heat until uniform consistence, strain forcibly through muslin. Dose, 3j–2 (30–60 cc.).

2. *Glyceritum Tragacanthæ*, N.F., 12.5 p. c., + glycerin 77.5, water 18.5. 3. *Pilulæ Ferri Carbonatis*, $\frac{1}{6}$ gr. (.01 Gm.). 4. *Trochisci Acidi Tannici*, $\frac{1}{3}$ gr. (.02 Gm.). 5. *Trochisci Ammonii Chloridi*, $\frac{1}{3}$ gr. (.02 Gm.). 6. *Emulsum Olei Morrhuæ cum Malto*, N.F., $\frac{3}{10}$ p. c. 7. *Stili Acidi Salicylici*, N.F., 5 p. c. 8. *Syrupus Trifolii Compositus*, N.F., $\frac{1}{10}$ p. c. 9. *Trochisci Eucalypti Gummi*, N.F., 1 gr. (.06 Gm.). 10. *Trochisci Ulmi*, N.F., $\frac{1}{6}$ gr. (.1 Gm.).

Unoff. Preps.: Pills, Troches—various kinds.

PROPERTIES.—Demulcent, emollient, protective, nutritious.

USES.—Was not known to the Greeks until 4th–5th century, when its uses were as now—expectorant, for cough, hoarseness, similar to acacia; its superior adhesiveness over the latter renders it a better protective in excoriated surfaces, ulcers, burns, etc. Employed largely for suspending resins, oils, heavy powders, etc., in emulsion. Also to cohere pills (paste: 5j + glycerin 3j; 4 Gm., + 30 Gm.), troches, etc.; its partial insolubility in the stomach restricts somewhat its popularity.

Allied Plants:

1. *Astragalus baeticus*.—Mediterranean basin; seed used for coffee. *A. exscapus*; C. and S. Europe, mountains; root mucilaginous, astringent, bitter, diuretic. *A. glycyphyllos*, Europe; leaves and seed sweetish, diuretic. *A. crotalaria*, *Loco Weed*, *Rattle Weed*, and *A. mollissimus*, N. America (Cal., Neb., Tex.); poisonous to cattle, horses, etc., causing spinal tetanic action.

GLYCYRRHIZA. GLYCYRRHIZA, U.S.P.

<p>Glycyrrhiza glabra, Linné, + var. typica, Regel et Herder, glandulifera, Regal et Herder, or other varieties yielding a yellow sweet wood.</p>	}	<p>The dried rhizome and roots with not more than 2.5 p. c. of acid-insoluble ash.</p>
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Habitat. S. Europe, W. Asia, Syria, Persia, N. Africa; cult. in Russia, Spain, England, France, Germany, United States, China; rich low-lands, river valleys.

Syn. Glycyrrh., Liquorice Root, Licorice, Sweet Wood, Italian Juice Root (Wood), Spanish Juice Root, Radix Glycyrrhizæ Hispanicæ; Br. Glycyrrhizæ Radix; Fr. Régisse, Bois de Régisse—doux, Racine douce; Ger. Radix Liquiritiæ, Süßholz, Spanisches Süßholz, Lakritzenholz.

Glyc-yr-rhi'za. L. fr. Gr. γλυκύριζα—γλυκός, sweet, +ρίζα, root—*i. e.*, its saccharine taste (Dioscorides).

Gla'bra. L. *glaber*, smooth, hairless—*i. e.*, pods, leaves smooth on both sides.

Glan-du-lif'e-ra. L. *glandula*, a gland, + *ferre*, to bear—*i. e.*, pods covered with thick glandular spines.

Ty'pi-ca. L. *typicus*, typical, representative—*i. e.*, possessing the strongest characteristics of its group.

Lic'o-rice—*Liq'uo-rice* (lik'o-ris). Fr. *L. liquiritia*, corruption of *glycyrrhiza*.

PLANTS.—Perennial herbs; stem .6–1.5 M. (2–5°) high, several from the (crown) thick rhizome; leaves imparipinnate; leaflets 4–7 pairs, ovate, entire, smooth, glutinous beneath, dark green; flowers yellowish-white or purplish, pulse-shaped, racemes; fruit legume, 2.5 Cm. (1') long, brown, ovate, flat, 1-celled, 1–6 (kidney-shape) seeded; *G. glabra*, var. *glandulifera*—stem somewhat pubescent; leaves hairy, glandular beneath; legumes glandular, prickly. **RHIZOME** (*G. glabra*, var. *typica*): *Spanish*, nearly cylindrical, upper portion somewhat knotty, usually in pieces 14–20 Cm. (6–8') long, 5–20 Mm. ($\frac{1}{3}$ – $\frac{4}{5}$ ') thick, yellowish-brown to dark brown, longitudinally wrinkled; thinner rhizomes often having prominent alternate buds, thicker having distinct corky patches; fracture coarsely fibrous; internally yellow, radiate; bark 1–3 Mm. ($\frac{1}{5}$ – $\frac{1}{8}$ ') thick; wood porous, in narrow wedges, rhizome with small pith—none in roots; odor distinctive; taste sweetish, slightly acrid—bark; (*G. glabra*, var. *glandulifera*): *Russian*, nearly cylindrical, somewhat tapering, sometimes split longitudinally, 15–30 Cm. (6–12') long, 1–5 Cm. ($\frac{2}{3}$ –2') thick, pale yellow when deprived of outer corky layer; fracture coarsely fibrous; internally pale yellow; wood radially cleft; less sweet than preceding. **POWDER**, brownish-yellow with reddish-brown cork cells (Spanish); pale yellow without reddish-brown cork cells (Russian)—numerous wood-fibers, bast-fibers, and starch grains, .002–.02 Mm. ($\frac{1}{12500}$ – $\frac{1}{1250}$ ') broad, tracheæ, crystal-fibers with monoclinic calcium oxalate prisms. *Solvents*: water, diluted alcohol. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—The one variety of the root with the other, as they often are collected together; also the underground stem, which resembles the root, but has a thin central pith; roots of allied species (wood not yellow nor sweet), worm-eaten, decayed and discolored pieces, fibrous roots (little sweetness).

Commercial.—Plants, like lemon and orange, do not thrive in cold latitudes, becoming woody and less sweet, and while formerly the wild grown, owing to hardy, persistent rapacious habit, supplied the demand, now it is cultivated extensively by planting cuttings in rows, 4 feet (1.3 M.) apart. Roots are dug when sweetest, autumn of 4th year—preferably of plants that have not borne fruit, a process that exhausts the sweetness of the sap, by removing the earth 2–3 feet (.6–1 M.)

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deep, the entire length of rows, thereby exposing subterranean portion and allowing easy pulling up of whole plants, from which roots are taken, cleaned, washed, trimmed, assorted, cut into suitable lengths, and marketed via Alicante, Tortosa, Hamburg, in bundles, bales, bags. There are two varieties: 1, *Spanish* (*Italian, Turkish, Alicante, Tortosa*—*G. glabra*, var. *typica*), usually *unpeeled* and for a long time most esteemed, but as bitterness and acidity reside in the bark it now constitutes only one-tenth of that consumed; 2, *Russian* (*G. glabra*, var. *glandulifera*), usually *peeled*, larger, richer in glycyrrhizin and extractives, and in far greater demand. The Calabrian is preferred by many, while the Italian and Sicilian are consumed at home for making the extract.



FIG. 199.—*Glycyrrhiza glabra*, var. *typica*.

CONSTITUENTS.—Glycyrrhizin, $C_{44}H_{63}O_{18}N$, 6–8 p. c., Glycyramarin, $C_{36}H_{57}O_{13}N$ (bitter principle, mostly in the bark), sucrose, glucose, asparagin 2–4 p. c., fat .8 p. c., volatile oil .03 p. c., gum, tannin, starch, resin, yellow coloring matter, ash 5–7 p. c.

Glycyrrhizin.—This is combined with ammonia, being called glycyrrhizate of ammonium or glycyrrhizic acid, $C_{44}H_{62}O_{18}N.NH_4$. It is a tribasic acid (glucoside) obtained from cold infusion by coagulating

albumin with heat, filtering, precipitating with sulphuric acid, washing precipitate with water, dissolving it in alcohol to which a little ether has been added (or in very weak ammonia water, 1 to 10), filtering, evaporating; it is very soluble in water, sparingly in alcohol, ether, when boiled with diluted sulphuric acid (by hydrolysis) splits into parasaccharic acid (glucose), $C_6H_{10}O_8$, and bitter resinous glycyrrhetin, $C_{32}H_{47}O_4N$.



FIG. 200.—*Glycyrrhiza glabra*, var. *typica* (rhizome), natural size.

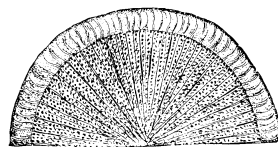


FIG. 201.—*Glycyrrhiza glabra*, var. *glandulifera* (root).

PREPARATIONS.—1. *Extractum Glycyrrhizæ*. Extract of Glycyrrhiza. (Syn., Ext. Glycyrrh., Extract of Licorice, Extractum liquiritiæ, Licorice; Fr. Suc (jus) de Réglisse, Sucre noir; Ger. Succus Liquiritiæ, Süssholzsaft, Lakritz, Lakritzensaft.)

Manufacture: Evaporate decoction to proper consistence, pulverize or mold. This is the commercial extract, in flattened, cylindrical masses or rolls, 15–18 Cm. (6–7") long, 15–30 Mm. ($\frac{3}{8}$ –1 $\frac{1}{8}$ ") thick, glossy black, brittle, sharp, smooth, conchoidal fracture; characteristic, sweet taste; yield 26–32 p. c., containing glycyrrhizin 10–24 p. c.; at least 60 p. c. soluble in cold water; powder brown; ash 8 p. c. Dose, *ad libitum*.

Preps.: 1. *Trochisci Ammonii Chloridi*, 3 gr. (.2 Gm.). 2. *Pilule Ferri Iodidi*, N.F., $\frac{1}{6}$ gr. (.01 Gm.).

2. *Extractum Glycyrrhizæ Purum*. Pure Extract of Glycyrrhiza. (Syn., Ext. Glycyrrh. Pur., Pure Extract of Licorice Root; Br. Extractum Glycyrrhizæ, Extractum Glycyrrhizæ Depuratum; Fr. Extrait de Réglisse (pur); Ger. Succus Liquiritiæ depuratus, Gereinigter Süssholzsaft.)

Manufacture: Macerate, percolate, in metallic percolator, 100 Gm. with boiling water until exhausted, promptly evaporate to a pilular consistency; yield 16–25 p. c. Dose, *ad libitum*.

Prep.: 1. *Fluidextractum Cascaræ Sagradæ Aromaticum*, 4 p. c.

3. *Fluidextractum Glycyrrhizæ*. Fluidextract of Glycyrrhiza. (Syn., Fldext. Glycyrrh., Fluidextract of Licorice, Fluid Extract of Glycyrrhiza; Br. Extractum Glycyrrhizæ Liquidum; Fr. Extrait fluide de Réglisse; Ger. Süssholzfluidextrakt.)

Manufacture: Macerate 100 Gm. + 500 cc. boiling water 2 hours, pack in a tinned or enameled metallic percolator, exhaust with boiling water, promptly evaporate to 75 cc., cool, add alcohol 25 cc., mix, allow to stand 7 days in a stoppered container, decant clear liquid, filter remainder, wash residue with mixture alcohol 1, water 3, q. s. 100 cc. Dose, m̄xv–60 (1–4 cc.).

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Preps.: 1. *Elixir Glycyrrhizæ*. Elixir of Glycyrrhiza. (Syn., Elix. Glycyrrh., Elixir Adjuvans, Elixir of Licorice, Flavoring Elixir; Fr. Elixir de Réglisse—adjuvant; Ger. Gewürzhaftes Lakritzenelixir.)

Manufacture: Mix fluidextract of glycyrrhiza 12.5 cc. with aromatic elixir 87.5 cc., filter. Dose, *ad libitum*; as a flavoring vehicle.

2. *Mistura Glycyrrhizæ Composita*. Compound Mixture of Glycyrrhiza. (Syn., Mist. Glycyrrh. Co., Brown Mixture; Fr. Mixture de Réglisse; Ger. Lakritzenmixture.)

Manufacture: Dilute fluidextract of glycyrrhiza 12 cc. with glycerin 12, water 50, add antimony and potassium tartrate .024 Gm., dissolved in hot water 1.2 cc., then camphorated tincture of opium 12, spirit of nitrous ether 3, and water q. s. 100 cc., mix. Dose, 3ss–4 (2–15 cc.).

3. *Syrupus Sarsaparillæ Compositus*, 1.5 p. c. 4. *Elixir Glycyrrhizæ Aquosum*, N.F., 15 p. c.: Prep.: 1. *Elixir Cascaræ Sagradæ*, N.F., 50 p. c. 5. *Elixir Taraxaci Compositum*, N.F., 6 p. c.

4. *Pulvis Glycyrrhizæ Compositus*. Compound Powder of Glycyrrhiza. (Syn., Pulv. Glycyrrh. Co., Compound Licorice Powder; Fr. Poudre pectorale de Réglisse composée; Ger. Pulvis Liquiritiæ compositus (Pectoralis Kurellæ), Brustpulver.)

Manufacture: Mix oil of fennel .4 Gm. with sucrose 50 Gm., add glycyrrhiza 23.6, senna 18, washed sulphur 8; mix thoroughly, pass through No. 80 sieve. It is greenish-yellow, fennel-like odor—fragments of glycyrrhiza with yellow fibers, crystal-fibers, large tracheæ, starch grains, .002–.02 Mm. ($\frac{1}{12500}$ – $\frac{1}{1250}$) broad; fragments of senna with non-glandular hairs, epidermis, stomata with 2 neighboring cells, crystal-fibers. *Tests*: 1. Moisten .1 Gm. with alcohol 2 cc., + water 10 cc., boil, cool, filter; filtrate—pale yellowish-brown; + 1 drop of potassium hydroxide T. S.—changes at once to yellowish-red; should be free from hydrogen sulphide odor. Dose, 3ss–2 (2–8 Gm.).

5. *Massa Hydrargyri*, 10 p. c.

6. *Fluidglyceratum Glycyrrhizæ*, N.F., 100 p. c.

Preps.: 1. *Syrupus Glycyrrhizæ*, N.F., 25 p. c., + syrup q. s. 100; or macerate root (20) in water (100) + ammonia water (10) for 12 hours, filter, add syrup q. s. 100 parts; or mix fluidextract (2) with syrup (8). Dose, *ad libitum*; mostly for flavoring; 2. *Elixir Bromidorum Quinque*, N.F., 8 p. c.; 3. *Elixir Guaranae et Apii*, N.F., 3 p. c.

7. *Fluidextractum Sarsaparillæ Compositum*, N.F., 12 p. c. 8. *Fluidextractum Trifolii Compositum*, N.F., 21.5 p. c. 9. *Pilulæ Ferri Iodidi*, N.F., $\frac{2}{3}$ gr. (.045 Gm.). 10. *Pilulæ Laxativæ Compositæ*, N.F., $\frac{2}{3}$ gr. (.045 Gm.). 11. *Species Pectorales*, N.F., 15 p. c. 12. *Tinctura Aloes*, N.F., 20 p. c. 13. *Tinctura Aloes et Myrrhæ*, N.F., 10 p. c. 14. *Tinctura Rhei Dulcis*, N.F., 4 p. c.

Unoff. Preps.: Ammoniated Glycyrrhizin, gr. 5–15 (.3–1 Gm.). Decoction, Infusion, each, 5 p. c.

PROPERTIES.—Demulcent, expectorant, laxative; locally—slight stimulant. Increases, when chewed, the flow of saliva and mucus, which secretions are emollient to the throat.

USES.—Febrile catarrhal conditions, bronchitis, bowel and urinary affections; here should be prepared with flaxseed, rice, barley, or gum water. In pharmacy used to mask taste of aloe, ammonium chloride, bitter sulphates, colocynth, guaiacum, hyoscyamus, mezereum, senega, senna, quinine, turpentine, etc. Mechanically as an excipient and dryer in pills, troches, etc.

Allied Plants:

1. *Glycyrrhiza echina'ta*.—Europe, Hungary, S. Russia; flowers in globular heads, pod ovoid with long spines. *G. lepidota*; United States (Mo., Minn.).

2. *Abrus precato'rius*, *Indian (Wild) Licorice*, *Jequirity*, India, Brazil.—Seed used as standard weight, and for criminal poisoning, although inert when taken whole; contain *abrin*, having the action of snake-venom, being cardiac depressant; root contains glycyrrhizin, but is a poor substitute for glycyrrhiza.

3. *Ono'nis spino'sa*, *Rest-harrow*, Europe.—Root .6 M. (2°) long, 12 Mm. ($\frac{1}{2}$ ') thick; odor and taste similar to official glycyrrhiza.

4. *Ar'achis hypogæ'a*, *Peanut*, *Groundnut*.—Tropical America, cult. United States. Small succulent plant, yielding abundant subterranean seed, which are edible, popular and contains fixed oil 45 p. c. suitable for replacing sesame or olive oil.

SANTALUM RUBRUM. RED SAUNDERS, U.S.P.

Pterocarpus santalinus, } The heart-wood.
Linné filius.

Habitat. Madras; cultivated in S. India, Ceylon, Philippines.

Syn. Santal. Rub.; Red Santal, Chandam, Chundana, Ruby Wood; Br. Pterocarpi Lignum, Red Saunders (Sandal) Wood; Fr. Santal Rouge; Ger. Rothes Sandelholz.

Pter-o-car'pus. L. from Gr. πτερόν wing, + καρπός fruit—*i. e.*, its winged fruit pods or legumes girdled with a broad crisped wing.

San-ta-li'nus. L. adj. form fr. *sandal*, Pers. *sandal*, useful; Gr. σάνταλον.

San'ta-lum. L. noun form; sandalwood, saunders.

Ru'brum. L. *ruber*, red, ruddy—*i. e.*, the color of the wood.

PLANT.—Tree 6–9 M. (20–30°) high, .3–.5 M. (12–18') thick, some trunks hollow; leaves trifoliate; leaflets broadly oval, emarginate, 5–15 Cm. (2–6') long, hoary beneath; flowers yellow, papilionaceous corolla, spikes; fruit orbicular legume, wing slightly crisped, 2-seeded. HEART-WOOD, in billets, logs, 1–1.6 M. (3–5°) long, 10–20 Cm. (4–8') thick, deprived of light-colored sap-wood, hard, heavy, dark reddish-brown, splitting coarse-splintery; usually in coarse

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powder, purplish to brownish-red, nearly odorless and tasteless. POWDER, reddish-brown—numerous wood-fibers of irregular outline and sharp pointed ends, occasionally forked, lumina filled with fine, granular protoplasmic content, occasional tracheæ filled with yellow, resinous masses, medullary rays 1 cell wide, 3–6 deep, crystal-fibers with prisms of calcium oxalate; mounts in chloral hydrate T. S.—deep, rich red color. *Tests*: 1. Mix .5 Gm. with ether 10 cc.—solution orange-yellow, with greenish fluorescence in bright light; .5 Gm. with alcohol 10 cc.—solution distinctly red. 2. Mix .5 Gm. with water 10 cc.—liquid clear and colorless. *Solvents*: alcohol; ether; acetic acid; alkaline solutions; boiling water or diluted alcohol partially.

PREPARATION.—1. *Tinctura Lavandulæ Composita*, 1 p. c.

CONSTITUENTS.—Santalin .25–.5 p. c., Santal, Pterocarpin, Homopterocarpin.

Santal (*santalic acid*), $C_{17}H_{16}O_5$.—Coloring matter, obtained by precipitating alcoholic tincture with lead acetate, washing precipitate with hot alcohol, decomposing it with hydrogen sulphide in the presence of alcohol, evaporating; occurs in red needles, inodorous, tasteless, resinous, soluble in alcohol (blood-red), ether (yellow), sulphuric acid (deep red), alkalies (violet), also in oils of clove, cinnamon, bergamot, bitter almond.

Santal, $C_8H_6O_3$, **Pterocarpin**, $C_{20}H_{16}O_6$, **Homopterocarpin**, $C_{24}H_{24}O_6$ —All occur in colorless scales—the latter soluble in carbon disulphide and when fused with potassium hydroxide yields phloroglucin.

USES.—Red Saunders has no important medicinal properties, being used only for imparting color. Employed natively as an astringent and with sapan wood for dyeing silk, cotton, wool, giving various reds according to mordants used.

Allied Plants:

1. *Ichthyome'thia Piscip'ula* (*Piscid'ia Erythri'na*), *Jamaica Dog-wood*.—W. Indies. Well-developed tree, whose root-bark has long been used for catching fish, orange-yellow, fissured, tough, fibrous, odor opium-like, taste bitter, acrid; contains piscidin piscidic acid, resin, starch, fat. Narcotic, analgesic, soporific; neuralgia, nervous insomnia, whooping cough, dysmenorrhea; similar to opium, but less powerful, and devoid of unpleasant after-effects. Dose, ʒss–1 (2–4 Gm.); extract, fluidextract.

KINO. KINO, *U.S.P.*

Pterocarpus Marsupium , <i>Rozburgh.</i>	{	The dried juice from the trunk, yielding not less than 45 p. c. alcohol-soluble extractive, or 80 p. c. water-soluble extractive.
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Habitat. E. India, in forests; C. and S. India (Malabar), Ceylon, Bengal.

Syn. Gummi (Resina) Kino, Vengay, Bastard Teak, Bija, Amboyna Kino Tree; Br. Kino, Kino Eucalypti (*Eucalyptus* (Red) Gum); Fr. Kino de l'Inde; Ger. Kino.

Mar-su'pi-um. L. *marsupium*, a pouch, bag, purse—*i. e.*, shape of the fruit.

Ki'no. E. India name as given the extract.

PLANT.—Large tree, 18–24 M. (60–80°) high, .6–1 M. (2–3°) thick, many spreading branches; bark brownish-gray, internally red and fibrous; leaves alternate, imparipinnate, deciduous; leaflets 5–7, alternate, 5–10 Cm. (2–4') long, obovate, emarginate, coriaceous; flowers May–June, pale yellow; fruit indehiscent pod, orbicular, 2.5–4 Cm. (1–1½') broad; seed 1, kidney-shaped. JUICE (kino), in small, brittle, angular fragments, usually less than 10 Mm. (¾') broad, dark reddish-brown, reddish-black; inodorous; taste very astringent; upon mastication coloring saliva pink. POWDER, dark red—angular fragments, with glass-like, conchoidal surface, thinner pieces translucent, yellowish-red, brownish-red; mounted in water—fragments rounded, gradually disintegrate, leaving colorless, granular particles, some being rod-shaped bacteria and a few cellular fragments; mounted in alcohol—red color of fragments deepens, translucency increases, the angular outlines being preserved while solution takes place. Tests: 1. Add boiling water, cool, filtrate faintly acid; with ferric chloride T. S.—dark green precipitate; with alkalies—reddish-violet color. Solvents: alcohol, to the extent of 90 p. c.; boiling water to the extent of 40–80 p. c.; alkalies, with impairment of astringency. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—Inferior juices, catechu, dragon's blood (insoluble in water), kinos containing gum (swelling in water, alcohol), etc.

Commercial.—Plant, called natively *Buja*, is prized for fine timber and juice, the privilege of tapping trees for the latter being granted by the government to highest bidders; it is collected to some extent the entire year, but chiefly during inflorescence, dry season, February–March (when it is better and easier dried), by cutting into the tree-trunk to the cambium a perpendicular incision and lateral feeders; the juice, resembling currant-jelly, exudes freely into clay cups, bamboo-joints, etc., placed at the bottom of main incision, when it is dried in the sun and air (inspissated) or boiled to the consistency of a thick extract, occasionally skimming off impurities, then poured into shallow pans to dry until crumbly (half-inch layer requiring a week) and packed in wooden boxes for market. Trees yield most at night and when small often are killed by excessive bleeding, which may be averted by resting alternate years; each produces about 24 ounces (.7 Kg.) that upon evaporation becomes half as much kino. Liquid preparations, especially in diluted alcohol tend to gelatinize (with loss of astringency) from presence of an enzyme—destroyed by boiling—and should be kept in small bottles and seldom opened; the menstruum making a permanent solution is alcohol 65, water 20, glycerin 15 volumes, although alcohol 50, water 25, glycerin 25 usually gives satisfaction. There are several varieties: 1, *Malabar* (*E. India*), official, described above, rarely found on the market; 2, *African* (*Gambia*—*P. erina'ceus*), similar to preceding, not in our market but common in England; contains tannin 50–60 p. c.; 3, *Bengal* (*Palas*, *Butea Gummi* (Br.)—*Bu'tea frondo'sa*) in transparent ruby-red tears,

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fragments, often with leaf-vein impressions, brittle, not adhesive on mastication, yields pyrocatechin on dry distillation, one-third to one-half soluble in hot alcohol, the remainder being mucilaginous matter; contains tannin 15–35 p. c.; 4, *Australian* (*Botany Bay, Kino Eucalypti* (Br.)—*Eucalyptus rostrata*, *E. amygdalina*, *E. resinifera*, and other species of Myrtaceæ), not very brittle, adheres to teeth, tinges saliva red, soluble in alcohol, 80–90 p. c., in water, lessening with age; furnishes much of the present commercial kino; contains tannin 45–50 p. c.; 5, *W. India* (*Jamaica, Caracas—Coccoloba uvifera*, Polygonaceæ), obtained by boiling the violet-brown wood and bark of the large tree, evaporating the decoction; resembles official but has brownish tint, less glossy, bitter, soluble in water, alcohol (90 p. c.); contains tannin 70 p. c.



FIG. 202.—*Pterocarpus Marsupium* (Kino): A, flowering twig; 1, 2, 3, parts of the flower; 4, stamens; 5, pistil; 6, fruit; 7, vertical section of winged fruit.

CONSTITUENTS.—Kino-tannic acid, $C_{18}H_{18}O_8$, 40–80 p. c., Kino-red, $C_{28}H_{22}O_{11}$, Pyrocatechin (pyrocatechuic acid, catechol), $C_6H_6O_2$, Kinoin, $C_{14}H_{12}O_6$, gum, ash 1.3–3 p. c.

Kino-tannic Acid.—Similar to catechuic acid, always mixed with coloring matter and pectin in extraction; with ferric salts—greenish-black, with ferrous salts in neutral solutions—violet color.

Kino-red.—Obtained by exposing cold aqueous solution to the air, when red precipitate slowly forms, hastened by heating, or heat kinoin to $130^\circ C.$ ($266^\circ F.$); it is amorphous, tasteless, nearly insoluble in water, and is the anhydride of kinoin: $2C_{14}H_{12}O_6 - H_2O = C_{28}H_{22}O_{11}$.

Pyrocatechin.—Obtained by treating kino with ether, or the product of dry distillation of kino contains much of it, which may be purified by resublimation; soluble in ether, water.

Kino.—Boil kino with diluted hydrochloric acid, kino-red immediately separates, now agitate clear solution with ether; occurs in white crystals, slightly soluble in ether, cold water, red with ferric chloride.

PREPARATIONS.—1. *Tinctura Kino.* Tincture of Kino. (Syn., Tr. Kino; Fr. Teinture de Kino; Ger. Kinotinktur.)

Manufacture: 10 p. c. Agitate thoroughly in a flask 10 Gm. with boiling water 50 cc., heat for 1 hour on water-bath containing boiling water, shaking frequently, cool, add recently boiled water q. s. 50 cc., then add alcohol 50 cc., stopper flask, set aside in cool place for 24 hours, decant through cheesecloth. Should be kept cool, dark, in small, tightly-stoppered bottles. Dose, \mathfrak{z}_{ss} -2 (2-8 cc.).

Unoff. Preps.: *Compound Powder of Kino and Opium*, 75 p. c., + opium 5, cinnamon 20, dose, gr. 10-15 (.6-1 Gm.). *Compound Tincture of Kino and Opium*, 20 p. c. (tincture), + tincture of opium 10, \mathfrak{z}_{ss} -1 (2-4 cc.). Fluidextract, Infusion, Gargle.

Owing to gum (pectin) coagulating, the liquid preparations are very unstable, consequently catechu often is used instead with equally good results.

PROPERTIES.—Astringent, tonic, hemostatic; similar to but less powerful than tannin; locally inferior to other astringents.

USES.—Diarrhea, pyrosis, menorrhagia, dysentery, leucorrhea, ulcers, sore throat, epistaxis, hemorrhages, diabetes, manufacture of wines. Useful in dyeing and tanning, but rather too expensive.

Incompatibles: Aqueous solution is precipitated by gelatin, soluble salts of iron, silver, lead, antimony, mercuric chloride, sulphuric, nitric, and hydrochloric acids.

ARAROA. GOA POWDER, *Br.*

Chrysarobinum. Chrysarobin, $C_{30}H_{26}O_7$, *U.S.P.*

Vouacapoua Araroba, *Aguar* Druce. $\left\{ \begin{array}{l} \text{A mixture of neutral principles obtained from} \\ \text{Goa Powder, a substance deposited in the} \\ \text{wood (of this plant).} \end{array} \right.$

Habitat. Brazil, Bahia; in damp forests.

Syn. Araroba or Arariba Tree, Po(h)de Bahia, Crude Chrysarobin; Chrysarob.; Fr. Poudre de Goa, Chrysarobine; Ger. Goa Pulvre, Chrysarobin.

Vou-a-ca-pou'a. L. fr. native C. American name (nomen caribæum), *voicapou*.

Ar-a-ro'ba. L. fr. E. India name, *ar(ar)oba*, as applied to the bark.

Chrys-ar-o-bi'num. L. for *Chry-sar'o-bin*, fr. Gr. χρυσός, gold, + *ar(ar)oba*.

Go'a. After Portuguese colony of Goa, on the Malabar coast of India, to which it was imported from Bahia, in Brazil, 1852.

PLANT.—Large tree 24-30 M. (80-100°) high; trunk smooth, spheroidal, head not very bushy; leaves paripinnate, with long petioles; flowers purple, paniculate racemes; wood yellow, with numerous longitudinal canals and many irregular transverse interspaces or lacunæ

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in which the Goa Powder is found—a result of decay or chemical changes in the cell-walls of the trunk-wood (medullary rays), being possibly an antiseptic preservative of the plant; yields much chrysophanic acid by oxidation.

Commercial.—Tree resembles the copaiba, and is called natively *Angelim Amargoso*; the oldest yield most powder, which is obtained by felling, splitting the tree, and then scraping the powder from the clefts, those doing this often suffering with irritated eyes and face; occurs as a light yellow powder when fresh, but brownish on exposure, slightly crystalline, rough, mixed with wood fibers, inodorous, bitter; 7 p. c. soluble in water, 80 p. c. in benzene, 50 p. c. in hot chloroform.

CONSTITUENTS.—GOA POWDER: Chrysarobin 65–85 p. c., gum 7 p. c., resin 2 p. c., bitter extractive 7 p. c., woody fiber 5 p. c., ash .3–3 p. c.

Chrysarobinum. Chrysarobin.—Obtained by treating Goa Powder with hot benzene (hot chloroform), evaporating to dryness, powdering. It is a brownish, orange-yellow, microcrystalline powder, tasteless, odorless, irritating mucous membrane, soluble in alcohol (385), chloroform (13), ether (160), benzene (30), carbon disulphide (180), solutions of fixed alkali hydroxides (red), slightly in water and boiling water—neutral; contains methyl chrysarobin in varying percentage, and is a reduced quinone. *Tests:* 1. Dissolve in sulphuric acid—deep red solution, which poured into water deposits chrysarobin unchanged. 2. Incinerate—ash .25 p. c.; shake 1 Gm. with potassium hydroxide T. S. (10)—yellow, yellowish-red, deep red, due to absorbing oxygen from the air, producing chrysophanic acid— $C_{30}H_{26}O_7 + O_4 = 2C_{15}H_{10}O_4 + 3H_2O$, or inversely— $2C_{15}H_{10}O_4 + H_8 = C_{30}H_{26}O_7 + H_2O$. 3. Mix .002 Gm. with 2 drops of fuming nitric acid—red mixture, turning violet-red with a few drops of ammonia T. S. (dif. from chrysophanic acid—yellow liquid). Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ (.008 Gm.).

PREPARATION.—1. *Unguentum Chrysarobini*. Chrysarobin Ointment. (Syn., Ung. Chrysarob.; Fr. Pommade de Chrysarobine; Ger. Chrysarobinsalbe.)

Manufacture: 6 p. c. Triturate chrysarobin 6 Gm. with hydrous wool fat 94 Gm. previously melted, heat on water-bath for 20 minutes, stirring occasionally, strain (thereby removing about 1 p. c.), stir until congealed.

PROPERTIES.—Irritant, in doses of gr. 20 (1.3 Gm.) gastro-intestinal irritant, causing large watery, bilious stools, vomiting, nausea. Externally—produces diffuse dermatitis, followed by follicular and furuncular inflammation; stains skin dark brown, removed by chlorinated lime.

USES.—Parasitic skin diseases of vegetable origin, ringworm, acne, favus, psoriasis, chronic eczema, hemorrhoids—ointment; solution in water, vinegar, or chloroform—allowed to dry then cover with collodion; suppositories, 1 gr. (.06 Gm.)—hemorrhoids.

Allied Compounds:

1. *Anthrarobin* (*Desoxyalizarin*), $C_{14}H_{10}O_3$.—Obtained from the coal-tar product alizarin by action of nascent hydrogen; it is a strong deoxidizing agent, miscible with fats, weaker, less irritating and toxic than chrysarobin, soluble in alcohol, glycerin.

2. *Hydroxylamine Hydrochloride*, NH_2OHHCl .—This does not stain the skin, hence is preferred often to the other reducing agents (chrysarobin, pyrogallol, anthrarobin, etc.) in skin diseases, but being a poison, care should be exercised not to allow too much to be absorbed by the system.

Allied Plants:

1. *Coumarou'na* (*Dip'teryx*) *odora'ta*, *Tonka Bean*; *Coumarinum*, *Coumarin*, *N.F.*—The anhydride of ortho-oxycinnamic acid occurring naturally in this plant, also in *Melilo'tus officina'lis* and others, or prepared synthetically; Guiana. Large tree; fruit resembles mango, peach, oblong-ovate, single-seeded; seed 4 Cm. ($1\frac{3}{5}$ ') long, compressed, rounded at each end, testa dark brown, thin, wrinkled, somewhat glossy, often covered with small white crystals (coumarin); kernel brownish, oily; odor agreeably aromatic, resembling vanilla; taste bitter, aromatic. There are two varieties: 1, Dutch; 2, English; contains coumarin (odorous principle) 1.5–2 p. c., fixed oil 25 p. c., sugar, mucilage. Coumarin, $C_9H_6O_2$ —developed in process of curing by steeping seed in rum, or 80 p. c. alcohol, for 1–2 days, concentrating, adding water to separate fixed oil; occurs in colorless, prismatic crystals, characteristic fragrant odor, bitter, aromatic, burning taste; soluble in alcohol, ether, chloroform, fixed or volatile oils, sparingly in water, more readily in hot water. Saturated aqueous solution + iodine T. S. —brown, flocculent precipitate, which clots on shaking, forming dark green curdy mass and clear liquid (dist. from vanillin); solution in ether—not extracted by ammonia water (dist. from vanillin). Narcotic, stimulant, insecticide, paralyzant to the heart; whooping-cough (fluidextract), flavoring sachets, cigars, tobacco, butter, perfumery, deodorizing iodoform. Dose, gr. 5–10 (.3–.6 Gm.). Coumarin 65 times stronger; 1. *Oleum Ricini Aromaticum*, $\frac{1}{100}$ p. c.

2. *Glyc'ine* (*So'ja*) *his'pida*, *Soja Bean*.—Japan, cultivated S. Asia; contains casein 40 p. c., fixed oil 15–20 p. c., dextrin 10, starch 5, cellulose 5, water 10, amylolytic ferment. Owing to the beans containing so little starch they are ground into flour, and made into bread for diabetic patients, in order to decrease sugar in the urine; plant—turned under as a nitrogenous fertilizer to land.

3. *Mucu'na pru'riens*, *Cowhage*, *Cowitch*.—Hairs of the pods, U.S.P. 1840–1870; E. and W. Indies. Climbing plant, flowers resemble those of the pea, purple; leaflets hairy; pods coriaceous, shape of italic letter *f*, 10 Cm. (4') long, covered with brown hairs, 2.5 Mm. ($\frac{1}{10}$ ') long, stiff, filled with brown granular matter, readily penetrating the skin, causing violent itching. Detached from pods (which then are eaten as also when green in India) by dipping into honey, scraping into paste; con-

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tains resin, tannin. Anthelmintic for round worms; irritant in paralysis; action on worms thought to be mechanical. Dose, gr. 1-3 (.06-.2 Gm.), followed by calomel, jalap; ointment also used.

4. *Flemingia rhodocar'pa*, *Wars*, *Wurru* (Ar. for saffron); E. Africa. Cylindrical glands and long hairs of the fruit—a deep purple powder, coarser than but used instead of kamala; turns black in water, odor slight; contains flemingin, similar to rottlerin.

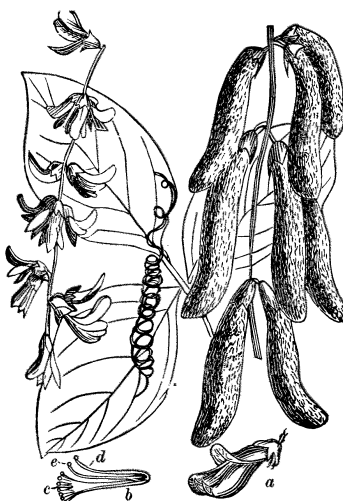


FIG. 203.—*Mucuna pruriens*: a, flower; b, stamen system; c, anthers; d, filament; e, anther.

PHYSOSTIGMA. PHYSOSTIGMA.

Physostigminæ Salicylas. **Physostigmine Salicylate**, $C_{15}H_{21}O_2N_3 \cdot C_7H_6O_3$, U.S.P.

Physostigma venenosum, { The salicylate of an alkaloid obtained from the dried ripe seed.

Habitat. W. Africa (near mouths of Niger and Old Calabar Rivers, in the Gulf of Guinea); introduced into India and Brazil.

Syn. Calabar Bean, Ordeal Bean, Chop Nut, Split Nut; *Physostigmatis Semina*; Fr. Fève de Calabar; Ger. Faba Calabarica, Kalabarbohne; *Physostig. Salicyl.*, Eserine Salicylate; Fr. Salicylate d'Eserine; Ger. *Physostigminum salicylicum*, *Physostigminsalicylat*.

Phy-so-stig'ma. L. fr. Gr. *φύσα*, a bladder, + *στίγμα*, stigma—*i. e.*, stigmatic appendage is hollow and inflated.

Ven-e-no'sum. L. *venenosus*, full of poison, poisonous—*i. e.*, plant's property.

Cal'a-bar Bean—*i. e.*, bean from the Calabar district on W. African coast.

PLANT.—Woody, perennial climber; stem 12-15 M. (40-50°) long, 5 Cm. (2') thick, smooth; root spreading; leaves large, pinnately

trifoliate, leaflets 7.5–15 Cm. (3–6') long, ovate pointed; flowers purplish, racemes; fruit June–Sept., legume 10–17.5 Cm. (4–7') long, compressed, pale brown, 2-valved, dehiscent, inside woolly, 2–3-seeded. Seed, oblong, ellipsoidal, somewhat compressed reniform, 15–30 Mm. ($\frac{3}{5}$ – $1\frac{1}{5}$ ') long, 10–15 Mm. ($\frac{2}{5}$ – $\frac{3}{5}$ ') broad, 12 Mm. ($\frac{1}{2}$ ') thick, reddish, chocolate-brown, smooth, brownish-black groove, 2 Mm. ($\frac{1}{12}$ ') wide, extending almost the entire length of convex edge, margins of seed-coat on both sides of the groove somewhat elevated, brownish-red and



FIG. 204.—*Physostigma venenosum*.

thickened; 2 concavo-convex cotyledons; taste at first starchy, afterward acrid. Powder, grayish-white—numerous starch grains, fragments of seed-coat with thick cells resembling stone cells, occasional fragments with tracheæ. Embryo 72 p. c., integuments 28 p. c., the former when moistened with potassium hydroxide T. S.—pale yellow; solvent: alcohol. Dose, gr. 1–4 (.06–.26 Gm.).

ADULTERATIONS.—*P. cylindrosperma*, seed 4 Cm. ($1\frac{3}{8}$ ') long, nearly cylindrical, groove and hilum shorter, not extending quite to the end; *En'tada scan'dens*, seed round, flat, 5 Cm. (2') broad (poisonous),

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also *Elæ'is guineen'sis*, *Oil Palm Seed*, and seeds of *Mucuna* species, none of which resemble Calabar bean.

Commercial.—Plant first noticed medicinally in 1846, and, except ligneous stem, resembles our String and Lima Beans (*Phase'olus multifo'rus* and *P. luma'tus*), preferring banks of streams into which the fruit often falls only to be dispersed and conveyed to settlers more or less remote.

CONSTITUENTS.—Physostigmine (eserine) .1 p. c., eseridine, physovenine (strong myotic), eseroline, eseramine, $C_{16}H_{25}O_3N$ (crystalline physiologically inactive), calabarine (liquid, not yet obtained pure, antagonistic to physostigmine, tetanic, may cause diarrhea and convulsions, soluble in alcohol, water, insoluble in ether), phytosterin—separable into sitosterin 80 p. c., stigmasterin 20 p. c., which crystallizes with 1 molecule of H_2O , inactive, starch 48 p. c., proteins (albumin) 23 p. c., gum, fat, ash 3–4 p. c.

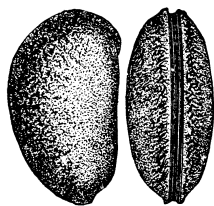


FIG. 205. — Physostigma: view from the side and edge, showing length of hilum.

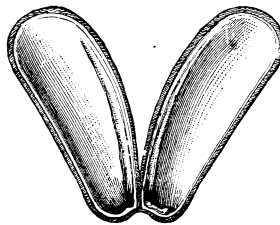


FIG. 206.—Physostigma split, showing cotyledons.

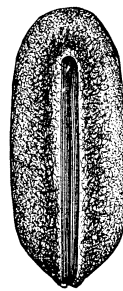


FIG. 207.—*Physostigma cylindrosperma*.

Physostigmine, $C_{15}H_{21}O_2N_3$.—Chiefly in embryo; claimed to be a reduction product of geneserine, $C_{15}H_{21}O_3N_3$, and is obtained by mixing powdered bean with 1 p. c. of tartaric acid, exhausting with alcohol, evaporating, treating residue with water, agitating filtrate with ether to remove color, adding sodium bicarbonate, shaking with ether, evaporating, getting colorless, amorphous physostigmine; hygroscopic, liquefies at $45^\circ C.$ ($113^\circ F.$), tasteless, soluble in alcohol, ether, chloroform, benzene, carbon disulphide, slightly in water; forms salts (benzoate, citrate, hydrobromide, hydrochloride, nitrate, etc.). With alkalis or chlorinated lime yields red *rubreserine*; with sulphuric acid gives yellow, then olive-green. Dose, gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.).

Physostigminæ Salicylas. **Physostigmine Salicylate**, $C_{15}H_{21}O_2N_3.C_7H_6O_3$, *U.S.P.*—Obtained by neutralizing alcoholic or ethereal solution of physostigmine with salicylic acid, allowing to crystallize; it is in colorless, faintly yellow, shining crystals, odorless, acquiring red tint on exposure (must use great caution in tasting); soluble in water (75), hot water (16), alcohol (16), hot alcohol (5), chloroform (6), ether (250);

cold, saturated aqueous solution neutral or faintly acid, usually pink on standing. *Tests*: 1. Aqueous solution with ferric chloride T. S.—deep violet color; solution of .1 Gm. + 2 cc. of sulphuric acid—not darker than yellow within 5 minutes (abs. of readily carbonizable substances). 2. Evaporate .005 Gm. to dryness with a few drops of ammonia T. S.—blue residue, which dissolved in alcohol, + acetic acid in excess—red, fluorescent solution; cold saturated solution 5 cc., + few drops of sodium hydroxide T. S.—pink color rapidly develops; incinerate .1 Gm.—ash negligible. *Impurities*: Sulphate, readily carbonizable substances. Should be kept dark, in small, well-closed containers. Dose, gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.).

Eseridine, $C_{15}H_{22}O_3N_3$.—By some thought to be calabarine, is a derivative of physostigmine, from which it differs by containing H_2O , and into which it can be converted by dilute acids; obtained from its mother-liquor by precipitating with lead subacetate and ammonia, evaporating filtrate, treating residue with alcohol, precipitating with phosphotungstic acid, decomposing with baryta; occurs in 4-sided crystals, soluble in alcohol, chloroform, ether, acts similar to physostigmine. Dose, gr. $\frac{1}{20}$ – $\frac{1}{10}$ (.003–.006 Gm.).

PREPARATIONS (Unoff.). **SEED**: *Extract*, gr. $\frac{1}{10}$ – $\frac{1}{2}$ (.006–.03 Gm.), *Tincture*, 10 p. c. (alcohol), $\mathfrak{m}\nu$ –20 (.3–1.3 cc.). *Lamellæ Physostigminæ* (Br.—sulphate), $\frac{1}{1000}$ gr. (.00006 Gm.).

PROPERTIES.—Sedative, myotic, motor depressant, paralyzant, emetic, purgative, diaphoretic, sialagogue, poisonous. Stimulates salivary, gastric, and intestinal secretions, peristalsis, acting directly upon the unstriated muscle-fibers, quickens breathing, then retards it, heart becomes slow and irregular, but more powerful, finally feeble and ceasing altogether, depresses, ultimately paralyzes spinal cord reflex, and motor centers.

USES.—Tetanus, chorea, epilepsy, progressive paralysis, tonic convulsions, gastralgia, strychnine and atropine poisoning, constipation (combined with belladonna and nux vomica). Externally—in neuralgia, muscular rheumatism, malignant tumors. Physostigmine salicylate ($\frac{1}{2}$ p. c. in water, few drops into eye) for breaking up ocular adhesions (iris, cornea, lens), lessen intra-ocular tension, iritis, corneal ulcers, prolapsed iris, paralysis of the iris accommodation following diphtheria, glaucoma. In Africa as *ordeal bean* of Calabar for punishing criminals and for witchcraft, the accused having to eat them until they vomit or die: if former, innocent; latter, guilty (?). A paste of 20 seed will kill.

Poisoning: Have nausea, giddiness, abdominal pain, indistinct vision, diminished heart action, muscular tremors and weakness, then complete relaxation, retarded respiration, motor paralysis, sphincters contract, cold extremities, skin covered with cholera-like sweat. Conscious until death, which is caused by carbon dioxide narcosis, and paralysis of the respiratory centers and heart-muscle. Evacuate stomach (emetics, pump); give atropine (physiological antidote)

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hypodermically, gr. $\frac{1}{30}$ (.002 Gm.); tannin, chloral hydrate (spine), strychnine, diffusible stimulants, coffee, ammonia, digitalis, alcohol, artificial heat and respiration, electricity. Empty bladder often (catheter), as the drug is eliminated by kidneys (bile and saliva), and urine becomes poisonous.

Incompatibles: Vegetable astringents, tannin, caustic alkalies, atropine, chloral hydrate, motor and tetanizing excitants.

Synergists: Motor depressants, conium, gelsemium, amyl nitrite, etc.

Allied Plants:

1. *Gera'nium macula'tum*, *Geranium*, *Cranesbill*, *N.F.*—Geraniaceæ. The dried rhizome with not more than 2 p. c. of foreign organic matter; N. America, rich woods, thickets. Perennial, hairy herb, .3–.6 M. (1–2°) high; leaves palmately 5–7-lobed, each lobe incised at apex, cuneate, hairy, pale green with paler spots; flowers large, purplish, umbels; petals 5, entire; fruit long-beaked. Rhizome, cylindraceous, 2.5–10 Cm. (1–4') long, 3–15 Mm. ($\frac{1}{8}$ – $\frac{3}{8}$ ') thick, somewhat branched, bent, flattened, strongly tuberculated, root-scars, wrinkled, dark purple-brown, internally light purple-brown; fracture short, non-

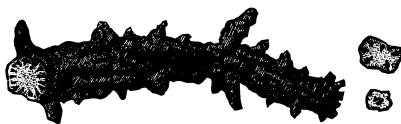


FIG. 208.—*Geranium maculatum*: rhizome and transverse section of rhizome and root, natural size.

fibrous, bark thin, cambium distinct, irregular, wood-wedges, large central pith, few fibro-vascular bundles; odorless; taste strongly astringent. Powder, purplish-brown—cortical and pith parenchyma, starch grains, calcium oxalate rosettes, cork cells with brownish amorphous content, fragments bluish-black with ammonio-ferric alum T. S.; tracheæ, tracheids; solvents: alcohol, water; contains tannin 10–28 p. c., gallic acid, resin, crystalline principle, geranium-red, a phlobaphene formed from the tannin, ash 8 p. c. Astringent, tonic; diarrhea, chronic dysentery, hemorrhages, gleet, leucorrhea, aphthæ, relaxed vagina, throat, uvula, rectum, indolent ulcers. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Geranii* (75 p. c. alcohol). Extract; Tincture; Decoction, 5 p. c. (water or milk); "Eclectic" *geranin*.

2. *G. Robertia'num*.—Europe; popular astringent for hemorrhage, diuretic for gravel. *Ero'dium* (*Geranium*) *moscha'tum*, *Stork's-bill*; diaphoretic. *E. cicuta'rium*, *Heron's-bill*; diuretic for dropsy.

35. LINACEÆ. Flax Family.

Li-na'se-e. L. *Lin-um* + aceæ, flax, fr. Celtic *llin*, a thread, whence Gr. *λινον*, L. *linum* (classic names), Eng. linen—*i. e.*, its fabric. Herbs. Distinguished by flowers being regular; stamens 5, monadelphous at

base; sepals 5, imbricate, petals 5; ovary 2-5-celled, styles 2-5; fruit capsular, seeds 2 in each cell, albuminous, superior; universal, temperate climates; demulcent, purgative, stimulant, sedative, tonic; fibers, oil.

Genus: **1. Linum.**

LINUM. LINSEED, *U.S.P.*

Linum usitatissimum,
Liné.

The dried ripe seed with not more than 2 p. c. other seeds or foreign organic matter, yielding not less than 30 p. c. non-volatile, ether-soluble extractive—98 p. c. being saponifiable.

Habitat. C. Asia, Egypt, S. Europe, spontaneous in most temperate countries; cultivated in Russia, Egypt, India, United States, S. Europe, England, Holland.

Syn. Flaxseed, Flax, Lint-bells, Winter lien; Br. Lini Semina, Lini Semina Contusa (Crushed); Fr. Lin, Semence (Graine) de Lin; Ger. Semen Lini, Leinsamen, Flachssamen.

Li'num. L. see etymology, page 330, of Linaceæ.

U-si-ta-tis'si-mum. L. sup. adj. fr. *usitatus*, most useful, common, familiar.

Flax seed. AS. *fleax, flechlen*, to braid, plait, twist—i. e., its fibers, + *seed*.

PLANT.—An annual; stem .6 M. (2°) high, stiff, erect, solitary, round, smooth, green; leaves small, lanceolate, acute, entire, sessile, pale green, 2-4 Cm. ($\frac{1}{2}$ –1 $\frac{3}{4}$ ') long; flowers June-July; terminal, bluish; fruit August, globular capsule, size of pea, with persistent calyx at base, crowned with sharp spine, 10-seeded in distinct cells. **SEED**, ovate, oblong-lanceolate, flattened, obliquely pointed at one end, 4-6 Mm. ($\frac{1}{6}$ – $\frac{1}{4}$ ') long, brown, smooth, shiny, raphe a distinct yellow ridge along one edge, hilum and micropyle in depression below pointed end; internally light yellow, brownish; odor slight; taste mucilaginous, oily. **POWDER**, yellowish-brown—large oil globules, irregular fragments of endosperm and seed-coat, the latter with pigment cells filled with brownish insoluble contents, stone cells with porous walls, aleurone grains. **MEAL** (ground, lini farina, crushed linseed), yellow with numerous brown coarse fragments—seed-coat and kernel. *Test:* 1. Boil 1 Gm. fat-free powder or meal with water 50 cc., cool—filtrate + iodine T.S. not more than faint blue (abs. of starch or starch-bearing seeds). *Solvent:* boiling water. Dose, $\overline{3j}$ -2 (4-8 Gm.).



FIG. 209.—*Linum usitatissimum*.

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ADULTERATIONS.—SEED: Foreign seeds and earthy matter 1–25 p. c.—mustard, rape and other cruciferous seeds, sand, small stones; POWDER: Damaged flour, cornmeal, other starchy substances, recognized by microscope or iodine test; expressed cake and that to which mineral oil has been added.

Commercial.—The flax is of ancient origin, being prized for its fabric and medicinal properties; most of our seed now come from Russia and Germany, but the United States furnishes considerable. When exposed to heat, light, damp atmosphere, or otherwise carelessly preserved, especially the ground, it is subject to insect attack, and should not be used after 1 year old.

CONSTITUENTS.—Fixed oil 35–40 p. c. (in nucleus), Mucilage, $C_{12}H_{20}O_{10}$, 15 p. c. (in integuments—viscid, odorless, nearly tasteless, precipitated by alcohol, lead subacetate, but not by tannin), proteins 25 p. c., tannin, amygdalin (resin, wax, sugar, no starch (except in young seed), ash 4–6 p. c.—phosphates sulphates, chlorides of potassium, calcium, magnesium).

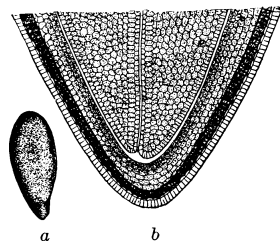


FIG. 210.—Flaxseed: *a*, entire magnified 3 diam.; *b*, transverse section near the edge, magnified 65 diam.

Oleum Lini. Linseed Oil, U.S.P.

(Syn., Ol. Lini, Oil of Flaxseed, Raw Linseed Oil; Fr. Huile de Lin; Ger. Leinöl, Leinsamenöl.) This fixed oil, usually obtained by drying the seed with heat, crushing, and expressing, is a yellowish, oily liquid, peculiar odor, bland taste; gradually thickens and darkens on exposure, acquiring a pronounced odor and taste; slightly soluble in alcohol, miscible with ether, chloroform, petroleum benzin, carbon disulphide, oil of turpentine; slightly acid; sp. gr. 0.930, congeals at $-20^{\circ}C.$ ($-4^{\circ}F.$);

consists of liquid glycerides of oleic acid, $C_{18}H_{34}O_2$ (5), linoleic acid, $C_{18}H_{32}O_2$ (15), linolenic acid, $C_{18}H_{30}O_2$ (15), and isolinoleic acid, $C_{18}H_{32}O_2$ (65) 85–90 p. c., also a mixture of palmitin, myristin, and stearin 10–15 p. c.; also claimed to consist chiefly of linoleic acid, 22–25 p. c. of linolenic acid, and 5 p. c. of solid fatty acids; 1 p. c. of non-saponifiable matter. Linolein, the glyceride of linoleic acid, is considered the drying constituent, which on exposure is converted into oxylinoleic acid hydrate, and finally into linoxyn, $C_{32}H_{54}O_{11}$ (insoluble in ether, and soon forms in the boiled oil). Yield by cold process 16–20 p. c., by heat 25–28 p. c., the latter being darker, with stronger odor and more acid taste. **Tests:** 1. Linseed oil spread in thin layer on glass plate forms a hard, transparent film (abs. of non-drying oils). 2. Add 3 Gm. potassium hydroxide to oil 10 cc. + alcohol 10 cc. + distilled water 10 cc., heat on water-bath until clear; the addition of distilled water 100 cc.—clear solution, free from oily drops (abs. of mineral or rosin oils). 3. Oil 2 cc. + glacial acetic acid 2, agitate, cool, add sulphuric acid 1

drop—greenish color (abs. of rosin or rosin oils, which produce a violet color). *Impurities*: Free acid, non-drying oils, mineral or rosin oils, rosin. Should be kept in well-stoppered containers, and that which has been “boiled” must not be used or dispensed. Dose, ʒ ss–2 (15–60 cc.).

PREPARATIONS.—SEED: 1. *Species Emollientes, Emollient Cataplasma*, *N.F.*, 20 p. c. OIL: 1. *Sapo Mollis*. Soft Soap. (Syn., Sapo Moll., Sapo Viridis, Green Soap; Fr. Savon (mou) vert; Ger. Sapo kalinus, Kaliseife, Grune seife.)

Manufacture: Boil, stirring frequently, dekanormal solution of potassium hydroxide 29 cc. and sodium hydroxide 110 with linseed oil 400 and water q. s. 925, add glycerin 50 cc., boil until clear, add hot water q. s. 1000 Gm., let stand, stir until water absorbed. It is a soft, unctuous, yellowish-white mass, slight characteristic odor, alkaline taste; aqueous solution alkaline; solution in hot distilled water (1 in 20) nearly clear.

Preps.: 1. *Linimentum Saponis Mollis*. Liniment of Soft Soap. (Syn., Lin. Sapon. Moll., Tincture of Green Soap, Spiritus Saponis Kalinus Hebra; Fr. Teinture de Savon vert; Ger. Hebra's Seifenspirit.)

Manufacture: 65 p. c. Mix oil of lavender 2 cc. with alcohol 30, add soft soap 65 Gm., stir or agitate until dissolved, set aside 24 hours, filter, add alcohol q. s. 100 cc.; used externally.

2. *Linimentum Saponis Mollis Compositum, Tinctura Saponis Viridis Composita, N.F.*, 15 p. c.—soft soap 15 Gm., oil of cade 2 cc., alcohol q. s. 100 cc.

2. *Linimentum Calcis*, 50 p. c. 3. *Liquor Cresolis Compositus*, 35 p. c. 4. *Ceratum Resinae Compositum, Deshler's Salve, N.F.*, 13.5 p. c. 5. *Pasta Zinci Mollis, N.F.*, 25 p. c. 6. *Petroxolinum Sulphuratum, N.F.*, 37 p. c.

Unoff. Preps.: SEED. *Infusion*, 5 p. c. *Compound Infusion*, 5 p. c., + glycyrrhiza root 2 p. c. These were once official and are effective from the dissolved mucilage of the epithelium (testa), which is altered starch. Dose, *ad libitum*. *Decoction*, 5 p. c. *Poultice*.

PROPERTIES.—Demulcent, emollient, diluent, diuretic.

USES.—*Infusion* or tea for inflammation of mucous membranes of respiratory, digestive, and urinary organs, renal and vesical irritation, catarrh, dysentery, calculi, strangury. *Decoction*, owing to the oil it contains, is less acceptable to the mouth, but all the better for enema. *Poultice* of ground meal to enlarged glands, swellings, boils, pneumonia, etc., made by adding boiling water to meal for proper consistency and bringing to a boil. Should coat skin with glycerin, olive or other oil before applying, and place as near to affected spot as possible; may cover with oiled silk to retain heat and moisture, and may add olive oil, lard, laudanum or any anodyne, stimulating, or astringent solution to poultice. The oil is laxative (ʒ j; 30 cc.), excellent in piles (ʒ j–2; 30–60 cc. night and morning); sometimes it is added to purgative enemata, also to cover erysipelatous and irritated skin surfaces,

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but with the disadvantages of soon drying (thus rendering skin stiff) and becoming sour and irritating. The *linimentum calcis* is applied to recent burns to allay irritation.

Allied Products:

1. *Flaxseed Cake, Oil-cake*.—Flaxseed when ground yields cake-meal, and this, after being deprived of oil, becomes oil-cake; it still contains all of the nitrogen, 4–5 p. c., and, moreover, a little oil, thus serving well as a cattle food; yields ash 5–8 p. c.

2. *Boiled Linseed Oil*.—Obtained by heating oleum lini to 130° C. (266° F.), while passing a current of air through it, when it boils, losing 6–8 p. c. by weight; or may heat and add litharge, red lead, manganese dioxide, lead acetate or manganous borate, thereby increasing the oil's weight and drying properties. It is darker in color, thicker, sp. gr. 0.939–0.950, and dries faster, hence useful in painting, varnishing, etc., but must never be used in liniments as a substitute for the official ("raw") oil, since irreparable injury (from forming crusts) might be occasioned to burns, etc., in removing dressings.

3. *Flax Liber-fibers*.—These furnish linen, which, when scraped, gives lint, while the primitive short fiber is useful as tow.

36. ERYTHROXYLACEÆ. Coca Family.

Er-i-throx-sil-a'se-e. L. *Erythroxyl-on* + aceæ, fr. Gr. *ερυθρός*, red, + *ξύλον*, wood—*i. e.*, some species have red wood. Shrubs, trees. Distinguished by flowers regular, small, calyx 5-lobed, petals 5, stamens 10, ovary 1–3-celled, superior; fruit drupe; temperate climates, tropics; stimulant, tonic, narcotic, dye.

Genus: **1. Erythroxylon.**

COCA. COCA.**Cocaina. Cocaine, U.S.P.**

Erythroxylon Coca, Lamarck, } An alkaloid obtained from the leaves.
and other species.

Habitat. Peru, Bolivia, Ecuador—eastern slopes of the Andes (Colombia, Brazil, India, Ceylon, Java); cultivated.

Syn. Erythroxylon, Spadic, Coca leaves, Cuca, Hayo, Ipado, Coca Folia; Fr. Feuilles de Coca; Ger. Kokablätter; Cocain, Methyl-benzoyl-ecgonine; Br. Cocaina; Fr. Cocaine; Ger. Cocainum, Kokaina.

Er-y-throx'y-lon. L. see Etymology, above, of Erythroxylaceæ.

Co'ca. Sp. from native name, meaning tree or plant, *par excellence*.

PLANT.—Shrub 1–2 M. (3–6°) high, with many spreading, purplish, brown branches, wrinkled bark, smooth twigs; flowers small, yellow-petals 5; stamens 10; fruit reddish drupe, oval, 12 Mm. ($\frac{1}{2}$ ') long, sarcocarp scanty. Leaves oval-elliptical, 2.5–7.5 Cm. (1–3') long, 2–4

Cm. ($\frac{4}{5}$ – $1\frac{3}{5}$) broad, greenish-brown or clear brown, smooth, slightly glossy and coriaceous, shortly petioled, base short and abruptly narrowed, entire, midrib prominent underneath, with conspicuous line of collenchyma tissue running longitudinally on either side, one-third the distance between it and the margin, the enclosed areola of slightly different color; odor characteristic; taste bitterish, faintly aromatic, followed by numbness of tongue, lips, and fauces; powder yellowish-green. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS. — Leaves that are smudgy brown or with dull surface, also small jaborandi leaves, sometimes 40–50 p. c.; Inga and Pacay flowers by accident.



FIG. 211.—*Erythroxylon Coca*.

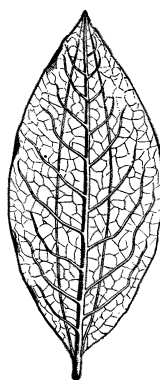


FIG. 212.—Coca leaf: under side, usual size.

Commercial.—Coca, although not introduced into England until 1870, was used in S. America prior to the Spanish conquest, 1569, by the aborigines, who extolled it as a God-given plant ("The Divine Plant of the Incas") that satisfied hunger, strengthened the weak, and banished man's misfortunes; but the invaders, intolerant of such homage, forbade its use and cultivation until they observed that it enabled the conquered to perform better work and service. Previous to 1884 the alleged properties were thought legendary and imaginative, when, being considered simply a mild stimulant like tea, Koeler proclaimed its local anesthetic power. Species differ when wild and under cultivation, and escaping this soon degenerate and show marked changes in leaf-characteristics. It is cultivated extensively in the Andes on terraced plantations, *cocales*, cleared from the forests on the warm declivities, thriving best in a moist atmosphere amid scattered trees,

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but not deep shade, which, as well as low elevation, develops bitterness, consequently any variation in this or in the prescribed soil, exposure, and curing may affect quality. Propagation is similar to our peach,

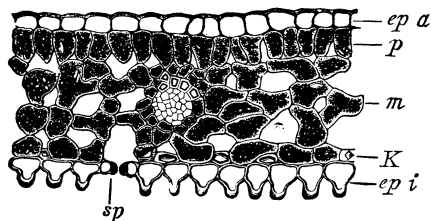


FIG. 213.—Coca leaf, cross-section; *ep a*, upper epidermis; *p*, palisade layer; *m*, spongy parenchyma (in the center a small fibro-vascular bundle); *K*, a crystal, magnified 160 diam.; *ep i*, epidermis of lower side with papilla and a stoma (*sp*).

yielding leaves the second year and continuing for fifty thereafter. Leaves when bright green above and yellow-green below are picked carefully to avoid breaking, or injuring young leaf-buds that form the next crop, removed in baskets, spread on unroofed floors, and dried quickly for a few hours in the sun, if too rapidly losing odor and green color, if too slowly acquiring disagreeable odor and taste; after remaining 2-3 days in the coca-house, in loose piles, they are exposed again

for a short time to the sun, to drive off developed sweat, and then compressed into bales (*cestos*), 25-50 pounds; 11.6-23.3 Kg., or better, tin-lined boxes that prevent likely deterioration in shipping through fermentative decomposition. Irrespective of the care in drying and keeping impairment begins at once, cocaine decreasing materially, especially in dampness, owing to which they should be discarded after a few months. Although in some localities collection is almost continuous there are at least 2-3 yearly harvests, the September being best, the April next, each yielding when dried 60-80 pounds (27-37 Kg.) per acre; the annual production is

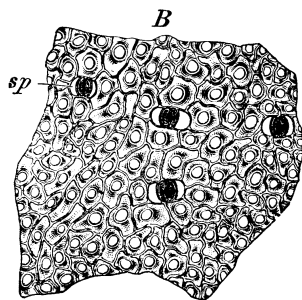


FIG. 214.—Coca leaf: Epidermis of lower side with the papillae and stomata seen from above, magnified 160 diam.

about 80,000,000 pounds (37,383,177 Kg.), exported largely from Huanuco, Lima, Truxillo, etc. There are two varieties: 1, *Huanuco* (*Cuzco*—*E. Coca*, short-styled), after cities of S. Peru, has best aroma, most cocaine, and less isotropyl-cocaine; grown mostly in Bolivia, S. Peru, thriving and yielding maximum product at 1,050-1,800 M. (3,500-6,000°), in 18° south, and inferior grades at lower elevations; the true Bolivian (*E. bolivia'num*, long-styled) is prized most highly,

has larger fruit, smaller leaves, and owing to home demand seldom is exported; 2, *Truxillo* (*Trujillo*—*E. truxillense*, short-styled), leaves ovate-oblongate, 1.6–5 Cm. ($\frac{2}{3}$ –2') long, one-half as broad, pale green, thin, brittle, usually much broken, smooth, shining, petiole short and stout, slight point at apex, entire, the two collenchyma lines underneath frequently incomplete or obscure; odor more tea-like than preceding; taste and numbing effect similar; powder pale green; grown more northward, thriving well at lower elevations and preferred by natives for chewing. Java and India coca (*E. Coca*, var. *Sprucea'num*, long-styled, styles exceeding stamens) seems identical with this variety but owing to inferiority is not exported.

CONSTITUENTS.—Cocaine (1860) .5–1 p. c., cinnamyl-cocaine, truxilline (truxil-cocaine, isatropyl-cocaine, cocamine), $C_{16}H_{23}O_4N$ —all three upon hydrolysis yielding ecgonine and methyl alcohol; pseudotropine, ecgonine, coca-tannic acid, wax, volatile oil, ash 8–10 p. c.; hygrine (volatile aromatic liquid) is doubted by some, while cocainidine, probably isomeric with cocaine, but weaker, has not yet been studied thoroughly.

Cocaina. Cocaine, $C_{17}H_{21}O_4N$.—This alkaloid, composed of methyl alcohol, benzoic acid, and ecgonine, into which it separates by heating with strong sulphuric acid, is obtained by moistening leaves with sodium hydroxide solution, treating with benzin (kerosene), from which the alkaloids, as salts, can be transferred to diluted sulphuric acid by agitation; upon adding excess of sodium hydroxide solution the lesser alkaloids and cocaine are precipitated (hygrine, etc., remaining in solution); cocaine may now be separated by filtering and expressing, and purified by crystallizing from alcohol. It is in colorless crystals, white crystalline powder, odorless, permanent, soluble in water (600), hot water (270), alcohol (6.5), chloroform (.7), ether (3.5), olive oil (12), liquid petrolatum (30–50), very soluble in warm alcohol, melts at $97^{\circ}C$. ($207^{\circ}F$.); forms salts (hydrochloride, nitrate, sulphate, etc.). Dose, gr. $\frac{1}{8}$ –2 (.008–.13 Gm.).

PREPARATIONS.—1. *Cocainæ Hydrochloridum*. Cocaine Hydrochloride, $C_{17}H_{21}O_4N.HCl$. (Syn., Cocain. Hydrochl., Cocainum hydrochloricum, Cocaine Chloride, Cocainæ Hydrochloras, Cocaine Hydrochlorate; Fr. Chlorhydrate de Cocaïne; Ger. Cocainum hydrochloricum, Kokainhydrochlorid.)

Manufacture: Dissolve pure alkaloid, cocaine, in alcoholic solution of hydrochloric acid, and allow anhydrous salt to crystallize. It is in colorless, transparent crystals, lustrous leaflets, white, crystalline powder, permanent, odorless, soluble in water (.4), alcohol (3.2), warm alcohol (2), chloroform (12.5), glycerin, insoluble in ether; aqueous solution (1 in 20) neutral, levorotatory; melts at 183 – $191^{\circ}C$. (362 – $376^{\circ}F$.), the higher point indicating greater purity. *Tests*: 1. Aqueous solution (1 in 20) + silver nitrate T. S.—white precipitate, insoluble in nitric acid. 2. Aqueous solution (1 in 50) 5 cc. + 5 drops of chromium

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trioxide solution (1 in 20)—yellow precipitate, redissolved on shaking; now add hydrochloric acid 1 cc.—permanent orange crystalline precipitate. 3. Dissolve .5 Gm. in sulphuric acid 1 cc.—not more than slight yellow tint (abs. of readily carbonizable substances)—add cautiously distilled water 2 cc.—aromatic odor of methyl benzoate, on cooling—crystals of benzoic acid separate; incinerate .5 Gm.—ash negligible. 4. Aqueous solution (1 in 50) 5 cc. + $\frac{N}{2}$ sulphuric acid .3 cc. + $\frac{N}{10}$ potassium permanganate .1 cc.—violet color does not disappear entirely in half hour (abs. of cinnamyl-cocaine). *Impurities*: Cinnamyl-cocaine, isatropyl-cocaine, readily carbonizable substances. This salt is dispensed generally under the name of cocaine in (hypodermic) solutions, 2–4–5–10 p. c. Dose, gr. $\frac{1}{8}$ –2 (.008–.13 Gm.).

Unoff. Preps.: I. LEAVES: *Fluidextract* (diluted alcohol), \mathfrak{z} ss–2 (2–8 cc.). *Infusion*, 5 p. c., \mathfrak{z} j–2 (30–60 cc.). *Tincture*, 20 p. c. (diluted alcohol), \mathfrak{z} j–4 (4–15 cc.). *Wine*, 6.5 p. c., \mathfrak{z} ij–4 (8–15 cc.). II. COCAINE: *Oleate*, 5–10 p. c. *Unguentum Cocainæ* (Br.), 4 p. c. III. COCAINE HYDROCHLORIDE: *Injectio Cocainæ Hypodermica* (Br.), 5 p. c., \mathfrak{m} v–10 (.3–.6 cc.). *Lamellæ Cocainæ, Discs* (Br.), $\frac{1}{50}$ gr. (.0013 Gm.).

PROPERTIES.—Cerebral stimulant, bitter tonic, diuretic, mydriatic, diaphoretic, anaphrodisiac, narcotic. Locally, has little action upon the unbroken skin, but acts upon mucous membranes and subcutaneous tissue as anesthetic and analgesic, producing also its constitutional effects. It increases digestion, respiration, heart action, temperature, arterial tension, and the irritability of the sensory nerves, followed by mental, moral, and muscular depression. It anesthetizes the gastric mucous membrane, thereby temporarily deadening the sensations of hunger and thirst, which, however, seem all the greater as the effects wear off; the brain is stimulated by increasing the blood supply, producing wakefulness, a sense of hilarity and well-being (similar to cannabis), increased muscular strength and endurance. Acts as a diuretic by checking waste processes, lessening the quantity of urea, but increases that of urine; dilates the pupil by stimulating the ends of sympathetic nerve in the iris. When full amount (leaves) chewed one works cheerfully as long as the effect lasts, irrespective of meal hour, which may continue 3–4 days from repeated doses—usually, however, food is taken at night, and only the meal of mid-day bridged over. Natives drink its tea like Chinese tea elsewhere, and carry a bag of leaves and one of ashes or lime; after forming a quid of the leaves deprived of ribs (\mathfrak{z} j; 4 Gm.), a little ash or lime is added to give pungency and to aid the secretion of saliva; each chew lasts an hour, when a new one follows. Cocaine, in general action, resembles atropine; causes little injury to natives, but strangers soon become haggard-looking and idiotic.

USES.—In melancholia, hysteria, epilepsy, spinal paralysis, insanity, diabetes, headache, typhoid state, opium-habit, uterine inertia, vomiting of pregnancy, gastric irritability, cholera morbus, spermator-

rhea, debility, poisoning by chloral hydrate, opium, or bromides. Locally, to burns, painful ulcers, fissures of anus, hay fever, sore throat, laryngitis, hemorrhoids, bronchitis, coryza, and in surgical operations; hypodermically in fingers, toes, small tumors—for amputation; for spinal anesthesia not as safe as novocaine, stovaine, eucaine; no more than gr. $\frac{3}{4}$ (.045 Gm.) should be applied at once.

Poisoning: Have nervous excitement, oppression, and fullness of head, sometimes nausea and vomiting, pulse and respiration at first rapid, then slow, breathing labored, face cyanotic, pupils dilated,



FIG. 215.—*Guaiacum sanctum*.

extremities cold, convulsions, coma, death; may have delirium and unconsciousness early, or only asphyxia. Place in horizontal position and fresh air, empty stomach, stimulants—strong coffee, etc., and if circulation fails—strychnine, ether, alcohol, amyl nitrite, caffeine, atropine, oxygen and ammonia inhalations; chloral hydrate (gr. 30–60; 2–4 Gm.), paraldehyde, sulphonal, chloroform, ether or morphine injections; artificial respiration; nitroglycerin (hypodermically) for convulsions. Chronic poisoning (*cocainism* or *habit*), marked by loss of flesh, disordered circulation, insane delusions and hallucinations, collapse, is more rapid and nearly as degenerative and serious as

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that of opium, and may be treated similarly, but usage does not create nerve irritation to the same extent, consequently one with strong will power may desist abruptly its use without suffering other than the denial of mental satisfaction and pleasures, the craving for which it tends to establish.

Incompatibles: Alkalies, alkaline carbonates and bicarbonates, mercuric chloride, iodine, iodides, ammonia, zinc chloride, borax.

Synergists: Cerebral effects—alcohol, cannabis, belladonna; analgesic—atropine, phenol, conium, opium; mydriatic—atropine.

Allied Plants:

1. *Guai'acum officina'le* or *G. sanc'tum*, *Guaiac*, *Guaiac Resin*, N.F.—Zygophyllaceæ. The resin of the wood, yielding not more than 15 p. c. of residue insoluble in alcohol; W. Indies, S. America. Small

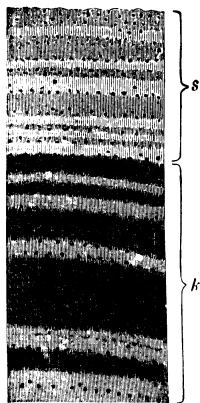


FIG. 216.—Guaiacum wood; cross-section, magnified 4 times; k, heartwood; s, sapwood.

trees 6–9 M. (20–30°) high, stem-bark ash-gray, striated, spotted; leaves paripinnate, yoked in pairs, evergreen; leaflets 2.5–4 Cm. (1–1½') long; flowers large, blue; fruit 2–5-celled capsule; seeds black, red. Wood (*Lignum Vitæ*): sap yellowish, heart brownish, heavier than water, sp. gr. 1.30, hard, dense, tough, resinous, with heat—emitting balsamic odor; taste slightly acid; in shop as raspings. Resin: in irregular fragments, large masses, tears, brown—greenish gray-brown on exposure; fracture with glassy luster, thin pieces translucent, reddish to yellowish-brown. Powder, grayish, becoming green on exposure; odor balsamic; taste slightly acid; soluble in alcohol, ether, chloroform, creosote, solutions of alkalies, chloral hydrate T. S., sparingly in carbon disulphide, benzene; alcoholic solution with excess of chlorine water or tincture ferric chloride—blue, changing quickly to green; solvents: alcohol, acetone, chloroform; contains guaiaretic acid, guaiaconic acid (alpha-

resin) 50–70 p. c., guaiac beta-resin 10 p. c., gum 4–9 p. c., guaiacic acid, guaiac-yellow, by dry distillation get guaiacol. Alternative, diaphoretic, expectorant, stimulant, antiseptic; rheumatism, gout, lumbago, syphilis, scrofula, amenorrhea, dysmenorrhea, diphtheria. Dose, gr. 5–30 (.3–2 Gm.); 1. *Tinctura Guaiaci*, 20 p. c. (alcohol), dose, ℥v–60 (.3–4 cc.); 2. *Tinctura Guaiaci Ammoniata*, 20 p. c. (sp. ammon. arom.), dose, ℥v–30 (.3–2 cc.): Prep.: 1. *Gargarisma Guaiaci Compositum*, 10 p. c. + tr. cinch. co. 10, honey 20, pot. chloras 4, +; 3. *Tinctura Guaiaci Composita*, *Dewees' Tincture of Guaiac*, 12.5 p. c., + pot. carb. .6, pimenta 3.2 (diluted alcohol), dose, ℥v–60 (.3–4 cc.). Mixture (Br.), 2.5 p. c., ℥iv–8 (15–30 cc.). Lozenge (Br.), 3 gr. (.2 Gm.), Syrup. *G. angustifolium*; S. Texas, Mexico. Wood hard, heavy, splitting irregularly, yellowish-brown; sometimes substituted for the preceding.

37. RUTACEÆ. Rue Family.

Ru-ta'se-e. L. *Rut-a* + aceæ, fem. pl. of *rutaceus*, of or resembling rue, fr. Gr. *ρύτή*, *ρύω*, to flow—*i. e.*, referring to medicinal properties (female). Trees, herbs, shrubs. Distinguished by leaves exstipulate, dotted with pellucid glands, containing aromatic volatile oil; sepals 4-5; petals 4-5, imbricated; ovary connate or united by base, style, or stigma, superior; stamens distinct, equal or double the petals; albuminous or exalbuminous; tropics; antispasmodic, tonic, febrifuge, diuretic.

Genera: 1. **Barosma**. 2. **Pilocarpus**. 3. **Citrus**.

BUCHU. BUCHU, *U.S.P.*

Barosma	$\left\{ \begin{array}{l} \textbf{betulina}, (Thunberg) \\ \textit{Bartling et Wendland}, \\ \textbf{crenulata}, (Linné) \textit{Hooker}, \\ \textbf{serratifolia}, (Curtis) \textit{Willdenow}. \end{array} \right.$	$\left\{ \begin{array}{l} \text{The dried leaf with not more} \\ \text{than 8 p. c. stems nor 2} \\ \text{p. c. other foreign organic} \\ \text{matter.} \end{array} \right.$
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Habitat. S. Africa, Cape Colony (Cape of Good Hope, Cape Town); mountains.
Syn. Bookoo, Buku, Bueku, Bueco; Br. Buchu Folia, Folia Bueco, Diosmæ or Barosmæ; Fr. Feuilles de Bueco (Bookoo, Buchu); Ger. Bueco or Buchublätter.

Ba-ros'ma. L. fr. Gr. *βάρβς*, heavy + *δουή* odor—*i. e.*, its powerful smell.

Be-tu-li'na. L. *betulinus*, fr. Celtic *betu*, their name for birch—*i. e.*, leaves resembling birch leaves.

Cren-u-la'ta. L. *crenulatus*, *crena*, notched, notch; *i. e.*, leaf margins crenulate.

Ser-ra-ti-fo'li-a. L. *serratus*, notched like a saw, + *folium*, a leaf—*i. e.*, leaves with margins saw-like, serrated.

Buchu (bu'ku). African plant name; *Diosma*, old name, meaning "divine odor."

PLANTS.—Woody shrubs, .3-1.2 M. (1-4°) high, branches many, stiff, angular, bark smooth, purple; young twigs covered with immersed oil-glands; flowers solitary, pink; calyx 5 segments, deeply cut; petals 5, glandular-punctate; stamens 5; fruit 5-coccus capsule, adherent by inner margins, 9 Mm. ($\frac{3}{8}$ ') long, 12 Mm. ($\frac{1}{2}$ ') broad, 5-seeded. LEAVES, LEAF, (*B. betulina* + *B. crenulata*): Short, rhomboidally oval, obovate, 9-30 Mm. ($\frac{3}{8}$ -1 $\frac{1}{5}$ ') long, 4-20 Mm. ($\frac{1}{6}$ - $\frac{4}{5}$ ') broad, apex obtuse, rounded, recurved, base wedge-shaped (cuneate), or obtuse, dentate, glandular-punctate, oil gland at the base of each tooth, papillose, longitudinally striate beneath, coriaceous, petiole 1 Mm. ($\frac{1}{25}$ ') long, yellowish-green; odor aromatic, mint-like; taste camphoraceous; (*B. serratifolia*): Long, linear, lanceolate, 12-40 Mm. ($\frac{1}{2}$ -1 $\frac{3}{8}$ ') long, 4-10 Mm. ($\frac{1}{8}$ - $\frac{2}{5}$ ') broad; apex acute, rounded, serrate, otherwise resembling the preceding. POWDER, light green—epidermal cells with spherocrystals, crystal aggregates of hesperidin, rosette aggregates of calcium oxalate, few simple hairs, numerous stomata, oil secretion cavities, oil globules, fragments of fibro-vascular bundles. *Solvents*: Alcohol; boiling water partially. Dose, gr. 15-30 (1-2 Gm.).

ADULTERATIONS.—Leaves, branchlets, flowers and non-aromatic capsules of allied species, also leaves of *Empleurum serrulatum*, which are yellowish-green, acute, different odor and taste, less mucilaginous

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and contain volatile oil 1 p. c., without any crystalline content. *Karoo buchhu* (*B. pulchella*), leaves 6 Mm. ($\frac{1}{4}$ ') long, half as broad, thick, ovate, acute, nearly entire, apex recurved, oil gland not superficial; another variety (*Agathos'ma varia'bile*), leaves strong anise odor; *Psora'lea obli'qua*, leaves minutely dentate, hairy, brown dotted.



FIG. 217.—*Barosma crenulata*: 1, calyx; 2, style and stigma; 3, fruit; 4, seed; 5, dots on leaf.

Commercial.—Grows in stony, hilly valleys; cultivated in gardens, since 1774, for persistent attractive flowers. There are two varieties: 1, *Short* (*B. betulina*, *B. crenulata*), and 2, *Long* (*B. serratifolia*); the latter usually containing less of the active constituent—volatile oil .66 p. c., which is without diosphenol. Imported chiefly in large bales.

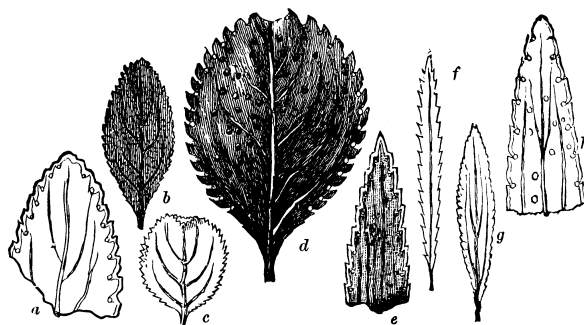


FIG. 218.—Buchu: a, b, *Barosma crenulata*; c, d, *B. betulina*; g, h, *B. serratifolia*; e, f, *Empleurum serrulatum*; b, c, f, g, natural size.

CONSTITUENTS.—Volatile oil 1–1.6 p. c., bitter glucoside (barosmin), hesperidin, resin, gum, salts, ash 4–7 p. c.

Volatile Oil, $C_{10}H_{16}O$.—This gives the medicinal properties, and is obtained by distillation and rectifying over sodium; sp. gr. 0.969; contains some $C_{10}H_{18}O$ (a body having peppermint-like odor), and upon cooling separates 30 p. c. barosma camphor, or phenol *diosphenol*,

$C_{10}H_{16}O_2$, a stearoptene occurring in white needle-like crystals, blackish-green with ferric salts.

Barosmin (*diosmin*, *rutin*).—Soluble in ether, volatile oils, dilute acids and alkalies, sparingly in alcohol, crystallizes in microscopic needles.

PREPARATIONS.—1. *Fluidextractum Buchu*. Fluidextract of Buchu. (Syn., *Fldext. Buchu*, Fluid Extract of Buchu; Fr. *Extrait fluide de Bucco*; Ger. *Buchufldextrakt*.)

Manufacture: Similar to *Fluidextractum Sarsaparillæ*, page 126, menstruum: alcohol. Dose, $\mathfrak{m}\text{xv}$ –30 (1–2 cc.).

Preps.: 1. *Elixir Buchu*, *N.F.*, 12.5 p. c.: *Preps.*: 1. *Elixir Buchu et Potassii Acetatis*, *N.F.*, 8.5 p. c. (pot. acet.). 2. *Elixir Buchu, Juniperi et Potassii Acetatis*, 15 p. c., + *fldext. junip.* 7.5, pot. acet. 5.

2. *Fluidextractum Buchu Compositum*, *N.F.*, 62.5 p. c., + cubeb, juniper berries, uva ursi, $\bar{a}\bar{a}$ 12.5 (80 p. c. alcohol). Dose, $\mathfrak{m}\text{xv}$ –30 (1–2 cc.): *Prep.*: 1. *Elixir Buchu Compositum*, *N.F.*, 25 p. c. + aromatic elixir q. s. 100. Dose, $\mathfrak{z}\text{j}$ –2 (4–8 cc.).

Unoff. Preps.: *Infusum Buchu* (Br.), 5 p. c., $\mathfrak{z}\text{ss}$ –2 (15–60 cc.). *Tinctura Buchu* (Br.), 20 p. c. (60 p. c. alcohol), $\mathfrak{z}\text{j}$ –2 (4–8 cc.).

PROPERTIES.—Diuretic, tonic, stimulant, carminative, diaphoretic; increases the fluids and solids of the urine, imparting peculiar odor; acts as a tonic, astringent, and disinfectant to the urinary tract, diminishing secretions. Large doses emetic, cathartic, causing burning in stomach, strangury; eliminated by the kidneys and bronchial mucous membrane.

USES.—Gravel, lithemia, vesical catarrh, irritated urethra, gonorrhea, gleet, chronic bronchitis, inflamed prostate, dropsy, retention or incontinence of urine, feeble digestion, flatulency; should not be given when inflammation is severe; often combined with alkalies, potassium hydroxide, etc. The native Hottentots, from whom the English and Dutch physicians learned its virtues, use an ointment as vulnerary, and a vinous tincture in gastric and vesical affections; they also value it as a perfume, rubbing the powdered leaves upon their greased bodies. *B. Ecklonia'na*, leaves oval, 2.5 Cm. (1') long, rounded at base, crenate, growing from pubescent shoots, have similar properties.

Allied Plants:

1. *Zanthoxylum america'num* and *Z. Cla'va-Her'culis*. 1. *Xanthoxylum*, *Prickly Ash Bark*, *N.F.*—The dried bark with not more than

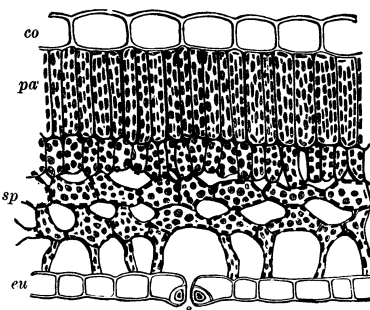


FIG. 219.—Buchu leaf: portion of a cross-section; *pa*, palisade cells; *sp*, spongy parenchyma; *co*, upper epidermis; *eu*, under epidermis; *s*, stomata.

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2 p. c. of foreign organic matter; 2. *Xanthoxyli Fructus*, *Prickly Ash Berry*, *N.F.* The dried fully grown fruit with not more than 2 p. c. of foreign organic matter; N. America; *Z. americanum*, Canada to Virginia—*Northern*; *Z. Clava-Herculis*, Virginia to Florida—*Southern*. *Z. americanum*, shrub 2-4 M. (6-12°) high, covered with sharp, scattered prickles; leaves imparipinnate, leaflets 4-5 pairs; flowers before the leaves, yellowish-green, corolla absent. Bark, transversely curved fragments, quills, 2-15 Cm. ($\frac{4}{5}$ -6') long, bark .5-2 Mm. ($\frac{1}{50}$ - $\frac{1}{2}$ ') thick, light gray, with foliaceous lichens, wrinkled, whitish lenticels, few straight, 2-edged spines linear at base, 5 Mm. ($\frac{1}{5}$ ') high, numerous shining crystals, fracture short, uneven, odor slight; taste bitter, acrid, pungent. Powder, light grayish-brown—parenchyma with starch grains, oily globules, calcium oxalate prisms; Northern—only a few



FIG. 220.—Xanthoxylum bark: A, Southern; B, Northern ($\frac{1}{3}$ Nat.).

non-lignified bast-fibers, stone cells and cork cell fragments; *Z. Clava-Herculis*, small tree, 6-12 M. (20-40°) high, .3-.6 M. (1-2°) thick, with prickles protruding through large corky cones, larger prickles on branches and petioles; leaflets 3-8 pairs, crenate; flowers after leaves appear, corolla present. Bark, transversely curved, irregular, oblong, flattened pieces, quills 2-40 Cm. ($\frac{4}{5}$ -16') long, bark 1-4 Mm. ($\frac{1}{25}$ - $\frac{1}{6}$ ') thick, light gray, with numerous large barnacle-shaped projections of cork, .5-3.5 Cm. ($\frac{1}{5}$ -1 $\frac{2}{3}$ ') thick, often 2 Cm. ($\frac{4}{5}$ ') high, lenticels, foliaceous lichens, obscurely striate, without crystals; odor and taste as in preceding. Fruit, capsules with short stalks (*Z. americanum*) or without stalks (*Z. Clava-Herculis*), ellipsoidal, fleshy, gray-brown, dehiscent; seeds 1-2, oblong, black; odor faintly aromatic, citral-like; taste of two species quite different, but both pungent, warm, aromatic, tingling sensation on chewing. Powder, dark brown—pericarp tissue

with oil cavities, parenchyma cells with spherocrystals of hesperidin, numerous globules of volatile oil; solvents: alcohol, boiling water; contain (root and fruit) resins (2), alkaloid (bitter—berberine (?)), xanthoxylin (tasteless, inert, crystalline), volatile oil (acrid, green), tannin, sugar, fat, gum, ash 12 p. c. Alterative, stimulant, sialagogue, diaphoretic, diuretic—causes salivation, tingling in tongue, increased cardiac action and arterial tension, also secretion from stomach, intestines, liver, and pancreas; resembles mezereum, guaiac, sanguinaria and stillingia in action; chronic rheumatism, myalgia, lumbago, dropsies, atonic dyspepsia, diarrhea, syphilis, pharyngitis—masticatory for toothache, paralysis of tongue; externally: counter-irritant in female pelvic diseases. Dose, gr. 15–30 (1–2 Gm.); Root: 1. *Fluidextractum Xanthoxyli* (75 p. c. alcohol), dose, ℥xv–30 (1–2 cc.); Preps.: 1. *Elixir Corydalis Compositum*, 3 p. c.; 2. *Elixir Hydrastis Compositum*, 1.75 p. c. Decoction, 5 p. c., ℥ss–2 (15–60 cc.), Extract, gr. 3–10 (.2–.6 Gm.); Fruit (berry): 1. *Fluidextractum Stillingiae Compositum*, 6.2 p. c.; Prep.: 1. *Syrupus Stillingiae Compositus*. *Z. florid'anum*, *Satin Wood*, identical with *Z. carib'anum*; *Z. ptero'ta*, Florida, Texas, Brazil—wood yellow, hard, bark and leaves pungent.

2. *Empleu'rum serrula'tum*.—Leaves sometimes mixed with buchu, occasionally constituting the main bulk; may be distinguished by their acrid taste, peculiar odor—differing from buchu—longer, narrower than even *B. serratifolia*, sides parallel, apex acute and glandless, coarsely dentate (serrulate); when held up to the light lateral veins not as straight, shorter and less strongly developed; contain peculiar volatile oil .64 p. c., possessing characteristic odor. Properties considered to differ from those of buchu.

3. *Ru'ta grave'olens*.—The leaves, U.S.P. 1830–1870; S. Europe, cultivated. Plant .6–1 M. (2–3°) high, woody; flowers yellow; fruit capsule, 4–5-lobed; seed black, many, all parts active; leaflets 12–25 Mm. ($\frac{1}{2}$ –1') long, 6 Mm. ($\frac{1}{4}$ ') wide, crenate, thick, pellucid-punctate, aromatic, bitter; contain volatile oil (*Oleum Rutæ*, U.S.P. 1870–1880, greenish-yellow, aromatic), rutin, (rutic or rutinic acid, $C_{42}H_{50}O_{25}$ —bitter, yellow, crystalline glucoside, identical with barosmin, decomposing into quercetin, etc.). Stimulant, emmenagogue, nervine; hysteria, colic, amenorrhea, menorrhagia, metrorrhagia—due to atony of uterus; dangerous abortifacient; large doses irritant-poison—severe gastro-enteritis, vomiting, abdominal pain, distention, bloody stools, strangury, convulsions, rarely death. Dose, gr. 5–20 (.3–1.3 Gm.); oil, ℥j–5 (.06–.3 cc.).



FIG. 221.—*Ruta graveolens*.

[Note: Pages 346-347 are missing from the original text. DM}

PILOCARPUS. PILOCARPUS.

Pilocarpinæ Hydrochloridum. Pilocarpine Hydrochloride, U.S.P.**Pilocarpinæ Nitras. Pilocarpine Nitrate, U.S.P.**

Pilocarpus { **Jaborandi**, *Holmes*,
microphyllus, *Stapf*. } { The hydrochloride and nitrate of
pilocarpine, an alkaloid obtained
from the dried leaflets.

Habitat. 1. Brazil—from Pernambuco; 2. Brazil—from Maranh; Paraguay, Uruguay; in forest-cleanings on the hill-slopes.

Syn. Pilocarp., Jaborandi, Pilocarpi Foliata; 1. Pernambuco Jaborandi. 2. Maranh Jaborandi; Fr. Jaborandi; Ger. Folia Jaborandi, Jaborandiblätter; Pilocarpin. Hydrochl., Pilocarpine Chloride, Pilocarpinæ Hydrochloras; Fr. Chlorhydrate de Pilocarpine; Ger. Pilocarpinum hydrochloricum, Pilocarpin-hydrochlorid; Pilocarpin. Nit.; Fr. Azotate de Pilocarpine; Ger. Pilocarpinum nitricum, Pilocarpinnitrat.

Pi-lo-car'pus. L. *pilus*, hair, or fr. Gr. *πίλος* a cap, + *καρπός* fruit—*i. e.*, fruit hat-shaped.

Jab-o-ran'di. L. fr. Port. *zha-bo-ran-de'*—*i. e.*, South American name.

Mi-cro-phy'l'lus. L. fr. Gr. *μικρός* small, + *φύλλον* leaf—*i. e.*, having small leaves.

PLANTS.—Shrubs 1.2–1.5 M. (4–5°) high, branches erect; bark smooth, with gray and white dots, roots 18 Mm. ($\frac{3}{4}$ ') thick; flowers small, pinkish-purple, pedicellate, racemes 45 Cm. (18') long; fruit, 5 carpels 4 Cm. ($1\frac{3}{5}$ ') long, compressed, curved ridges dotted with oil-glands, carpels 1-seeded, reniform, black; leaves imparipinnate, .3–.4 M. ($1-1\frac{1}{2}$ °) long, 2–5 pairs. Leaflets (*P. Jaborandi*): *Pernambuco*, oval, oblong, elliptical, 4–10.5 Cm. ($1\frac{3}{5}$ –4') long, 2–4 Cm. ($\frac{1}{5}$ – $1\frac{3}{5}$ ') broad, short, stout petiolules, acute, emarginate (rounded), base rounded or acute, mostly unequal, entire, narrowly revolute, smooth, shiny, coriaceous, glandular-punctate, grayish-brownish-green above, midrib mostly depressed, yellowish-, greenish-brown beneath, slightly pubescent on the prominent midvein; peculiarly aromatic when crushed; taste bitterish, becoming pungent with sialagogue effect; (*P. microphyllus*): *Maranh*, rhomboidally oval, obovate, elliptical, 1.5–5 Cm. ($\frac{1}{3}$ –2') long, 1–3 Cm. ($\frac{1}{5}$ – $1\frac{1}{5}$ ') broad, lateral ones nearly sessile, terminal ones on margined petiolules, .5–1.5 Cm. ($\frac{1}{5}$ – $\frac{3}{5}$ ') long, nearly uniform grayish-, yellowish-green, rather thin, otherwise resembling the preceding. Powder, dark green-, greenish-brown—epidermal cells 5–6-sided, stomata usually with 4 neighboring cells, fragments of fibro-vascular bundles showing tracheæ, wood-fibers, bast-fibers, rosette aggregates of calcium oxalate, oil-secretion reservoirs with oil globules, non-glandular hairs; solvents: diluted alcohol; boiling water partially. Dose, gr. 15–30 (1–2 Gm.).

ADULTERATIONS.—Leaves from which pilocarpine has been extracted, or leaves of *Pilocarpus* species possessing little activity or of pipera-ceous plants (thin, subcoriaceous, ovate, not emarginate but acuminate, finely granular, not pellucid-punctate), or of *Monnie'ra trifolia* and *Casca'ria* species, or leaflets of *Swart'zia decip'iens* (ovoid, short hairy petiole, upper surface shining, lower minutely hairy, not pellucid-

punctate, some only 5 Mm. ($\frac{1}{8}$ ') long) for "Maranham Jaborandi," sometimes 30 p. c., or "False Jaborandi"—leaves of *Hæmatoxylon campechianum*, notched apex, pellucid-punctate, without alkaloid, with red-brown secreting vessels, cinnamon and clove odor.

Commercial.—Plant was introduced into Europe, 1847, and now is cultivated. The names *Jaborandi*, *Jamborandi*, *Iaborandi* are applied natively, in both generic and specific sense, to several dissimilar pungent plants having sialagogic, diaphoretic and sudorific properties, as *Serro'nea Jaborandi*, *Piper Jaborandi* (possibly the true Jaborandi), *P. unguiculatum*, *P. citrifolium*, *P. reticulatum*, *P. Mollicomum*, *Erte'la* (*Auble'tia*) *trifolia*, *Xanthoxylum elegans*. Leaves should be

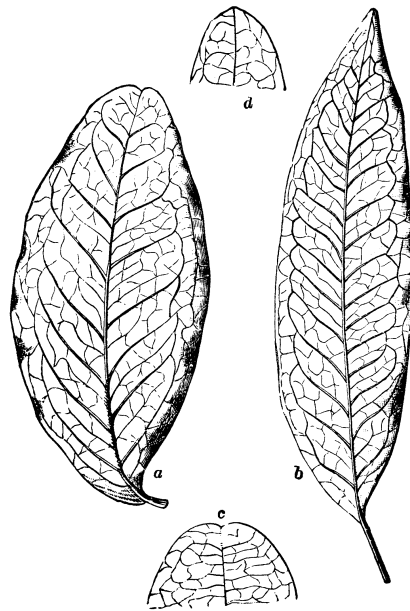


FIG. 222.—*Pilocarpus Jaborandi*: variously shaped leaflets. *a* and *c*, emarginate; *b* and *d*, pointed, blunt.

collected when grown, after rainy season, and, inclining to mustiness, should be dried thoroughly before packing. The once official species are high-priced, scarce, and subject to much substitution, while the Rio Jaborandi (*P. Selloanus*), also once official and popular, continues to have a limited demand in spite of great irregularity in characteristics and constituents.

CONSTITUENTS.—Pilocarpine .5–1 p. c. (1874), isopilocarpine, pilocarpidine, jaborine (?), volatile oil .5 p. c., (resin, tannin, malic acid, salts), ash 7 p. c.

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Pilocarpine (Pilocarpina), $C_{11}H_{16}O_2N_2$.—This liquid alkaloid, as first obtained under the name of jaborandine, was believed to be volatile, but this is not true, although it occurs as a colorless, syrupy liquid. It may be prepared by moistening powdered leaves with solution of sodium carbonate, exhausting with warm benzene, shaking out with diluted hydrochloric acid, after separation rendering acid solution alkaline with solution of sodium carbonate, shaking out with chloroform, evaporating chloroformic liquid getting residue of crude alkaloids; neutralize with diluted nitric acid, evaporate to dryness, purify by repeated crystallization from alcohol, dissolve pilocarpine nitrate in water, render alkaline with ammonia, shake out with chloroform, evaporate getting pure pilocarpine as a colorless syrupy liquid; it is soluble in water, alcohol, chloroform, slightly in ether, forms crystallizable salts (hydrochloride, nitrate, etc.); resembles nicotine in action.

Pilocarpinæ Hydrochloridum. Pilocarpine Hydrochloride, $C_{11}H_{16}O_2N_2 \cdot HCl$.—Obtained by neutralizing diluted hydrochloric acid (17.5) with pilocarpine (10), concentrating, setting aside over sulphuric acid to crystallize; it is in colorless, translucent crystals, odorless, faintly bitter taste, hygroscopic on exposure, soluble in water (.3), alcohol (3), hot alcohol (1.5), chloroform (366), insoluble in ether; aqueous solution (1 in 20) slightly acid, melts at $197^\circ C.$ ($387^\circ F.$). *Tests*: 1. To aqueous solution (.01–.02 in 2) add 2 cc. acid hydrogen dioxide T. S., cover with 1 cc. benzene, add 3–4 drops potassium dichromate solution (1 in 300), shake, benzene layer—violet, aqueous layer—yellow (dist. from other alkaloids). 2. Aqueous solution with silver nitrate T. S.—white precipitate, insoluble in nitric acid. 3. Solution of .1 Gm. in 2 cc. sulphuric acid—colorless or faintly yellow (abs. of readily carbonizable substances). 4. Add to 10 cc. aqueous solution (1 in 100) ammonia T. S., or potassium dichromate T. S.—no turbidity (abs. of foreign alkaloids); ash from .1 Gm.—negligible. *Impurities*: Foreign alkaloids, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.), administered best hypodermically (2 p. c. aqueous solution).

Pilocarpinæ Nitras. Pilocarpine Nitrate, $C_{11}H_{16}O_2N_2 \cdot HNO_3$.—Obtained by neutralizing diluted nitric acid (121) with pilocarpine (40), evaporating to dryness, redissolving in alcohol, crystallizing; it is in shining crystals, odorless, permanent, soluble in water (4), alcohol (75), hot alcohol (21), insoluble in chloroform, ether, melts at $172^\circ C.$ ($342^\circ F.$). *Tests*: 1. Aqueous solution mixed with equal volume of ferrous sulphate T. S. and carefully poured over sulphuric acid without shaking—brown ring at juncture of two layers. 2. To 5 cc. aqueous solution (1 in 50), acidulated with nitric acid, + few drops silver nitrate T. S.—no immediate opalescence (abs. of chloride); ash from .1 Gm.—negligible. *Impurities*: Chloride, etc. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.), administered best hypodermically (2 p. c. aqueous solution).

Isopilocarpine.—Obtained by action of heat or alkali on pilocarpine; it is a colorless, viscid oil, oxidizing into pilocarpic acid, $C_{11}H_{16}O_5N_2$, boiling at $261^\circ C.$ ($502^\circ F.$), distilling without decomposition, isomeric with pilocarpine; pilocarpidine, $C_{16}H_{14}O_2N_2$, found in *P. Jaborandi* but not in *P. microphyllus*, is a liquid body, differing from pilocarpine by auric chloride not precipitating aqueous solutions, in being weaker, deliquescent, oxidizing in air to syrupy jaboridine (possibly identical with jaborandine, $C_{10}H_{12}O_3N_2$; jaborine, $C_{22}H_{32}O_4N_4$, is of doubtful occurrence, although formerly believed to be in the leaves and to be formed by evaporating acid solutions of pilocarpine; as such it was yellow, amorphous, less soluble in water, but more so in ether than pilocarpine, isomeric with it (same molecular formula), but antagonizing its action, resembling atropine; the commercial jaborine has been found to be a brown oil composed of isopilocarpine, pilocarpidine, pilocarpine, and coloring matter.

Volatile Oil.—Obtained by distillation at $176^\circ C.$ ($350^\circ F.$), and is chiefly a terpene (pilocarpene) $C_{10}H_{16}$, with little solid paraffin-like substance, sp. gr. 0.875.

PREPARATIONS.—(Unoff.). **LEAVES:** *Fluidextract* (67 p. c. alcohol), dose, $\mathfrak{M}\text{XV}$ –30 (1–2 cc.). *Extract*, gr. 3–10 (.2–.6 Gm.). *Infusion*, \mathfrak{J} j–2 (30–60 cc.). *Tinctura Pilocarpi (Jaborandi)*, 20 p. c., \mathfrak{J} ss–2 (2–8 cc.). Pilocarpine, phosphate, acetate, hydrobromide, dose, each gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.), hypodermically.

PROPERTIES.—Diaphoretic, sialagogue, myotic, cardiac depressant, emetic, diuretic (repeated small doses), galactagogue, abortive. Full doses cause flushed face, quickened circulation and respiration, profuse sweating and salivation (lasting 2–4 hours, losing in perspiration 9–15 ounces (.27–.45 L.), in saliva 10–27 ounces (.3–.8 L.), these always being in the inverse ratio); increases bronchial, nasal, mammary, gastric, and intestinal secretions, lowers temperature 1–4 degrees, contracts pupils, produces chilliness and weakness. The heart soon becomes slowed and arterial pressure lowered, by stimulating the terminations of the vagus, or by depressing the motor centers in the heart-muscle. Both the fluid and solids (especially urea) of the perspiration are increased by direct influence on the nerve-endings governing its secretion, while the cells of the salivary glands are stimulated directly. Pilocarpine produces identical effects of the drug; isopilocarpine is 8–10 times weaker than pilocarpine, while jaborine irritates the stomach, causing nausea, vomiting, etc.

USES.—Dropsies, pleurisy, uremia, pulmonic edema, catarrhal jaundice, mumps, rheumatism, coryza, cold, influenza, Bright's disease, meningitis, diabetes, agalactia, parotitis, asthma, hiccough, erysipelas, diphtheria; best antidote to atropine, hyoscyamine, daturine, agaricin, etc.; powerful stimulant to hair growth—locally and internally. In ophthalmia use pilocarpine, in amblyopia (from alcohol or tobacco), detached retina, chronic iritis, keratitis, glaucoma, atrophic choroiditis,

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instead of physostigmine as a myositic. To avoid nausea, may give in form of enema.

Poisoning: Have profuse sweating, dizziness, salivation, vomiting, purging, contracted pupils, pain in eyes. Empty the stomach and wash it out with tannin; give atropine hypodermically and morphine to control nausea and vomiting; cardiac stimulants if necessary.

Incompatibles: Atropine, agaricin, morphine, tannin, caustic alkalies, ferric and metallic salts.

Synergists: Aconite, veratrum viride, gelsemium, sarsaparilla, spirit of ethyl nitrite, and drugs which paralyze the vasomotor system. *P. Selloanus* (possibly the same as *P. pinnatifolius*, leaflets under both names formerly official); *P. grandiflorus*, *P. pauciflorus*, *P. heterophyllus*, *P. spicatus*, *P. trachylophus*—all have similar medicinal value.

Allied Plants:

1. *Cuspa'ria Angostu'ra*, (*Galipe'a Cusparia (officina'lis)*), *Angustura (Bark)*; *Cuspariæ Cortex*, *Cusparia Bark*.—The bark, U.S.P. 1820–1870;



FIG. 223.—Angustura bark: one-half natural size.

Northern South America. Tree 4.5–6 M. (15–20°) high, leaves with 3 leaflets, 15–25 Cm. (6–10') long, 5–10 Cm. (2–4') broad, spotted white, tobacco odor, flowers white; bark in flat, curved, or quilled pieces 2.5 Mm. ($\frac{1}{10}$ ') thick, ochrey-gray, friable periderm, inside cinnamon-red, striæ of calcium oxalate, aromatic, bitter; contains volatile oil, resin, angusturin, 4 alkaloids. Used for diarrhea, dysentery, dyspepsia, typhoid, stimulant, febrifuge, large doses emetic; in infusion, tincture, extract. Dose, gr. 10–30 (.3–2 Gm.).

False Angustura Bark (*Strychnos Nux-vomica*) has stone-cells, no striæ of calcium oxalate; is very bitter, not aromatic, contains strychnine, brucine.

2. *Pte'lea trifolia'ta*, *Wafer-ash*, *Hop-tree*, *Swamp-Dogwood*, *Wing-seed*, *Shrubby Trefoil*.—Root-bark; N. America—N.Y.—Fla.—Texas; rocky places. Handsome shrub, 2.4–3.6 M. (8–12°) high, branches dark brown; leaves petiolate, light green, trifoliate; leaflets sessile, ovate, short-acuminate, crenulate, lateral ones inequilateral, terminal one cuneate at base, finely pellucid-punctate; root-bark one or more inches long, light brown, wrinkled, with thin epidermis, internally yellowish-white, darker by exposure, odor peculiar, aromatic, taste bitter, pungent, acrid; contains berberine (bitter, tonic), tannin, gallic acid, resin. Aromatic, tonic, stimulant, antiperiodic; dyspepsia, low fevers with gastro-intestinal irritation, typhoid conditions. Dose, gr. 15–30 (1–2 Gm.); infusion, \mathfrak{z} ss–1 (15–30 cc.); fluidextract. Leaves and young shoots anthelmintic; fruit (samara) aromatic, bitter, good substitute for hop.

AURANTIUM. ORANGE.

Aurantii Amari Cortex. Bitter Orange Peel, *U.S.P.***Oleum Aurantii Florum.** Oil of (Neroli) Orange Flowers, *N.F.*

Citrus Aurantium, (var. **amara**), *Linné.* { 1. The dried rind of the unripe fruit.
2. The volatile oil distilled from the fresh flowers.

Habitat. N. India, cultivated near the Mediterranean Sea, Spain, W. Indies, Madeira, China, S. and S. W. United States, Florida, California, etc.

Syn. Aurant. Amar. Cort., Curaçao (Wild) Orange, Aurantii Pericarpium, Cortex Pomorum Aurantii; Br. Aurantii Cortex Recens, Aurantii Cortex Siccatus; Fr. Écorce (Zeste) d'Orange amère, Écorce de Bigarade; Ger. Cortex Aurantii Fructus, Pomeranzenschale.

Citrus. L. fr. Gr. κίτρον, after the town of Citron in Judea, where it formerly flourished.

Au-ran'ti-um. L. *aurum*, gold—*i. e.*, yellow color of fruit.

A-ma'ra. L. *amarus*, bitter—*i. e.*, the decided bitter taste of the fruit.

Orange. Eng. fr. Skr. *nagarange* through the Arab. *naranj*.

PLANT.—Small tree 3–4.6 M. (10–15°) high; stem branched; bark shining, smooth, greenish-brown; leaves 7.5–10 Cm. (3–4') long, ovate, evergreen, faintly serrate, with oil-vesicles, fragrant, petioles 12–25 Mm. ($\frac{1}{2}$ –1') long; flowers May, 2.5 Cm. (1') broad, white;

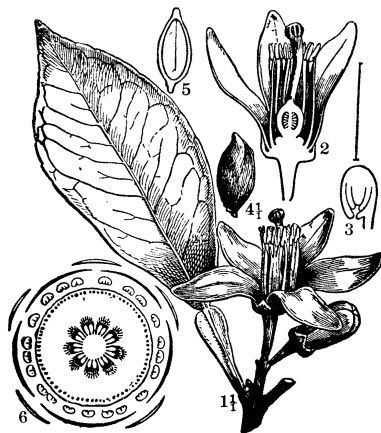


FIG. 224.—*Citrus Aurantium* (var. *amara*): 1, the end of a flowering twig; 2, flower, vertical section; 3, longitudinal section of ovary; 4, seed; 5, longitudinal section of seed; 6, diagram of flower.

fruit 5–10 Cm. (2–4') in diameter, round, red or yellow, 9–11-celled, each several-seeded. **RIND** (zest), in thin, irregular bands (ribbons) or quarters, yellowish, greenish-brown, numerous minute pits and fine reticulate ridges; inner surface whitish, many slight conical projections, fine anastomosing lines formed by vascular bundles; fracture hard, short; odor fragrant, aromatic; taste aromatic, bitter. **POWDER**,

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yellowish-gray, light brown—many parenchyma fragments with thick cell walls, tracheæ very small, calcium oxalate prisms; with potassium hydroxide T. S.—yellowish. *Solvents*: alcohol; water. Dose, gr. 15–30 (1–2 Gm.). OIL (flowers), a pale yellow, slightly fluorescent, neutral liquid, distinctive fragrant odor, similar to orange blossoms, and an aromatic, sweet then bitter taste; soluble in alcohol (1) with violet fluorescence, neutral reaction, in 80 p. c. alcohol (2), with excess—cloudy; sp. gr. 0.874, dextrorotatory. Should be kept cool, dark, in small, well-stoppered, amber-colored bottles.

Commercial.—This bitter fruit grows mostly in Spain, Madeira, India, China, being known as Seville or Bigarade Orange, and is not in the fresh state a commercial article with us. The Mandarin (*C. sinen'sis*), S. Europe, is much smaller, having flattened ends, very thin rind, and pleasant taste. The celebrated Bizarria, of Italy, pro-

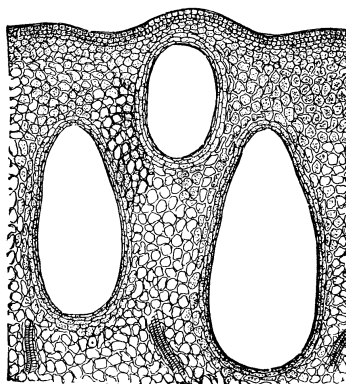


FIG. 225.—Orange peel: transverse section, magnified 65 diam.

duces on the same stem oranges, lemons, and citrons, and these often in mixed parts. The oil is distilled from fresh flowers, when it floats upon the water, and may easily be separated. There are four commercial grades: 1. *Ne'role (Essence de) Pe'tale*, most delicate—from flowers of *C. Aurantium*. 2. *Ne'role (Essence de) Bigarade*—from flowers of *C. amara (Bigaradia)*, N. F. 3. *Ne'role (Essence de) Portugal*—from immature fruits of *C. Aurantium*, 4. *Ne'role (Essence de) Petit Grain*—from immature fruits and leaves of *C. amara*. Imported mostly from Grasse, Cannes, Messina, Nice.

CONSTITUENTS.—RIND: Volatile oil, naringin (aurantiin) very bitter glucoside, aurantiamarin 1.5–2.5 p. c., leading bitter glucoside, isohesperidin .4–3 p. c., aurantiamaric acid .1 p. c., hesperidin, hesperic acid, (fixed oil, resin, gum, albumin, tannin, ash 4–7 p. c.). OIL (flowers): Limonene, linalool, linalyl acetate 7–18 p. c., geraniol, methyl anthranilate (to which odor and fluorescence are due).

Oleum Auranti Amari, N.F.—A volatile oil obtained by expression from the fresh peel. It is a pale yellow liquid, with characteristic, aromatic odor of Seville orange, and aromatic, bitter taste, soluble in alcohol (4), solution neutral, in all proportions of dehydrated alcohol, in glacial acetic acid (1); sp. gr. 0.845, dextrorotatory. Should be kept cool, dark, in small, well-stoppered, amber-colored bottles.

PREPARATIONS.—I. RIND: 1. *Tinctura Aurantii Amari*. Tincture of Bitter Orange Peel. (Syn., Tr. Aurant. Amar.; Br. *Tinctura Aurantii*; Fr. *Teinture d'Écorce d'Oranges amères*; Ger. *Pomeranzen-(schalen)tinktur*.)

Manufacture: 20 p. c. Similar to *Tinctura Veratri Viridis*, page 104, menstruum: 60 p. c. alcohol. Dose, ʒj–2 (4–8 cc.).

Prep.: 1. *Elixir Aurantii Amari, N.F.*, 2 p. c.

2. *Tinctura Cinchonæ Composita*, 8 p. c. 3. *Tinctura Gentianæ Composita*, 4 p. c. 4. *Infusum Gentianæ Compositum, N.F.*, $\frac{4}{5}$ p. c. 5. *Tinctura Amara, N.F.*, 6 p. c.

II. FLOWERS: 1. *Aqua Aurantii Florum*. Orange Flower Water. (Syn., Aq. Aurant. Flor., *Aqua Aurantii Florum Fortior*, Triple Orange Flower Water.)

Manufacture: Obtained as a by-product in distilling oil of orange flowers, or by collecting 3 parts of distillate from 2 of flowers. It is a saturated solution of the odoriferous principles of the fresh flowers obtained by distilling with water and separating the clear, saturated portion of the distillate; it is nearly colorless, clear or faintly opalescent, strong pleasant odor, and taste of orange blossoms; must be free from empyreuma, mustiness, or fungoid growths, and is best preserved by allowing a limited access of fresh air to the container. *Tests*: 1. Evaporate 100 cc.—residue .001 Gm.; neutral, slightly acid. 2. With hydrogen sulphide T. S., or sodium sulphide T. S.—no reaction (abs. of metallic impurities). Dose, ʒj–4 (4–15 cc.).

Preps.: 1. *Syrupus Aurantii Florum*. Syrup of Orange Flowers. (Syn., Syr. Aurant. Flor.; Fr. *Sirop de Fleurs d'Oranges*; Ger. *Pomeranzenblüthensirup*.)

Manufacture: Dissolve by agitation sucrose 85 Gm. in a mixture of orange flower water and distilled water, each 22.5 cc., without heat, add of the latter q. s. 100 cc., mix thoroughly, strain. Dose, *ad libitum*; as a flavoring vehicle.

2. *Trochisci Acidi Tannici*, q. s. 3. *Elixir Aurantii Amari, N.F.*, 2 p. c. 4. *Elixir Amygdalæ Compositum, N.F.*, 15 p. c. 5. *Elixir Glycyrrhizæ Aquosum, N.F.*, 20 p. c. 6. *Liquor Hypophosphitum Compositus, N.F.*, 3.5 p. c. 7. *Liquor Phosphatum Compositus, N.F.*, 12.5 p. c. 8. *Syr. Calc. Lactophos., N.F.*, 5 p. c.

III. OIL (Rind): 1. *Elixir Aurantii Amari, N.F.*, $\frac{2}{5}$ p. c.

IV. OIL (Flowers): 1. *Spiritus Odoratus, N.F.*, $\frac{2}{5}$ p. c.

Unoff. Preps.: RIND: *Fldext.* (75 p. c. alc.). *Inf.* (Br.), 5 p. c., ʒiv–8 (15–30 cc.). *Inf. Comp.* (Br.), 2.5 p. c. + lemon peel 1, clove .5. *Wine* (Br.)—fermenting saccharine solution + fresh bitter orange peel.

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PROPERTIES.—Stimulant, tonic, carminative, stomachic, bitter; excessive doses of both peel and oil cause colic, convulsions, occasionally death.

USES.—In indigestion, flatulence, corrigent to purgatives; aromatic when in combination with gentian, calumba, quassia, cinchona, etc.; most of the preparations are used as flavoring agents. Workmen employed among the fruit have skin eruptions, nervousness, headache, gastralgia, insomnia, muscular spasms.

AURANTII DULCIS CORTEX. SWEET ORANGE PEEL, U.S.P.

Citrus Aurantium, var. **sinensis**, { The fresh, outer rind of the ripe fruit.
Linné.

Habitat. Same as *C. Aurantium* (var. *amara*).

Syn. Aurant. Dulc. Cort., Curaçao, Navel (Seedless) Orange, Forbidden Fruit, Golden (Orange) Apple, Nerotia Flowers; Fr. Écorce (Zeste) d'Orange douce; Ger. Apfelsinenschalen.

Si-nen'sis. L. (Chinensis) Chinese, of or belonging to China—*i. e.*, its chief habitat.

PLANT.—Small tree, 4.5–6 M. (15–20°) high, identical with *C. Aurantium* (var. *amara*), differing only in point of variety, but having leaves and flowers more fragrant, and the fruit sweeter, larger, deeper yellow. RIND (zest), the outer orange-yellow layer recently separated by grating or paring, consisting of epidermal cells, parenchyma cells



FIG. 226.—*Citrus Aurantium*, var. *sinensis*.

of sarcocarp with chromoplastids, oil reservoirs and globules of volatile oil; odor highly fragrant; taste pungently aromatic. *Solvents:* alcohol; water. Dose, gr. 15–30 (1–2 Gm.).

Commercial.—This sweet fruit grows only by cultivation; was unknown to the Greeks and Romans, being introduced first into Europe

by the Portuguese in the 15th century. There are now some fifty varieties cultivated in Spain, Portugal, Madeira, Azores, China, West Indies, S. and S. W. United States, many of which have been given commercial names after the districts of production, as China, Portugal, Havana, Florida, California, Messina, and Malta (blood-red). These are imported in boxes of 100–200, having each orange wrapped in tissue-paper, the sweetest coming to us from Havana, Florida, and California.

CONSTITUENTS.—Volatile oil, hesperidin, (fixed oil, resin, gum, tannin, ash 4–5 p. c.).

Oleum Aurantii. **Oil of Orange, U.S.P.**—(Syn., Ol. Aurant., Oleum Aurantii Corticis, U.S.P. 1900, Orange Oil, Oil of Sweet Orange, Oleum Aurantiorum, Essence (Essential Oil) of Orange; Fr. Huile d'Orange; Ger. Pomeranzenschalenöl.) This volatile oil is produced mostly in S. Italy, Sicily, by expression from the fresh peel of the ripe fruit (sweet orange and its varieties), or rupturing the oil-glands mechanically and collecting the liberated oil, as with oil of lemon; if obtained by distillation the product is decidedly less fragrant. It is a yellow liquid, characteristic odor and taste of the outer part of sweet orange peel, sp. gr. 0.844; soluble in dehydrated alcohol, carbon disulphide, glacial acetic acid (1); neutral reaction, dextrorotatory; contains limonene (citrene, hesperidene), $C_{10}H_{16}$, 90 p. c., odor bearers (citral, citronellal, methyl ester of anthranilic acid). *Tests:* 1. With 90 p. c. alcohol (2)—does not form clear solution (dif. from washed citrus oils). 2. Evaporate 25 Gm. to dryness—residue not less than 2 p. c. (dif. from washed citrus oils). 3. Should not have a terebinthinate odor or taste (abs. of oil of turpentine); must meet requirements for heavy metals. The oil from the peel of bitter orange (*N. F.*) though chemically indistinguishable, has a superior flavor, but a limited production, and usually is mixed with this oil (sweet orange). Oil having a terebinthinate odor must not be dispensed. Should be kept cool, dark, in small, well-stoppered, completely filled, amber-colored bottles (to avoid developing terebinthinate odor). Usually shipped in tinned-copper cans. Dose, $\text{m}\bar{\text{j}}\text{--}5$ (.06–.3 cc.).

ADULTERATIONS.—Oil of turpentine, alcohol, etc.

PREPARATIONS.—I. RIND: 1. *Tinctura Aurantii Dulcis.* Tincture of Sweet Orange Peel. (Syn., Tr. Aurant. Dulc.; Fr. Teinture d'Orange douce; Ger. Apfelsinenschalentinktur.)

Manufacture: 50 p. c. Similar to Tinctura Cardamomi Composita, page 137—macerating 50 Gm. in alcohol 100 cc., filtering through purified cotton, and finishing with alcohol q. s. 100 cc. Dose, $\bar{\text{5}}\text{j--}2$ (4–8 cc.); as a flavoring vehicle.

Preps.: 1. *Syrupus Aurantii.* Syrup of Orange. (Syn., Syr. Aurant., Syrupus Aurantii Corticis, Syrup of Orange Peel; Fr. Sirop d'Écorce d'Orange; Ger. Pomeranzen(Orangen-schalen)-sirup.)

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Manufacture: Triturate purified talc 1.5 Gm. with tincture of sweet orange peel 5 cc. and citric acid .5 Gm., and add gradually distilled water 40 cc., filter, add through filter distilled water q. s. 45 cc.; dissolve in this, by agitation, sucrose 82 Gm. (without heat), add distilled water q. s. 100 cc., mix thoroughly, strain; must not dispense when of terebinthinate odor or taste or shows other deterioration. Dose, *ad libitum*—flavoring.

2. *Elixir Gentianæ Glycerinatum*, N.F., 1.5 p. c. 3. *Elixir Pepsini et Rennini Compositum*, N.F., 5 p. c. 4. *Elixir Taraxaci Compositum*, N.F., 6 p. c. 5. *Elixir Terpini Hydratis*, N.F., 2 p. c.

II. OIL: 1. *Spiritus Aurantii Compositus*. Compound Spirit of Orange. (Syn., Sp. Aurant. Co.; Fr. Esprit d'Orange composée; Ger. Zusammengesetzter Orangengeist.)

Manufacture: 20 p. c. Dissolve oil 20 cc., + oil of lemon 5, oil of coriander 2, oil of anise .5 in alcohol q. s. 100 cc. Should be kept in dark amber-colored bottles. As a flavoring vehicle.

Preps.: 1. *Elixir Aromaticum*. Aromatic Elixir. (Syn., Elix. Arom., Simple Elixir; Fr. Elixir aromatique; Ger. Aromatisches Elixir.)

Manufacture: 1½ p. c. To compound spirit of orange 1.2 cc., add alcohol q. s. 25, to this add syrup 37.5, in several portions with agitation, distilled water 37.5, purified talc 3 Gm., filter until clear, wash filter with 25 p. c. alcohol q. s. 100 cc.—flavoring.

Preps.: 1. *Elixir Glycyrrhizæ*, 87.5 p. c. 2. *Numerous Elixirs*—as a vehicle.

2. *Elixir Aletridis Compositum*, N.F., 1 p. c., + 10 other N.F. *Elixirs*—flavoring. 3. *Emulsa*—flavoring.

2. *Elixir Ferri Pyrophosphatis, Quininae et Strychninae*, N.F., ⅙ p. c. 3. *Elixir Pepsini Compositum*, N.F., ⅓ p. c. 4. *Liquor Ferri Peptonati*, N.F., ⅙ p. c. 5. *Liquor Ferri Peptonati et Mangani*, N.F., ⅙ p. c. 6. *Spiritus Cardamomi Compositus*, N.F., 2 p. c. 7. *Spiritus Myrciæ*, N.F., ⅓ p. c. 8. *Spiritus Vanillini Compositus*, N.F., 5 p. c. 9. *Syrupus Quinidinae*, N.F., ⅓ p. c. 10. *Tabellæ Sulphuris et Potassii Bitartratis*, N.F., ⅓ m. (.003 cc.). 11. *Trochisci Eucalypti Gummi*, N.F., ⅓ m. (.003 cc.).

PROPERTIES AND USES.—Aromatic; chiefly for flavoring and in perfumery; fruit deliciously edible.

LIMONIS CORTEX. LEMON PEEL, U.S.P.

Citrus medica, var. **Limonum**, { The outer yellow rind of the fresh
(Risso) Hooker filius. } ripe fruit.

Habitat. N. India; cultivated in subtropics, Mediterranean Basin, United States (California, Florida), Australia, etc.

Syn. Limon. Cort.; Fr. Écorce (Zest) de Citron (Limon); Citron, Limon; Ger. Cortex Fructus Citri, Flavido Corticis Citri, Citronen Limonen)—schale; Limone, Citrone.

Med'i-ca. L. *medicus*, medical, curative—*i. e.*, properties useful in medicine.

Li-mon'um. L. a lemon, fr. Arab. *limun*, *limu*, taken from Skr. *nimbuka*.

PLANT.—Straggling bush or tree, 3–4.5 M. (10–15°) high, more tender than the orange, having many angular branches and sharp spines in the leaf-axils; bark gray, that of branches green, of twigs reddish or purple; leaves evergreen, 5–6 Cm. (2–2½') long, ovate, acute, serrate, 12 Mm. (½') petioles; flowers all the year round, sweet-scented, white to purplish-pink; fruit ovoid berry 7.5 Cm. (3') long with nipple-shaped extremity, smooth, depressed punctations over the oil-glands, structure like orange; pulp acid, yellow; seed as in orange, only smaller. PEEL, the outer, lemon-yellow, dark yellow layer, recently separated by grating, paring, and consisting of an epidermal layer, numerous parenchyma cells containing yellow chromoplastids, and large oil reservoirs with globules of the volatile oil; odor fragrant,



FIG. 227.—*Citrus medica*, var. *Limonum*: a, flower; b, fruit.

distinctive; taste aromatic; sections mounted in a fixed oil show epidermal layer (small tabular cells), hypodermal layer containing numerous plastids, a mesocarp with colorless, thin-walled parenchyma, large elliptical oil reservoirs, granular protoplasm, calcium oxalate crystals. The inner spongy white portion should be removed and discarded. *Solvents*: alcohol; wine; water. Dose, ʒss–1 (2–4 Gm.).

Commercial.—Lemons reach us from California, Florida, W. Indies, Mediterranean region (Sicily, Spain, etc.) packed in boxes, each lemon being wrapped in white or brownish tissue-paper. Foreign varieties are known as *wax*, *imperial*, *gata*, and all, when kept several months, deteriorate, owing to the decomposition of citric acid, into sugar and carbon dioxide, in consequence of which, to insure preservation and permit long shipments, they must be coated with melted paraffin,

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dissolved shellac, or varnish. The rind should be pared thinly from the fruit with sharp knives and carefully dried.

CONSTITUENTS.—Volatile oil, bitter principle, hesperidin, ash 4 p. c.

Oleum Limonis. **Oil of Lemon, U.S.P.**—(Syn., Ol. Limon., Lemon Oil, Oleum de Cedro; Fr. Essence (Huile) de Citron—Cédrat; Ger. Citronöl, Limonenöl.) This volatile oil is produced mostly in Sicily, S. France, Italy (Calabria), by expression from fresh peel of the ripe fruit, using several processes that rupture mechanically the oil-cells thereby liberating the oil and rendering it easily collected: 1, *spugna*—collecting by sponge the oil from ruptured cells of the quartered rind; 2, *scorzetta*—of the halved rind; 3, *machina*—substituting a complicated machine for manual labor of expression and collection; 4, *écuelle à piquer*—not much used but consisting of an instrument, bowl-shaped, 25 Cm. (10") wide, of tinned-copper, having a raised opening in the center which forms with the outer edge a broad channel; to this there is a heavy cover similarly shaped, whose inner surface as well as that of the machine is armed with concentric rows of short 6 Mm. ($\frac{1}{4}$ ") spikes or ridges; an opening in the bottom allows the escape of oil. By a handle the cover is made to revolve rapidly one-half minute over the instrument, having between the two 5 to 8 fruits, after which they are replaced by fresh ones. About 7000 fruits can be exhausted daily by each machine. It is a pale yellow, greenish-yellow liquid, characteristic odor and taste of the outer part of fresh lemon peel, sp. gr. 0.853, dextrorotatory, soluble in alcohol (3), dehydrated alcohol, carbon disulphide, glacial acetic acid; neutral, slightly acid; contains at least 4 p. c. (7–8) of aldehydes calculated as citral, $C_{10}H_{16}O$, which gives the aroma and value (being also produced by oxidizing geraniol, $C_{10}H_{18}O$, with chromic acid), limonene (citrene), $C_{10}H_{16}$, 76 p. c., little cymene, $C_{10}H_{14}$, citronellal, $C_{10}H_{18}O$, phellandrene, pinene, geranyl acetate, a sesquiterpene, octyl aldehyde, nonyl aldehyde, methyl heptenone, terpineol. Should be kept cool, dark, in completely filled, well-stoppered, amber-colored bottles, and that having a terebinthinate odor must not be dispensed. Dose, m̄j–5 (.06–.3 cc.).

ADULTERATIONS.—Oils of other *Citrus* fruits, fixed oils, alcohol, oil of turpentine. The fragrant *Oil of Petit Grain Citronnier*, from immature fruits, leaves, and twigs, closely resembles *Neroli Petit Grain*, and may be used similarly.

Hesperidin, $C_{22}H_{26}O_{12}$.—A glucoside (bitter principle) from the white, spongy part or rind by boiling water; bitter, yellowish-white powder or white needles; soluble in diluted alkalis or acetic acid, black with ferric salts, and by diluted sulphuric acid decomposed into hesperetin, $C_{16}H_{14}O_6$, and glucose, $C_6H_{12}O_6$.

PREPARATIONS.—I. **PEEL:** 1. *Tinctura Limonis*. Tincture of Lemon. (Syn., Tr. Limon., Tinctura Limonis Corticis; Fr. Teinture d'Écorce de Citron; Ger. Citronenschalentinktur.)

Manufacture: 50 p. c. Similar to Tinctura Cardamomi Composita, p. 137—macerating 50 Gm. in alcohol 100 cc., filtering through purified

cotton, and finishing with alcohol q. s. 100 cc. Dose, ʒss–2 (2–8 cc.).

Preps.: 1. *Syrupus Acidi Citrici*, 1 p. c. 2. *Emulsum Petrolati*, N.F., 1.5 p. c.

II. OIL: *Liquor Magnesii Citratis*, $\frac{1}{10}$ cc. in 350. 2. *Spiritus Ammoniae Aromaticus*, 1 p. c. 3. *Spiritus Aurantii Compositus*, 5 p. c. 4. *Acetum Aromaticum*, N.F., $\frac{1}{10}$ p. c. 5. *Linimentum Terebinthinæ Aceticum*, N.F., 1.6 p. c. 6. *Mistura Oleo-Balsamica*, N.F., $\frac{2}{3}$ p. c. 7. *Spiritus Odoratus*, N.F., $\frac{4}{5}$ p. c. 8. *Syrupus Eriodictyi Aromaticus*, N.F., $\frac{1}{20}$ p. c. 9. *Syrupus Sennæ Aromaticus*, N.F., $\frac{1}{4}$ p. c.

Unoff. Preps.: PEEL: *Spirit*, 5 p. c., + oil 5 p. c. (alcohol), ʒss–2 (2–8 cc.). *Infusion*. *Syrup*. *Juice* (from fruit—used alone, neutralized by alkali, or made into syrup; soon spoils, but will keep a short time by letting stand until albumin is coagulated, straining into hot bottles, and covering with almond or sweet oil; flavor is preserved best by making it into concentrated syrup); yield $\frac{1}{2}$ –1 ounce (15–30 cc.) per lemon, dose, ʒij–5 (8–20 cc.).

PROPERTIES AND USES.—Stimulant, stomachic, added usually to infusions, tinctures, etc., chiefly for flavoring. Juice refrigerant, relieves thirst, febrile inflammatory affections in agreeable beverages; diaphoretic (neutral mixture), scurvy (seamen on long voyages should take ʒj (30 cc.) daily as a preventive), acute rheumatism; locally in sunburn, pruritus of scrotum, uterine hemorrhage after labor, gargle in diphtheria.

Limones, Lemons. The fruit, U.S.P. 1820–1850. *Limonis Succus, Lemon Juice*, U.S.P. 1860–1900.

Allied Plants:

1. *Citrus Aurantium*, var. *Bergam'ia*, *Bergamot*; *Oleum Bergamottæ, Oil of Bergamot*, N.F.—The volatile oil obtained by expression from the rind of the fresh fruit with not less than 36 p. c. of ester, calculated as linalyl acetate; S. Italy, France; cultivated. Small tree resembling the lemon and orange, flowers peculiar, delicious odor, fruit pale lemon color, pyriform or globose, with concave receptacles of oil in the rind. Oil obtained as that of lemon and orange, and is a greenish-yellow liquid, neutral, faintly acid, characteristic fragrant odor, aromatic bitter taste; forms clear solution with alcohol ($\frac{1}{2}$), not turbid with further addition, soluble in glacial acetic acid, 80 p. c. alcohol (2), with slight cloudiness and no separation of oil globules; sp. gr. 0.877, dextrorotatory; 2 Gm. evaporated to soft green residue—corresponds to not more than 6 p. c. of the oil (abs. of fixed oils); contains limonene (citrene), dipentene (bergaptene, bergamot camphor), linalool, and linalool acetate 36–39 p. c., upon which the value chiefly depends. Stimulant, excitant, aromatic; used exclusively as a perfume; 1. *Spiritus Odoratus*, 1.5 p. c.

2. *C. med'ica, Citron*.—Small tree, but fruit very large, 20–22.5 Cm. (8–9') long, resembling pineapple in shape. The rind is popular as a dessert, essence in perfumery, and juice for similar purposes as that of lemon and lime fruits. *C. medica*, var. *acida. Succus Citri*,

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Lime Juice; contains citric acid 5–10 p. c. *Succus Citri et Pepsinum*, lime juice 60 p. c., + glycerite of pepsin 40.

3. *Ægle Mar'melos*, *Belæ Fructus*, *Bael Fruit* (Br.), *Bengal Quince*.—The fresh half-ripe fruit; Malabar, Coromandel, cultivated in India. Fruit round, size of a large orange, cherry-red color, aromatic, sweetish, acidulous, mucilaginous, astringent when unripe, laxative when ripe, seed woolly, pulp firm, brittle, 12-celled, covered with hard, gourd-like nearly smooth rind, 3 Mm. ($\frac{1}{8}$ ') thick. The dried, half-ripe fruit is used, being adulterated sometimes with fruit of *Garcinia Mangosta'na*, *Mangosteen*; contains gum, pectin, sugar, tannin, bitter principle, volatile oil. It is mildly astringent. Dose, gr. 15–30 (1–2 Gm.), in diarrhea, dysentery.

38. SIMARUBACEÆ. Quassia Family.

Sim-a-ru-ba'se-e. L. *Simarub-a* + aceæ; from native name in Guiana. Shrubs, trees. Distinguished by containing bitter principle, and from allied Rutaceæ, by leaves being exstipulate, without glands or dots, alternate; ovary stalked, 4–5-lobed, superior; ovules 1 in each cell; stamens 8–10, augmented each by 1 or more scales; calyx 4–5; petals 4–5; fruit drupe; seeds exalbuminous; tropics; bitter, tonic, febrifuge.

Genera: 1. **Picrasma**. 2. **Quassia**.

QUASSIA. QUASSIA, U.S.P.

Picrasma excelsa, (Swartz) Planchon, } The wood.
Quassia amara, Linné.

Habitat. 1. W. Indies (Jamaica, St. Kitt's, Antigua, St. Vincent. 2. Surinam, W. Indies, Brazil, Guiana, Columbia, Panama.

Syn. Quass., Bitter Wood, Bitter (Ash, Bark) Quassia, Lofty Quassia, Bitter-wood Tree; Br. Quassiæ Lignum; Fr. Quassia de la Jamaïque, Bois (amer) de Quassia; Ger. Lignum Quassiæ, Quassiaholz.

Pic-ras'ma. L. fr. Gr. *πικρός*, bitter—*i. e.*, the plant's chief property.

Quas'si-a. L. fr. *Quassi*, *Quassy*, *Quash*, name of Surinam negro slave who used the bark as a secret remedy in curing malignant fevers (febrifuge).

Ex-cel'sa. L. *excelsus*; *ex*, out, + *celsus*, beyond, surpassing—*i. e.*, highest species of the genus.

A-ma'ra. L. *amarus*, bitter—*i. e.*, the intense bitterness of the wood.

PLANTS.—*Picrasma excelsa*, tree 15–24 M. (50–80°) high, .6–1 M. (2–3°) thick, erect, spreading; bark grayish-brown, smooth, wrinkled; leaves imparipinnate, 4–5 pairs; leaflets 5–10 Cm. (2–4') long, ovate, petiolate, when young covered with fulvous down; flowers, Oct.–Nov., small, yellowish-green, panicles, polygamous; fruit Dec.–Jan., black drupe, size of a pea; *Quassia amara*, small branching tree or shrub; flowers bright red, rather large racemes, hermaphrodite, decandrous; fruit 2-celled capsule, seed globular. Wood (*P. excelsa*): *Jamaica*, usually in chips, raspings, shavings, occasionally billets 5–20 Cm.

(2-8') thick, yellowish-white, with few light gray pieces somewhat coarsely grained; tracheæ in groups 2-6, medullary rays 1-5 cells wide, 10-20 rows deep, calcium oxalate, starch grains; fracture tough, fibrous; odor slight; taste very bitter; *Q. amara*: *Surinam*, similar to preceding, but billets usually thinner, tracheæ smaller, single or in pairs, medullary rays 1-2 cells wide, 10-30 rows deep, calcium oxalate crystals few or absent. POWDER, yellowish—fragments of tracheæ, bordered pores; wood-fibers, oblique pores; medullary rays and parenchyma with pores, calcium oxalate 4-6-sided prisms, crystal-fibers, starch grains. *Solvents*: water, diluted alcohol. Dose, gr. 15-60 (1-4 Gm.).



FIG. 228.—*Picrasma excelsa*.

Commercial.—Plants resemble our common ash and contribute two varieties: 1, *Jamaica* (*P. excelsa*—*Quassia* (*Simaruba*) *excelsa*), the larger, and furnishing most of the supply; 2, *Surinam* (*Q. amara*), the smaller and the original source of drug, upon which the slave Quassi established his own and its reputation, being prevailed upon to reveal his secret for compensation, 1756, when the wood was taken to Stock-

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holm and soon became a popular remedy in Europe and elsewhere; owing to scarcity, smallness of plant, and great demand there arose the necessity of recognizing the larger and more abundant source. The plants are felled, cut into segments, 1–1.2 M. (3–4°) long, 5–20 Cm. (2–8') thick, and shipped from Jamaica or Surinam with or without the bark, and upon reaching us are turned into cups, etc., reserving the shavings for store use; the wood at first is white, but changes by age to yellow.

CONSTITUENTS.—Picrasmin (quassiin) .05–.15–.75 p. c., alkaloid (yellowish, blue fluorescence with acidified alcohol), resin, mucilage, pectin; Surinam quassia also contains trace of tannin, giving black or bluish-black with ferric salts.

Picrasmin.—Obtained by neutralizing infusion with sodium hydroxide, precipitating with tannin, decomposing precipitate by heating with lead oxide or lime, dissolving out with alcohol. It is a mixture of two crystalline compounds, *a*-picrasmin, $C_{35}H_{46}O_{10}$, and *b*-picrasmin, $C_{36}H_{48}O_{10}$, homologous with quassiin, $C_{32}H_{40}O_{10}$, of Surinam quassia, crystallizing in needles or prisms, soluble in alcohol, chloroform, water (1200). Dose (amorphous) gr. $\frac{1}{2}$ –1 (.03–.06 Gm.); (crystalline) gr. $\frac{1}{32}$ – $\frac{1}{3}$ (.002–.02 Gm.).

PREPARATIONS.—1. *Fluidextractum Quassiae*, N.F. (33 p. c. alcohol).
2. *Tinctura Quassiae*, N.F. (33 p. c. alcohol). Dose, $\mathfrak{M}\text{xv}$ –60 (1–4 cc.).

Unoff. Preps.: *Extract* (water), gr. 1–3 (.06–.2 Gm.); *Infusion* (Br.), 1 p. c., $\mathfrak{Z}\text{iv}$ –8 (15–30 cc.); Concentrated Solution, 10 p. c.; Syrup, for fly poison.

PROPERTIES.—Tonic, febrifuge, anthelmintic, simple bitter (similar to calumba).

USES.—Atonic dyspepsia, diarrhea, gastric vertigo, constipation, loss of appetite, poisons flies (*papier mouri*), fish, dogs, rabbits. Infusion ($\mathfrak{Z}\text{ viij}$; 240 cc.), patient being in the knee-chest position, as enema for thread worms (*Oxyuris vermicularis*) or ascarides of rectum; internally for lumbricoid worms. Large doses cause headache, nausea, vertigo, vomiting, diarrhea, cramps, narcosis. Substituted for hop in making beer and ale.

Allied Plants:

1. *Picramnia pentand'ra* (?), *Cascara Amarga*, *Honduras Bark*, N.F.
—The dried bark of an undetermined species with not more than 2 p. c. of foreign organic matter; C. America. Large handsome tree. Bark, quills 50 Cm. (20') long, 3 Cm. (1 $\frac{1}{5}$ ') broad, bark 8 Mm. ($\frac{1}{3}$ ') thick, sometimes broken curved pieces, yellowish-brown, grayish lichens, fissured, reddish-brown when cork removed; inner surface brownish, striated, transverse markings, groups of stone cells, odor faint; taste extremely bitter, persistent. Powder, light brown—groups of bast-fibers, crystal-fibers, calcium oxalate prisms, stone cells, medullary ray tissue and parenchyma, starch grains, brown cork, lignified fibers; solvents: water, diluted alcohol; contains picramnine 3 p. c., starch 2 p. c., ash 4.5 p. c. Alterative, bitter aromatic, agreeable flavor.

Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Trifolii Compositum*, 10.8 p. c.; Prep.: 1. *Syrupus Trifolii Compositus*, 30 p. c.

2. *Simaruba amara* (*S. officinalis*, *S. medicinalis*, *Quassia Simaruba*).—The bark (of root), U.S.P. 1820–1870; Guiana to N. Brazil, W. Indies. Tree 15–18 M. (50–60°) high, crooked branches; leaves 22.5–30 Cm. (9–12') long, leaflets 3–5 pairs, 5–10 Cm. (2–4') long; flowers yellow; fruit drupe; bark flat, curved, or quilled, .5–1 M. (20–40') long, 3 Mm. ($\frac{1}{8}$ ') thick, yellowish-brown, striate, fibrous,

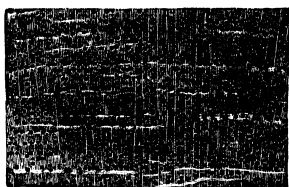


FIG. 229.—Jamaica quassia wood: cross-section magnified 3 diam.



FIG. 230.—*Simaruba amara* (*officinalis*): 1, calyx and ovary; 2, corolla; 3, stamens; 4, stamen and anther.

bitter; contains picrasmin, resin, volatile oil, calcium oxalate. Tonic, febrifuge, diuretic (large doses cause vomiting and purging); dysentery, diarrhea (*dysentery bark*), etc.; in infusion, decoction. Dose, gr. 10–30 (.6–2 Gm.).

3. *Sima'ba ce'dron* and *S. ferrugin'ea*.—Colombia, Brazil; resembles *simaruba*, but flowers hermaphrodite; fruit pear-shape, size of hen's egg. Used natively as febrifuge and as antidote to poisonous animal bites.

39. BURSERACEÆ (AMYRIDACEÆ). Myrrh (Frankincense) Family.

Ber-se-ra'se-e. L. *Burser-a* + *aceæ*, after Joachim Burser, German botanist, at Naples, 17th century. Trees, shrubs. Distinguished by secreting fragrant gum-resinous or resinous juice; leaves compound, dotted; ovary sessile, 1–5-celled, ovules in pairs; flowers perfect; calyx 2–5 divisions; petals 3–5; stamens twice the petals; fruit dry, 1–5-celled; seeds exalbuminous, superior; tropics, bitter, purgative, anthelmintic, poisonous; lumber.

Genus: 1. **Commiphora**.

MYRRHA. MYRRH, U.S.P.

Commiphora Myrrha, (Nees) Baillon, or other species. { A gum-resin yielding not less than 30 p. c. alcohol-soluble extractive, nor more than 4 p. c. acid-insoluble ash.

Habitat. E. Africa, S. W. Arabia, Somali country, around Hurrur; 450–900 M. (1500–3000°) elevation.

Syn. Myrrh, Gum Myrrh, Somali (Herabol) Myrrh, Resina Balsamodendri, Gummi-resina Myrrha; Fr. Myrrhe; Ger. Myrrha, Myrrhe.

Com-miph'o-ra. L. fr. Gr. κόμμι gum, + φέρος φέρειν bears, to bear—*i. e.*, produces gummy exudation.

Myrr'ha. L. fr. Gr. μύρρα, classic name—Ar. murr; Heb. mar, bitter—*i. e.*, gum-resin has bitterish taste.

PLANT.—Low, stunted bush or small tree 2.5–3 M. (8–10°) high; trunk considerable size, with many irregular, knotty, abortive branches at right angles, terminating in sharp spines; bark whitish-gray; leaves trifoliate, 2.5 Cm.



FIG. 231.—*Commiphora Myrrha*: 1, fruit-bearing twig; 2, ripe fruit; 3, and 4, vertical section of pistillate and staminate flowers respectively; 5 embryo.

(1') long, petiolate; leaflets sessile, 12 Mm. ($\frac{1}{2}$ ') long, unequal, obovate, central one the largest; flowers dioecious; fruit 12 Mm. ($\frac{1}{2}$ ') long, pyriform. **GUM-RESIN** (myrrh), in rounded, irregular tears or masses of agglutinated tears, reddish-brown, covered with yellowish dust; fracture waxy, granular, conchoidal, internally nearly white spots or lines, oily, translucent at edges; odor balsamic, aromatic; taste aromatic, bitter, acrid; triturated with water—brownish-yellow emulsion; with alcohol—brownish-yellow tincture, changing with nitric acid to purplish-red; macerated with water—neither swells nor dissolves. **POWDER**, yellowish-brown—numerous angular fragments of resin and gum, few fragments of lignified tissue, few starch grains. Reject tears dissolving completely in water, or those swelling with water. *Solvent*: alcohol. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Gum-resin of allied species (bdellium, etc.—fracture more transparent or opaque, odor and taste different), vegetable fragments, sand, salt, dark gums swelling or adhesive with water.

Commercial.—Trees form an undergrowth in the Red Sea coast forests where vegetation is scant, water scarce, and temperature high. Myrrh is formed in the bark and pith, and exudes spontaneously, like cherry-tree gum, or from artificial incisions through the stem-bark,

being at first a juice, then oily, soft, yellowish, golden, finally hard and reddish. It is collected mostly by the Somali, both at home and across the Aden Gulf, Arabia, and formerly entered commerce via Egypt and Lavan ports, hence the name *Turkey myrrh*, but now is conveyed to the great fair of Berbera, there purchased by the Banians of India, and shipped via Aden to Bombay, where it is assorted into grades (bdellium separated) and put into chests, 100–200 pounds (46–90 Kg.). There are three varieties: 1, *Turkey (African)*, the best—our official kind; 2, *Arabian*, cultivated in S. Arabia, east of Aden, called by Arabs *mur*, by Somalis *mulmul*, *heerabul*, resembles the preceding, but smaller, tougher, without white lines in fracture, less resin, volatile oil and fragrance, only 25 p. c. soluble in alcohol; 3, *Indian (Myrrha Indica)*, called natively *bissabul*, by Somalis *hebbakhade*, resembles dark myrrh, but has mushroom-like odor, strong, almost acrid, taste; contains resin 21 p. c., volatile oil 8 p. c., many impurities; in commerce as Opopanax.

CONSTITUENTS.—Volatile oil 4–8 p. c., Resin 25–40 p. c., Gum 40–60 p. c., bitter principle (glucoside, soluble in alcohol, water), ash 3–8.5 p. c.—mostly calcium carbonate.

Volatile Oil, $C_{10}H_{14}O$.—Also called *myrrhol* or *myrrhenol*, identical in formula with thymol and carvol, but distinct from them; easily resinifies, pale yellow, thick liquid, sp. gr. 0.988.

Resin, $C_{48}H_{32}O_{10}$.—Often called *myrrhin*, soluble in alcohol, chloroform, ether; consists of 2 parts—one soft the other hard and acid, the latter yielding protocatechuic acid and pyrocatechin, and further divisible into 2 parts— β and γ commiphoric acids.

Gum.—Two kinds, one soluble, the other swelling—galactose and arabinose—in water, adhesive, making stable paste; one precipitated by neutral, the other by basic lead acetate.

PREPARATIONS.—1. *Tinctura Myrrhæ*. Tincture of Myrrh. (Syn., Tr. Myrrh.; Fr. Teinture de Myrrhe; Ger. Myrrhentinktur.)

Manufacture: 20 p. c. Similar to *Tinctura Cardamomi Composita*, page 137; menstruum: alcohol. Dose, $\mathfrak{M}\text{xv}$ –60 (1–4 cc.); mostly used externally. 2. *Pilulæ Aloes et Myrrhæ*, N.F., 1 gr. (.06 Gm.). 3. *Tinctura Aloes et Myrrhæ*, N.F., 10 p. c. 4. *Tinctura Capsici et Myrrhæ*, N.F., 12 p. c. 5. *Pilulæ Antiperiodicæ*, N.F., $\frac{1}{8}$ gr. (.008 Gm.). 6. *Pilulæ Rhei Compositæ*, N.F., 1 gr. (.06 Gm.). 7. *Tinctura Antiperiodica*, N.F., $\frac{1}{5}$ p. c.

Unoff. Preps.: *Fluidextract*, $\mathfrak{M}\text{v}$ –30 (.3–2 cc.). *Compound Iron Mixture (Griffith's)*, 1.8 p. c. *Plaster*.

PROPERTIES.—Stimulant, tonic, expectorant, emmenagogue, astringent, carminative, vulnerary; increases circulation and the number of white blood corpuscles; it is eliminated by the genito-urinary and bronchial mucous membranes, augmenting and disinfecting their secretions; large doses vomit, purge, decrease bronchial secretion. Locally, stimulant, disinfectant, and antiseptic to mucous membranes, ulcerated surfaces, etc.

BURSERACEÆ

USES.—Atonic dyspepsia, amenorrhea, anemia, bronchial catarrh, cystitis, pharyngitis, chronic uterine and vaginal leucorrhea. Locally—ulcerated spongy gums, diseased mucous surfaces, relaxed throat, ptialism, ozena, indolent ulcers; tincture freely diluted with water a good disinfectant gargle to ulcerated sore throat; much used in tooth powders and wash.

Allied Products:

1. *Commiphora Mu'kul*, *Indian Bdellium*, and *C. africa'na*, *African Bdellium*.—Both occur in tears resembling myrrh, yellowish-brown, dusty, translucent, the former only slightly aromatic, not bitter, the latter with aroma distinct from myrrh, quite bitter; with nitric acid—no purplish-red; both contain volatile oil, resin, gum—the latter a bitter principle; a third variety is non-translucent; yielding a tincture blackened by ferric salts. *C. (Balsemoden'dron) Opobal'samum*, *Mecca Balsam (Gum)*.—*Bal'samum Gileaden'se*, *Balm of Gilead*. Possibly the myrrh of the Bible; opaque, yellowish, fragrant, viscid liquid; contains volatile oil 10–30 p. c.; soft resin 70 p. c., hard resin 12 p. c.

2. *Boswel'lia Carte'rii*, *Olibanum*, *Frankincense*.—E. Africa, S. Arabia. This gum-resin exudes from incisions made in the bark; occurs in yellowish-brown tears covered with white dust; odor balsamic, terebinthinate; taste balsamic, bitter; partly soluble in alcohol; yields with water milk-white emulsion; contains volatile oil 4–7 p. c. (mostly *olibene*, $C_{10}H_{16}$), resin 56–72 p. c., gum (resembles arabin) 30 p. c., bitter principle, ash 3 p. c. Stimulant, expectorant. Dose, gr. 15–30 (1–2 Gm.), in emulsion, plaster, or fumigation.

3. *Cana'rium commu'ne*, *Manila Elemi*, *Elemi*.—Philippine Islands. The oleoresin exudes from incisions in the bark of a tall tree; it is soft, yellowish, granular crystalline, when cold friable; odor strong, resembling fennel and lemon, terebinthinate; taste bitter, pungent; contains volatile oil 10–15 p. c., amorphous resin (*brein*) 60 p. c. (soluble in cold alcohol), crystalline resin (*amyrin*) 25 p. c., bryoidin, breidin, elemic acid, $C_{35}H_{46}O_4$ (crystalline). Stimulant, irritant; in plaster and ointment.

Allied Plants:

1. *Gua'rea (Sycocar'pus) Rus'byi*, *Cocillana*, *N.F.*.—Meliaceæ. The dried bark with not more than 5 p. c. of wood or other foreign organic matter; Bolivia—river-bottoms. Tree resembles a large apple tree. Bark, in flat, curved pieces, variable length and width, up to 2 Cm. ($\frac{3}{4}$ ') in thickness, externally fissured, gray-brown, ashy gray from lichens, orange-brown where cork removed, inner surface brownish, longitudinally striate; inner bark thicker than outer; fracture coarsely splintery-fibrous, soft; odor characteristic; taste slightly astringent, peculiar, slightly nauseous. Powder, light brown—lignified fibers, crystal-fibers, calcium oxalate prisms, medullary ray cells with brownish contents or starch grains, abundant stone cells, fragments of cork tissue; solvent: 75 p. c. alcohol; contains rusbyine, resins (2), alkaloid,

fat, tannin, ash 10 p. c. Expectorant (superior to ipecac), laxative, emetic; bronchitis, bronchial pneumonia, phthisis. Dose, gr. 5–20 (.3–1.3 Gm.); 1. *Fluidextractum Cocillanæ*. Syrup, Elixir, each 10 p. c., dose, ʒj–2 (4–8 cc.).

2. *Me'lia Azed'arach*, *Margosa Bark*, *Pride of India*.—The bark of the root, U.S.P. 1820–1880; China, India, cultivated, S. United States. Beautiful tree 9–12 M. (30–40°) high, leaves imparipinnate; flowers lilac color; fruit drupe, yellow, size of cherries, poisonous pulp; never leafless. Bark curved or quilled, 5–7.5 Cm. (2–3') long, 5 Mm. ($\frac{1}{5}$ ') thick; outer surface reddish with irregular blackish ridges; inner surface whitish or brownish, striate, sweet, bitter, nauseous; contains resin, tannin, sugar. Used for lumbricoid worms, emetic. Dose, gr. 15–60 (1–4 Gm.), in decoction, tincture (diluted alcohol).

40. POLYGALACEÆ. Milkwort Family.

Pol-i-ga-la'se-e. L. *Polygal-a* + aceæ, fr. Gr., *πολύς* much, + *γάλα*, milk—*i. e.*, believed to increase lacteal secretion in female animals. Shrubs, herbs. Distinguished by bitter, acrid properties and milky roots; flowers papilionaceous; petals 3–5, more or less united; sepals 5, of which 2 anterior are lateral, larger; petaloid, forming the wings to the flowers; stamens 8, monadelphous; ovary 2–3-celled; anthers open at apex; fruit capsular; universal; bitter, acrid; tonic, stimulant, febrifuge, astringent, emetic, purgative, diuretic, sudorific, expectorant; fruit edible, saponaceous.

Genus: 1. **Polygala**.

SENEGA. SENEGA, U.S.P.

Polygala Senega, { The dried root, with not more than 5 p. c. of stems,
Linné. { and other foreign organic matter.

Habitat. United States, in woods and rocky soil; Canada to S. Carolina, west to Wisconsin.

Syn. Seneg., Senega Snakeroot, Seneca Snakeroot, Seneka, or Snake Root, Rattlesnake Root, Milkwort, Mountain Flax; Br. *Senegæ Radix*; Fr. *Polygala de Virginie*; Ger. *Senegawurzel*.

Po-lyg'a-la. L., see etymology, above, of Polygalaceæ.

Sen'e-ga. L. fr. the Seneca (Senega) tribe, one of the five N. American Indian tribes; they inhabited W. New York and used this plant as a remedy for snake-bites.

PLANT.—Perennial herb; stems several, erect, 22.5–37.5 Cm. (9–15') high, smooth, round, leafy, occasionally reddish or purplish below, green above; leaves 2.5–5 Cm. (1–2') long, 12 Mm. ($\frac{1}{2}$ ') wide, lanceolate, sessile, margins rough, bright green; flowers May–June, small, diadelphous, white, spike 2.5–5 Cm. (1–2') long, calyx showy; sepals 5 (3 small, green; 2 larger, petaloid, called wings); corolla small, closed; fruit capsule, 2-celled, compressed, 2-seeded, black. Root,

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usually in pieces; when entire, slenderly conical, with an enlarged crown, 3–15 Cm. ($1\frac{1}{5}$ –6') long, 2–10 Mm. ($\frac{1}{12}$ – $\frac{2}{5}$ ') thick, tortuous, somewhat branched, few rootlets, crown knotty with numerous buds and short stem-bases, brownish-yellow, crown darker and rose-tinted, longitudinally wrinkled, frequently with a distinct ridge (keel); fracture short, wood pale yellow; usually eccentrically developed and in pieces; odor suggesting methyl salicylate; taste sweetish, afterward

strongly acrid. POWDER, grayish-yellow, sternutatory—fragments of cork, parenchyma and sieve tissue developing oily globules, tracheæ, tracheids, numerous pores, wood-fibers, lignified medullary ray cells. *Solvents*: boiling water; alcohol; diluted alcohol. Dose, gr. 5–30 (.3–2 Gm.).



FIG. 232.—*Polygala Senega*.

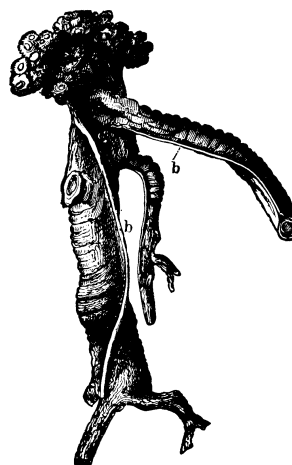


FIG. 233.—*Polygala Senega*: root, natural size; b, b, the keel.

ADULTERATIONS.—Allied species, also gillenia, triosteum (rhizome and roots), American gentians (rootlets), often to 25 p. c.—result of careless collection and intentional fraud; in Europe occasionally the underground portion of *Cynanchum Vincetoxicum*. Of these none has a keel, some contain starch, and all differ in odor, color, and taste.

Commercial.—The official root, as well as some of the growing plants of this genus emit a slight wintergreen odor; the southern root is smaller

and usually paler, while the Manitoba is larger and stouter, often dark, with purple discoloration about the crown; the large, broad-leaved form is considered var. *latifolia*. Root should be collected in the autumn, and comes chiefly from Minnesota and northward.

CONSTITUENTS. — Saponin-like compound 5–6 p. c., composed of senegin 1.5 p. c., and polygalic acid 4 p. c. (analogous to saponin and components, quillaja-sapotoxin, quillajic acid, of quillaja), fixed oil 8–9 p. c., volatile oil .12 p. c., methyl salicylate (increasing with age), resin, polygalite, sugar 7 p. c., pectin and albuminoids 18.40 p. c., malates, yellow coloring matter, ash 4–5 p. c.

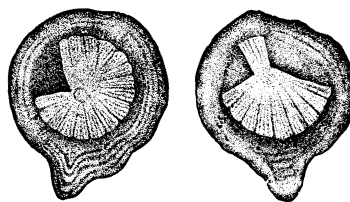


FIG. 234.—Senega: transverse sections magnified.

Senegin (*polygalin, saponin*), $C_{32}H_{54}O_{18}$.—Obtained by exhausting root with 60 p. c. alcohol, concentrating, precipitating with alcohol and ether; mother-liquor contains the salt of an organic acid. It is a neutral glucoside, white, amorphous, inodorous powder, insoluble in alcohol, not precipitated by normal lead acetate, and forms soapy emulsion with boiling water; by hydrochloric acid decomposed into glucose and sapogenin, $C_{14}H_{22}O_2$.

Polygalic Acid, $C_{19}H_{30}O_{10}$.—Sparingly soluble in alcohol, insoluble in ether or chloroform, precipitated by neutral and basic lead acetates.

Fixed Oil.—Obtained from root by ether; contains virgineic acid which gives disagreeable aroma.

Volatile Oil.—This is a mixture of valer(ian)ic ether and methyl salicylate.

PREPARATIONS.—1. *Fluidextractum Senegæ*. Fluidextract of Senega. (Syn., Fldext. Seneg., Fluid Extract of Senega; Fr. Extrait fluide de Polygale de Virginie; Ger. Senegafluidextrakt.)

Manufacture: Macerate, percolate 100 Gm. with alcohol 200 cc. + water 100 cc., proceed with menstruum (same strength) until exhausted, reserve first 80 cc., evaporate remainder to soft extract, which dissolve in the reserve, add ammonia water gradually until faintly alkaline (slight odor of ammonia), and menstruum q. s. 100 cc. Dose, \mathfrak{m} v–30 (.3–2 cc.).

Preps.: 1. *Syrupus Senegæ*. Syrup of Senega. (Syn., Syr. Seneg.; Fr. Sirop de Polygale; Ger. Senegasirup.)

Manufacture: 20 p. c. Mix ammonia water 1 cc. with fluidextract of senega 20 cc., add syrup q. s. 100 cc.; mix well. Dose, \mathfrak{z} j–2 (4–8 cc.).

2. *Syrupus Scillæ Compositus*, 8 p. c. 3. *Mistura Pectoralis*, N.F., 3.5 p. c.

Unoff. Preps.: *Abstract*, gr. 5–10 (.3–6 Gm.). *Infusum Senegæ* (Br.), 5 p. c., \mathfrak{z} iv–16 (15–60 cc.). *Liquor Senegæ Concentratus*, 50 p. c.,

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5_{ss-j} (2-4 cc.). *Tinctura Senegæ* (Br.), 20 p. c. (60 p. c. alcohol),
5_{ss-j} (2-4 cc.).

PROPERTIES.—Stimulating expectorant, diuretic, diaphoretic, irritant. Produces throat and gastro-intestinal irritation, some salivation with inclination to cough, increased bronchial secretion; large doses vomit and purge. Insufflation causes sneezing, coughing, and nasal catarrh. Externally—an irritant to the skin. Senegin is a violent irritant, heart depressant, likewise same to vascular, nervous, and muscular systems. It is excreted by kidneys, skin, bronchial mucous membrane, all being stimulated and irritated by it.

USES.—Secondary stage of acute and in chronic bronchitis, in typhoid pneumonia, asthma, croup, renal dropsy, promotes expectoration; no value when mucus tough and scanty, or unless the primary acute inflammation has been subdued; slight value in dropsy. In amenorrhea, give decoction two weeks before each menstruation, chronic rheumatism, rheumatic paralysis; senegin in gr. 2 (.13 Gm.) doses for uterine hemorrhage. Popular with North American Indians for rattlesnake and other snake-bites.

Allied Plants:

1. *Polygala alba*, *White, Texas* or *False Senega*.—West of Mississippi River; root 6 Mm. ($\frac{1}{4}$ ') thick, resembling official, but has a lighter color internally, also a cylindrical wood, and is destitute of keel; contains polygalic acid 3 p. c.; yields light-colored infusion and tincture. *P. Boyki'nii*, Southern States; like the *P. alba*, only thinner, yet some consider both to be one and the same species.

2. *P. polygama* (*rubella*), *Bitter Polygala*.—The root and herb, U.S.P. 1820-1870; Canada-Florida. Plant 15-22.5 Cm. (6-9') high; leaves mucronate; flowers purple; keel crested, shorter than the wings; fruit 2-seeded, capsule oblong; contains bitter principle analogous to senegin; similar to *P. amara* of Europe. Tonic in bronchial catarrh; large doses laxative, diaphoretic.

41. EUPHORBIACEÆ. Spurge Family.

U-for-bi-a'se-e. L. *Euphorbia* + aceæ, Gr. Εὐφορβος, well fed, fr. εὖ, well, + φέρειν, to feed, after Euphorbus, physician to Juba, king of Mauritania. Trees, shrubs, herbs. Distinguished by containing acrid, milky, poisonous juice; flowers unisexual; calyx usually wanting; corolla none; ovary superior, 3-celled, ovules 2 from each cell; fruit tricoccous, 3-6-seeded capsule; temperate climates, tropics; emetic, purgative, diuretic, rubefacient, poisonous, starchy food, caoutchouc, aromatic, tonic, dyes, wood, edible roots.

Genera: 1. **Croton**. 2. **Ricinus**.

CROTON TIGLIUM. CROTON OIL PLANT.

Oleum Tiglii. **Croton Oil**, U.S.P.

Croton Tiglium, } A fixed oil expressed from the seeds.
Linné.

Habitat. India, Philippine Islands, (Ceylon, Borneo, Japan, Hindustan, Moluccas); cultivated.

Syn. Purging Croton, Croton Seeds, Grana Tiglii, Grana Molucca; Ol. Tiglii; Br. Oleum Crotonis; Fr. Graine de Tilly ou des Moluque, Croton (Semence); Huile de Croton Tiglium; Ger. Granatill, Purgirkörner; Krotonöl.

Cro'ton. L. fr. Gr. κροτών, dog-tick—*i. e.*, from the resemblance of the seed.

Tig'li-um. L. fr. Gr. τιλάω, to have a thin stool—*i. e.*, its medicinal property; croton plant seeds once called *grana tiglii* or *grana tilli*.



FIG. 235.—*Croton Tiglium*.

PLANT.—Small tree, 4.5–6 M. (15–20°) high, trunk crooked; bark smooth, light brown, that of branches scarred from fallen leaves; leaves 10–12.5 Cm. (4–5') long, 5 Cm. (2') wide, glabrous, ovate, serrate, bright green, veins prominent beneath, petioles 2.5–5 Cm. (1–2') long; flowers, monoecious, racemes—staminate at upper part—pistillate at lower, greenish-white; fruit capsule, size of hazelnut, smooth, brownish-yellow, 3-celled (tricoccus), each cell 1-seeded, dehiscent. Seed, 12 Mm. ($\frac{1}{2}$ ') long, 8 Mm. ($\frac{1}{3}$ ') wide, ovoid, caruncle inconspicuous, raphe fine, testa thin, roughish, not shiny, brittle, gray-brown, mottled or blackish, albumin oily; integuments 33–36 p. c., kernel 64–67 p. c.

CONSTITUENTS.—Fixed oil 30–40 p. c. (from entire seed), 50–55 p. c. (from kernels alone), proteins, albumin, etc.

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Oleum Tiglii. Croton Oil.—This fixed oil obtained from the seed, deprived of shell or testa, chiefly by expression, is a pale yellow, brownish-yellow, somewhat viscid and slightly fluorescent liquid, slight characteristic odor, mild, oily, afterward acrid, burning taste (must use great caution in tasting and handling, as it produces pustular eruptions when applied to the skin), soluble in ether, chloroform, fixed or volatile oils, slightly in alcohol (when fresh in 55–70 parts, when 3–4 years old in 20 parts), acid reaction, sp. gr. 0.943, congeals at -16°C . (3.2°F .); contains glycerides of stearic, palmitic, myristic, lauric, and oleic acids, and of the volatile acids—acetic, butyric, formic, valeric, tiglic (tiglinic—oleic series), $\text{C}_5\text{H}_8\text{O}_2$, also crotonol, $\text{C}_{18}\text{H}_{38}\text{O}_4$. The purgative principle is insoluble in alcohol, the vesicating, croton-resin, $\text{C}_{13}\text{H}_{18}\text{O}_4$, is soluble, and this latter, with several inactive oily acids, constitutes crotonolic (crotonoleic) acid, closely related to oleic and ricinoleic acids, which, together with its glyceride, is believed by some to be both purgative and vesicating; it is oily, readily decomposed, slightly acid, forms salts, soluble in alcohol, severe irritant to skin and mucous membranes; croton-resin is hard, brittle, pale yellow, soluble in alcohol, ether, chloroform, vesicating property destroyed by long boiling with potassium or sodium hydroxide solution. *Tests*: 1. Heat gently with dehydrated alcohol (2)—clear solution from which the oil separates, partially or completely, on cooling. 2. Shake vigorously for a few minutes 2 cc. with 1 cc. each of fuming nitric acid and distilled water—does not solidify, partially or completely, on standing 24 hours (abs. of foreign oils). Should be kept dark, in small, well-stoppered bottles. Dose, $\text{m}\frac{1}{3}$ –2 (.02–.13 cc.).

ADULTERATION.—SEED: Those of *C. oblongifolius*, *Kuli Seed*—larger, dark grayish-brown; root-bark popular in India; OIL: Various fixed non-drying oils, castor oil, etc.



FIG. 236.—*Croton Tiglium*: lateral and ventral view and longitudinal section of seed.

Commercial.—Plant—all parts used in India from early times; root as a drastic cathartic in dropsy; wood diaphoretic (small doses), purgative, emetic (large doses); leaves, owing to acidity, when chewed and swallowed, irritant—inflaming lips, mouth, throat and alimentary canal. Seed most active, having been introduced into Europe, 1630, as *grana Molucca*, *grana tiglia*, etc., and now imported mostly for the oil which is extracted by: 1, Expression; 2, Decoction; 3, Solution (benzin, carbon disulphide, chloroform, ether). The first method is preferred, and consists in crushing and expressing the seed without integuments at moderate temperature, thereafter digesting the marc in alcohol at 54°C . (130°F .), again expressing and reclaiming alcohol. That extracted in India, from seed roasted slightly to separate easily the shells (using only the kernels), is pale yellow, while that extracted in Europe (also from kernels alone but from which shells have been removed without

heat) is reddish-brown, due to greater age of the seed and the higher heat employed in expression.

PREPARATIONS.—(Unoff.): *Collodium Tiglii*, 10 p. c. *Linimentum Tiglii (Crotonis)*, 13 p. c. *Compound Liniment*, 20 p. c. + oil of sassafras 20, oil of turpentine 20, olive oil 40. Emulsion. Pill. Tincture; or may give on lump-sugar.



FIG. 237.—*Croton Eluteria*.

PROPERTIES.—Powerful purgative, irritant poison, rubefacient, all due to local action; it is drastic, causing in 1-2 hours copious watery stools. Overdoses cause intense congestion of intestinal canal, vomiting, purging, possibly death from gastro-enteritis; an alkali increases its purgative effect, which is experienced often by even smelling, or rubbing the oil on the skin.

USES.—Mania, coma, obstinate constipation, lead colic, tenia, dropsies, dysentery, apoplexy, paralysis. Externally—rheumatism, gout,

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neuralgia, glandular swellings, pulmonary and laryngeal troubles, bronchitis, ovaritis, pleurisy. Can apply the oil directly to the surface by rubbing until dry mj-2 (.06-.13 cc.), or the same quantity dissolved in either, chloroform, olive oil, soap liniment, alcohol, ether, or oil of turpentine.

Poisoning: Have abdominal pain, great congestion of intestinal canal, vomiting, purging (fluid stools), pulse small and thready, skin moist, face pinched, prostration, collapse, death possibly from gastro-enteritis. Evacuate stomach, give milk, olive oil, mucilage, white of egg, gelatin, soup, opium, alcoholic liquids, artificial heat, hot poultice or fomentations to stomach, spirit of camphor, digitalis, warm stimulating baths.

Allied Plants:

1. *Croton Elute'ria*, *Cascarilla*.—The dried bark, U.S.P. 1820-1890; Bahama Islands. Plant 1.5-6 M. (5-20°) high, stem, 2.5-20 Cm. (1-8') thick, leaves 2.5-7.5 Cm. (1-3') long, ovate, lanceolate, petiolate, under side bronzed-silver, flowers monœcious, white, odorous, fruit

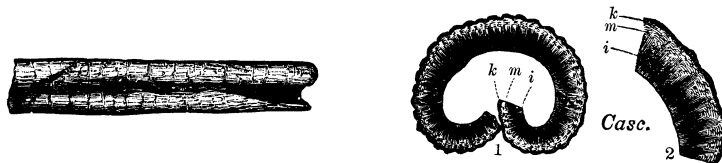


FIG. 238.—Cascarilla: bark quill.

FIG. 239.—Cascarilla: 1, cross-section enlarged; 2, cross-section 8 times enlarged; k, cork; m, middle bark; i, liber.

15 Mm. ($\frac{3}{8}$ ') thick, ovate, silvery-gray, 3-furrowed, 3-celled; bark in quills or curved pieces, 10 Cm. (4') long, 3-8 Mm. ($\frac{1}{8}$ - $\frac{1}{3}$ ') broad, 1-3 Mm. ($\frac{1}{25}$ - $\frac{1}{8}$ ') thick, silvery-gray from lichen, or brown when this is absent, the exposed surface wrinkled, transversely fissured, inner surface reddish-brown, smooth, fracture short, resinous, thin whitish medullary rays, odor aromatic, musk-like, especially when burned, taste aromatic, bitter; contains volatile oil 1.6 p. c., cascarillin, betaine, resin 15 p. c., tannin, pectin, vanillin. Stimulant, tonic, febrifuge; intermittents, dyspepsia, diarrhea, poor substitute for cinchona. Dose, gr. 15-30 (1-2 Gm.); tincture, 20 p. c. (70 p. c. alcohol), dose, ʒss-2 (2-8 cc.); extract, dose, gr. 5-8 (.3-.5 Gm.); infusion, 5 p. c., dose, ʒiv-8 (15-30 cc.). *C. lucidus*, growing with the preceding plant; *C. niveus* (*pseudochi'na*), *Copalchi Bark*, Mexico, and *C. Malam'bo*, *Malambo Bark*, Venezuela. All produce barks that resemble closely.

2. *Mallo'tus philippinen'sis*, *Kamala*, *Rottlera*.—The glands and hairs from the capsules, U.S.P. 1860-1890; Philippine Islands, India, China. Small tree, 6 M. (20°) high; bark pale, branches with ferruginous tomentum; leaves 7.5-15 Cm. (3-6') long, petiolate, ovate,

entire, coriaceous, glabrous, under side rusty; flowers diœcious, tomentous; fruit tricoccous, globular capsule, size of small cherry, externally 3-furrowed, covered with red powder. Glands and hairs (kamala) glandular, mobile, brick-red powder, inodorous, nearly tasteless; under microscope as stellately arranged colorless hairs mixed with depressed globular glands, containing numerous red club-shaped vesicles; burns like lycopodium, and ash should not be more than 4-8 p. c. Capsules when collected are rolled about in baskets, and

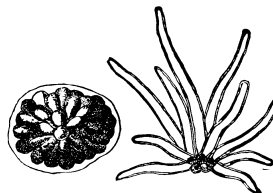


FIG. 240.—Kamala: magnified 190 diam.



FIG. 241.—*Mallotus philippinensis*: a, twig of staminate plant; b, twig of pistillate plant.

rubbed with hands to remove glands and hairs, which in turn, passing through the meshes, are caught upon cloths; contain resins (2—rottlerin,

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isorottlerin) 80 p. c., wax, coloring matter, albuminous matter 7 p. c., cellulose 7 p. c., ash 4 p. c. Tenifuge (anthelmintic, purgative); tape-worm, sometimes for the round- and seat-worms; also externally in scabies, skin affections, herpetic ringworm. Next to male-fern for tenia, being better than kousso or turpentine. *Adulterations*: Wurrus, resins, etc., used not only as vermifuge, but in skin affections and as dyes; also many fruits—Soria, Satze (Tatze), Embelia, and the bark of *Albiz'zia* (*Acacia*) *anthelmin'tica* (Mesenna, Mussena, Busenna—Abyssinian names for acacia bark) is employed as tenifuges in India and Abyssinia; also powdered leaves, fruit-stalks, colored starch, earth, sand, in all sometimes 60 p. c.—increasing ash 65–75 p. c. Dose, ʒj–2 (4–8 Gm.); fluidextract, ʒj–2 (4–8 cc.); tincture, 30 p. c. (alcoholic), ʒj–4 (4–15 cc.); electuary; syrup; mucilage.

RICINUS. CASTOR OIL PLANT.

Oleum Ricini. Castor Oil, U.S.P.

Ricinus communis, } A fixed oil obtained from the seeds.
Linné.

Habitat. India; cultivated in tropics; India, Italy, Spain, Sicily, United States.
Syn. Palma Christi, Castor Bean, Mexico Seed, Oil Plant, Oil Seed (Nut); Fr. Ricin (Graine); Ger. Wunderbaum; Ol. Ricin, Oleum Palmæ Christi; Fr. Oleum e Semini Ricini, Huile de Ricin; Ger. Rizinusöl.

Ric'i-nus. L. a bug, dog-tick—*i. e.*, from the resemblance of the seed.

Com-mu'nis. L. common, general—*i. e.*, it is the ordinary common species.

PLANT.—This is quite variable in habit and appearance—in tropics a tree 9–12 M. (30–40°) high, in warm or temperate regions a woody bush 3.6–4.5 M. (12–15°) high; in Middle United States with herbaceous stems 1.6–3 M. (5–10°) high, hollow, smooth, glaucous, purplish bloom above; leaves with blade 15–20 Cm. (6–8') broad, palmately divided ($\frac{3}{4}$ depth) into 7–11 lanceolate, serrate segments, smooth, bluish-green, paler beneath, on long, curved, cylindrical, purplish petioles; flowers July, monœcious, large, apetalous, racemes, staminate below, pistillate above; fruit tricoccous capsule 2.5 Cm. (1') long, blunt, greenish, deeply grooved, sometimes smooth, usually spinescent on the 3 projecting sides, 3-celled, each cell 1-seeded, which is expelled in Aug.-Sept. by capsule dehiscing into 6 valves. Seed 12 Mm. ($\frac{1}{2}$ ') long, 6 Mm. ($\frac{1}{4}$ ') broad, 3 Mm. ($\frac{1}{8}$ ') thick, size of a coffee grain, with caruncle, raised raphe, grayish, marbled with blackish spots or bands of various tints and shapes, smooth, shining.

CONSTITUENTS.—Seeds (testa 23.82 p. c., kernel 69.09 p. c.) yield fixed oil 35–45 p. c., gum (mucilage) 2.4 p. c., starch and lignin 20 p. c., albumin 5 p. c., ricinine, proteins (emulsin), sugar, ash (testa 10 p. c., kernel 4 p. c.). The poisonous principle, ricin, is an albuminoid, soluble in a 10 p. c. solution of sodium chloride, precipitated by acids, coagulated by heat; harmless to chickens.

Oleum Ricini. Castor Oil.—This fixed oil, obtained from the seed chiefly by expression, is a pale, almost colorless, transparent, viscid liquid, faint, mild odor, bland, slightly acrid, usually nauseating taste, miscible with dehydrated alcohol or glacial acetic acid; sp. gr. 0.955; at 0° C. (32° F.) separates into crystalline flakes, at -18° C. (-4° F.) congeals into yellow mass; contains mostly triricinolein (the glyceride of ricinoleic acid), $C_3H_5(C_{18}H_{33}O_3)_3$, also palmitin, ricinoleic acid (ricinic acid), $C_{18}H_{34}O_3$, which is a viscid oil readily converted by



FIG. 242.—*Ricinus communis*: a, stamen; b, anther; c, stigmas; d, transverse section of capsule; e, seed; f, embryo.

nitrous acid into ricinelaidic acid, crystalline, melting at 50° C. (122° F.). *Tests*: 1. Only partly soluble in petroleum benzin (dif. from most other fixed oils). 2. Soluble (clear) in an equal volume of alcohol (abs. of foreign fixed oils). Should be kept in well-closed containers. Dose, ʒj-8 (4-30 cc.).

ADULTERATIONS.—Rare: Cottonseed, rapeseed, sesame, and mineral oils—detected by decreased solubility in alcohol and preceding tests.

Commercial.—Plant, called Palma Christe from supposed shape of leaves resembling Christ's hand, is cultivated extensively in the United

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States for the oil which is extracted from the seed by: 1, Expression; 2, Decoction; 3, Solution (benzin, carbon disulphide, chloroform, ether). The first method is preferred, and consists in crushing and freeing seed of the integuments, dark skin, etc., and expressing at 60° C. (140° F.), or in heating clean seed in shallow tanks short of scorching, 65° C. (150° F.), to render oil more fluid, and expressing them hydraulically in hempen bags between hot iron plates; while this affords the greatest yield of oil it is of inferior quality, the best being from hand-screw presses. This white oil now is run into iron vats with water, boiled to separate impurities (albumin being coagulated and removed by skimming, mucilage and starch being dissolved in water), strained, reboiled (to destroy acidity), strained, and, if opaque, treated with fuller's earth, or magnesium oxide (1 p. c.) and animal charcoal (2.5 p. c.), filtered through paper and felt, and put into cans or barrels, constituting as such *cold-pressed castor oil*; by grinding marc with water and expressing may obtain 6–8 p. c. additional good oil; the yield by cold expression is 25–30 p. c., with heat 35–45 p. c. The method by decoction, owing to water dissolving poisonous ricin and heat increasing

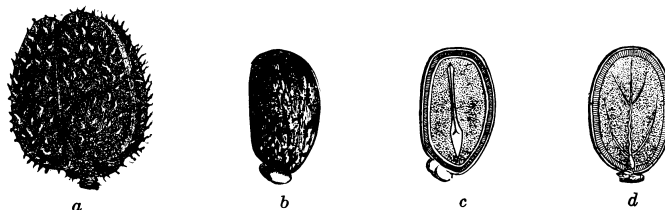


FIG. 243.—a, Ricinus fruit; b, seed; c and d, longitudinal sections.

oil's acidity, is not so desirable, consisting in crushing the seed after removing husks (testa), boiling with water (oil floating on surface), straining, reboiling to dissipate acrid principle, straining, filtering; this oil usually is brownish, acrid, irritating, and comes from E. and W. Indies. The method by solution causes the oil to turn rancid quicker, in spite of which it is preferred in France and Italy, being considered more agreeable and effective. The so-called popular Italian castor oil is produced extensively around Verona, Italy, where only fresh seed thoroughly deprived of coating are expressed hydraulically without heat; this oil although remarkably free from disagreeable odor and taste is none the less active. An ethereal or alcoholic tincture of the seed is claimed to be less irritating and nauseous. The press-cake, usually 60 p. c., is employed chiefly as a fertilizer, and, after the removal of ricin by salt solution, as a cattle-food. In India there are two varieties of seeds, *large* and *small*, the latter yielding the best oil.

PREPARATIONS.—1. *Collodion Flexile*, 3 p. c. 2. *Emulsum Olei Ricini*, *N.F.*, 35 p. c., + acacia 9, tincture of vanilla 2.5, syrup 20,

water q. s. 100. Dose, \mathfrak{z} j-2 (30-60 cc.); 3. *Oleum Ricini Aromaticum*, N.F., 97 p. c., + gluside $\frac{1}{20}$, oil of cinnamon $\frac{3}{10}$, oil of clove $\frac{1}{10}$, vanillin $\frac{1}{10}$, coumarin $\frac{1}{100}$, alcohol 3. Dose, \mathfrak{z} iv-8 (15-30 cc.). 4. *Linimentum Sinapis Compositum*, N.F., 15 p. c.

Unoff. Preps.: *Castor Oil Mixture* (Br.), 37.5 p. c., \mathfrak{z} j-2 (30-60 cc.); Capsules, Paste.

PROPERTIES.—Purgative, demulcent. It is non-irritating until the duodenum is reached, where the bile and pancreatic juice decompose it into glycerin and ricinoleic acid; this latter combines with sodium, forming sodium rincinoate, which mildly irritates the bowels, causing purgation, stimulating muscular glands and coat, but not the liver; acts in 4 to 6 hours, producing liquid stools without much pain or tenesmus, followed by sedative effect on intestines. Leaves are said to be galactagogic when applied to breast, and to impart cathartic power to the milk and various secretions. Glycerin increases the purgative effect.

USES.—Constipation, colic, diarrhea, dysentery, enteritis in pregnancy, puerperal state, tape and lumbricoid worms, traumatic fever, renal calculi, night-sweats, amenorrhea, engorged liver, hemorrhoids, cystitis, gonorrhea. In dysentery may add laudanum, \mathfrak{M} xx (1.3 cc.), to each dose in order to counteract any pain, tenesmus, or exhaustion from frequent passages; externally applied to warts, as a local sedative, protective; base of Turkish-red oil used in calico dyeing and printing.

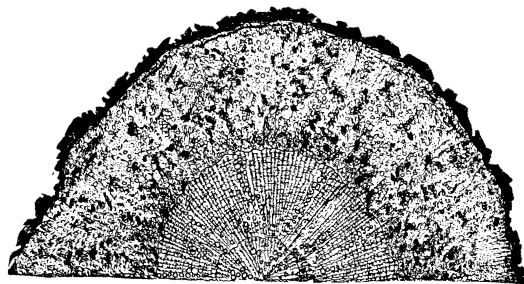
Administration.—In emulsion flavored to suit, or equal quantities of oil and either heavy sarsaparilla, peppermint, or cinnamon syrup beaten together, or take with soda water, malt liquor, orange juice, coffee, etc. All disguise very effectively the nauseating oil taste. At one time the seed were employed, but action too violent; their griping principle (ricin) is said to reside in the embryo and testa, hence to make best oil most of these should be removed before expressing.

Allied Plants:

1. *Stillin'gia sylvat'ica*, *Stillingia*, *Queen's Root*, N.F.—The dried root with not more than 3 p. c. of foreign organic matter, and that which has been stored for more than 2 years must not be used; S. United States. Perennial lactiferous (when wounded emits milky juice) herb, .3-1 M. (1-3°) high; leaves lanceolate, sessile, serrate; flowers yellow, monœcious; fruit rough round capsule, 3-celled, each cell 1-seeded. Root, terete, unequally tapering, rarely branched, 20-40 Cm. (8-16') long, .5-3 Cm. ($\frac{1}{5}$ -1 $\frac{1}{5}$ ') thick; usually in cut pieces, 2-5 Cm. ($\frac{1}{2}$ -2') long; reddish-brown, wrinkled, fracture fibrous; internally—bark thick, spongy, fibrous with resin cells, easily separable from porous, radiate wood; odor distinct; taste bitter, acrid, pungent. Powder, pinkish-brown—numerous starch grains with central cleft, fragments with secretion cells bearing resin, tracheæ, wood-fibers, bast-fibers, brownish cork cells, calcium oxalate crystals in rosettes; solvents: boiling water, diluted alcohol; contains sylvacrol (resin), volatile oil 3-4 p. c., glucoside, tannin 10-12 p. c., gum, starch, ash

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5 p. c. Alterative, expectorant, diuretic, diaphoretic, sialagogue, cholagogue, antivenereal; large doses emetic, cathartic, increases heart action, circulation, various secretions; syphilis, scrofula, skin and chronic hepatic affections. Dose, 15–30 gr. (1–2 Gm.); 1. *Fluidextractum Stillingiæ* (diluted alcohol), dose, ℥xv–30 (1–2 cc.): Prep.: 1. *Elixir Corydalis Compositum*, 6 p. c.; 2. *Fluidextractum Stillingiæ Compositum*, 25 p. c., + corydalis 25, blue flag, sambucus, chimaphila, āā 12.5, coriander 6.3, prickly ash berry 6.2, diluted alcohol q. s. 100, dose, ʒss–1 (2–4 cc.): Prep.: 1. *Syrupus Stillingiæ Compositus*, 25 p. c., glycerin 10, syrup 65, dose, ʒj–4 (4–15 cc.). Decoction, 5 p. c., ʒj–2 (30–60 cc.), Extract, gr. 2–5 (.13–.3 Gm.), Tincture 10 p. c., ʒss–2 (2–8 cc.). *Stillingia sebifera*, *L. sebum*, tallow, + *ferre*, to bear; China; S. Carolina, Georgia, Florida—sea coast. Tree 6–9 M. (20–30°) high, fruit 3-celled, 3-seeded, imbedded in solid, inodorous fat (palmitin, stearin), melts at 44° C. (112° F.), called China or Vegetable Tallow; used for candles.

FIG. 244.—*Stillingia* root: magnified 10 diam.

2. *Euphorbia hirta*, *Euphorbia*, *Euphorbia Pilulifera*, *Pill Bearing Spurge*, *N.F.*—The dried herb with not more than 5 p. c. of foreign organic matter, nor yielding more than 3 p. c. of acid-insoluble ash; Australia, W. Indies—Tropics, open rich grounds. Pubescent, bristly-hairy, especially upper nodes (dist. from spurious variety), reddish-purple; roots usually present; stems slender, sparsely leafed at base, greenish-brown, rough or hairy; leaves opposite, oblong, serrated, rusty pale green, pubescent on lower surface veins, much broken; flowers numerous, small; fruit 3-celled capsule; seed triangular-ovoid, pale brown; odor aromatic, characteristic; taste faintly bitter, aromatic, acrid. Powder, light yellowish—wood-fibers, wood parenchyma, medullary ray and pith parenchyma with tracheids and tracheæ, pores, markings, cork cells with amorphous content; starch grains, lignified fibers, leaf epidermis with non-glandular hairs; solvents: diluted alcohol, water; contains acrid resin, glucoside, ash 12 p. c. Cardiac and respiratory stimulant; asthma, asthmatic, chronic, subacute bronchitis; may occasion gastric pain, nausea, death. Dose, ʒss–1 (2–4 Gm.); 1. *Fluidextractum Euphorbiæ* (diluted alcohol): Prep.: 1. *Elixir*

Euphorbia Compositum, *Antiasthmatic Elixir*, 5.25 p. c., + fldext. lobelia .7, sodium bromide 3.5, sodium iodide 3.5, spirit of glyceryl trinitrate .875, comp. tinct. of cardamom 5, oil of peppermint .1, glycerin 12.5, alcohol 20, dist. water q. s. 100, dose, \mathfrak{z} j-2 (4-8 cc.).

3. *Euphorbia corollata*, *Flowering (Blooming) Spurge*.—The root U.S.P. 1820-1870; S. United States. Perennial herb, .6-1 M. (2-3°) high; leaves lanceolate; flowers umbels, 5- (3-7-) forked, white; root many-headed, .5 M. (18') long, 5-25 Mm. ($\frac{1}{8}$ -1') thick, blackish-brown, fissured, bark thick, white inside, sweet, bitter, acrid; contains glucoside, resin, euphorbon; yields milky juice when punctured. Diaphoretic (gr. 5; .3 Gm.), cathartic (gr. 10; .6 Gm.), emetic (gr. 20; 1.3 Gm.), expectorant (gr. 2-5; .13-.3 Gm.), vesicant; in infusion, decoction.

4. *E. Ipecacuan'ha*, *Ipecac Spurge*, *Wild Ipecac*.—The root, U.S.P. 1820-1870; United States. Plant resembles preceding, being a green or purple perennial, 12.5-25 Cm. (5-10') high, stem forked from the base; leaves obovate, glabrous; flowers inconspicuous; fruit angled pod, smooth; seed white, dotted; root several-headed, .6 M. (2°) long, knotty, with stem-scars, 10 Mm. ($\frac{3}{8}$ ') thick, branched, brown, wrinkled, bark thick, white inside, sweet, bitter, acrid; constituents, properties, and uses similar to preceding.

5. *Heve'a (brasiliensis and H. guianensis)*, *Elastica*, *Rubber*.—The prepared milk-juice, U.S.P. 1890-1900; S. America, east of Andes, India, near streams. Large trees, smooth straight trunks, 15-18 M. (50-60°) high; leaves trifoliate, leaflets obovate, 10 Cm. (4') long, dark green; flowers racemes. Resin (rubber), in flask-shaped, roundish masses, incised pieces showing laminated structure, lighter than water, brownish-black, internally lighter, mottled, tough, elastic, odor creosote-like, almost tasteless; solvents: chloroform, carbon disulphide, oil of turpentine, petroleum benzin, benzene; melts at 125° C. (257° F.), soft and adhesive on cooling; heated with sulphur 10 p. c.—vulcanized and insoluble; with 40 p. c.—hard rubber (ebonite). Milk (resembling cow's) exudes from small pick holes, being caught in small cups, emptied into large vessels and conveyed to smoking station, where wooden paddles (lower end) are dipped repeatedly into it (then sometimes into sand—adulteration), and rotated in a column of smoke until coagulated and mass has attained considerable size; contains resin (caoutchouc) 32 p. c., volatile oil, fixed oil. Base of plasters; woven into fabrics to compress and support relaxed muscles and parts; hard rubber in surgical implements—bougies, catheters, pessaries, specula, syringes, etc.

6. *Man'ihot Manihot (utilis'sima)*, *Tapioca*. (See pages 90, 91).—The fecula of root (rhizome), U.S.P. 1820-1870; Brazil, W. Indies. Shrub 2-2.5 M. (6-8°) high; stem jointed, petiolate leaves at upper portion, 3-5- to 7-lobed, glaucous.



FIG. 245.—Tapioca starch.

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Root fleshy, white, tuberous, 1 M. (3°) long, weighing 20–30 pounds (9–13 Kg.). Matures in 8 months; contains poisonous (HCN) milky juice; this is pressed out and the cassava meal made into bread or washed for its starch, which is diaphanous, muller-shaped, layers indistinct, hilum near rounded end, only half size of potato starch, which furnishes the factitious tapioca. Nutrient, demulcent, non-irritant; convalescence, debility, asthenic diseases, in doses ʒss–1 (15–30 Gm.), prepared with boiling water, flavored with lemon juice, sugar, vanilla, aromatics, wine, etc.

7. *Omphalea oleifera*, *Tambor Oil*.—C. America. Expressed from the seed; an excellent purgative, does not gripe like castor oil.

42. ANACARDIACEÆ. Sumac(h) Family.

An-a-kar-di-a'se-e. L. *Anacardi-um* + aceæ, fr. Gr. *ἀνά*, alike, + *καρδία*, heart—*i. e.*, fruit heart-shaped. Trees or shrubs. Distinguished by abounding in a resinous, gummy, acrid, milky juice; exhalations or juice often poisonous, latter black on drying; ovary 1-celled; styles 1–3 or none; ovules solitary with long funiculus; calyx and corolla regular, 5-lobed, rarely 3–4–7; stamens same number or double the petals. Disk present or wanting; fruit drupe or nut-like, edible; seed exalbuminous, superior; tropics; varnishes, dyes, poisonous.

Genus: 1. **Rhus**.

RHUS GLABRA. RHUS GLABRA, U.S.P.

Rhus glabra, { The dried ripe fruit with not more than 5 p. c. stems or
Linné. { other foreign organic matter.

Habitat. N. America, west to California, Idaho; on barren or rocky soil.

Syn. *Rhus* Glab., Sumac Berries, Sumach, Mountain-, Dwarf-, Sleek-, Smooth-, Upland-, Scarlet, or Pennsylvania Sumach, Indian salt (powder on the berries); Fr. Sumach, Sumac; Ger. Sumach.

Rhus'. L. fr. Gr. *ῥοῦς*; Celtic *rhudd*, red—*i. e.*, color of the fruit, also the leaves of the same species in autumn.

Gla'bra. L. fr. *glaber*, smooth, hairless—*i. e.*, its leaves and branches.

Su'mac. L. fr. Ar. *summaq*—*i. e.*, their native name for the plant.

PLANT.—Woody shrub 1.5–4.6 M. (5–15°) high; stem more or less bent, dividing into many straggling branches, pith large, wood thin, white; bark smooth, grayish or reddish, with small scattered warts; leaves imparipinnate; leaflets 11–31, lanceolate, acuminate, serrate, whitish beneath, changing to a beautiful red in autumn; flowers June–July, greenish-red, terminal panicles. FRUIT, Sept., drupes in small clusters, flattened ovoid, nearly globular, somewhat reniform; 3.5–5.5 Mm. ($\frac{7}{8}$ – $\frac{1}{4}$) long, nearly as broad, usually somewhat less; apex with raised scar, five-parted calyx occasionally with short pedicel at base; dark red, velvety with short hairs; endocarp smooth, shiny, crimson—yellowish-red; 1-locular, 1-seeded; seed brown, very hard; inodorous; taste acidulous, astringent. POWDER, brownish-red—

numerous non-glandular hairs, usually several celled, uniseriate, filled with pink or red dried sap, occasionally rod-shaped crystals; few slender 1-celled, colorless, non-glandular hairs; numerous brownish glandular hairs, fragments red-celled epicarp with adhering mesocarp having spiral tracheæ; stone cells of endocarp small, fragments of embryo with cells having aleurone grains and fixed oil. *Solvent*: diluted alcohol. Dose, \mathfrak{z} ss-1 (2-4 Gm.).

ADULTERATIONS.—Fruits of allied species—*R. hirta* (*typhina*—shaggy coating of long, straight hair), *R. aromatica* (smaller, less compressed, nearly spherical), *R. Coriaria* (rougher, hispid).

Commercial.—Sumac grows in waste fields, along fences, woods, etc., the bark, galls, and leaves are very astringent, being collected during summer or fall for use in tanning and dyeing, while from these an extract is made containing 25-30 p. c. tannin, and this is its most convenient form for all trade and chemical purposes. For this extract sumac is cultivated in Virginia and other States.

CONSTITUENTS.—**FRUIT**: Acid calcium and potassium malates, tannin (gallo-tannic acid) 2 p. c., gallic acid, coloring matter. **SEED**: Fixed oil. **GALLS**: Tannin 60-70 p. c.

PREPARATIONS.—1. *Fluidextractum Rhois Glabræ*. Fluidextract of *Rhus Glabra*. (Syn., *Fldext. Rhois Glab.*, *Extractum Rhois Glabræ Fluidum*, U.S.P. 1890; Fr. *Extrait liquide de Sumac*; Ger. *Flüssiges Sumachextrakt*.)

Manufacture: Similar to *Fluidextractum Ergotæ*, page 63—macerate, percolate 100 Gm. with 1st menstruum: glycerin 10 cc., alcohol 50, water 40; finish with 2d: diluted alcohol. Dose, \mathfrak{z} ss-1 (2-4 cc.).

Unoff. Preps.: *Decoction*, 5 p. c., \mathfrak{z} j-2 (30-60 cc.). *Infusion*, 5 p. c., \mathfrak{z} j-2 (30-60 cc.).

PROPERTIES.—Astringent, refrigerant, diuretic; resembles tannin.

USES.—Catarrhal affections of stomach and bowels, pharyngitis, tonsillitis, mercurial aphthæ, spongy gums, and other mouth affections (as a gargle), ulcers, wounds, etc. (as a wash).

Allied Plants:

1. *Rhus aromatica*, *Fragrant (Sweet-scented) Sumac(h)*, 1.5-2.5 M. (5-8°) high; given in extract, fluidextract (alcoholic), tincture, and for hematuria, leucorrhea, but mainly for incontinence of urine (enuresis). Dose, gr. 10-30 (.6-2 Gm.). *R. copallina*, *Black, Dwarf, Mountain Sumac(h)*, 1-2.5 M. (3-8°) high; downy branches; leaflets entire; excels all in yield of tannin. *R. hirta* (*typhi'na*), *Staghorn Sumac(h)*, 4.5-9 M. (15-30°) high; hairy; leaflets serrate. All three indigenous to N. America. *R. Coriaria*, *European Sumac(h)*, Mediterranean Basin; leaflets elliptic, woolly, serrate. *R. semialata* and *R. japonica*, China, Japan; these furnish galls which are used in Germany largely for obtaining tannic and gallic acid (see pages 157, 160). The fruits of all these are red, hairy, and acidulous, while the leaves are astringent.

2. *R. radicans*, *Rhus Toxicodendron*, *Poison Ivy*.—The fresh leaflets, U.S.P. 1870-1890; N. America. Climbing plant over fences, rocks,

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trees, etc.; flowers small; fruit smooth drupe. Leaflets, collected May-June, trifoliate, petiolate, entire, glabrous, the 2 lateral nearly sessile, 10 Cm. (4') long, obliquely ovate and pointed; when dry brittle, inodorous, astringent, when fresh with acrid juice blackening on exposure, applied to skin produces swelling, inflammation, etc.—hence should not handle ungloved or confound with the harmless *Ptelea trifoliata*, *Three-leaved Hoptree*, whose leaflets are sessile, thicker, paler green; contains toxicodendrol 3.3 p. c., tannin, acetic acid (formerly considered toxicodendric acid); toxicodendrol, the active,

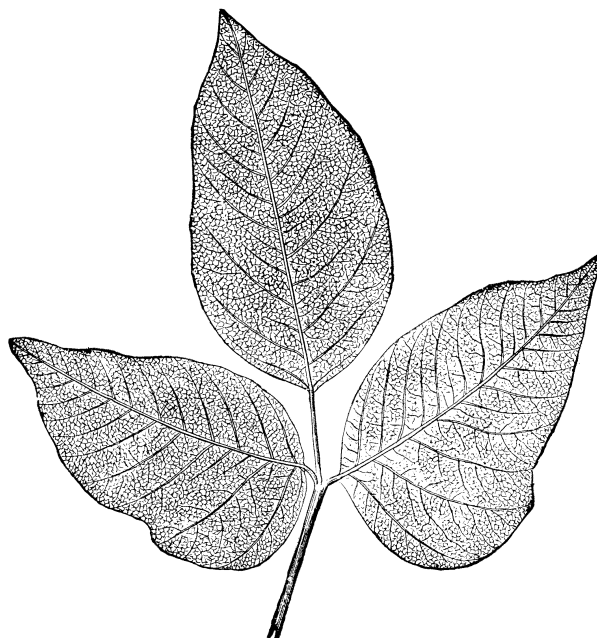


FIG. 246.—*Rhus radicans*: leaf one-half natural size.

irritating, poisonous principle, is a viscid, non-volatile oil (or freed fat acid, or complex glucoside), agreeably odorous, soluble in alcohol, benzene, ether, chloroform, decomposed by heat. Irritant, rubefacient, narcotic, poisonous; internally produces gastro-intestinal inflammation, vertigo, nausea, muscular debility, delirium, mydriasis, convulsions, death. *Poisoning*: The fresh leaves, juice or flying pollen produce external itching, burning, redness, tumefaction, vesication, desquamation, lasting 1-2 weeks. Apply at once soap and water with scrubbing-brush, lead water and laudanum, alkaline solutions (sodium bicarbonate—8 p. c. solution 3-4 times daily, sulphite, chlorinated, thio-

sulphate, diluted ammonia, soapsuds, alum curd), or hot aqueous saturated solution of magnesium sulphate (frequently), or fresh bruised leaves of either fire weed (*Erechtites hieracifolia*), touch-me-not (*Impatiens aurea, biflora*) or burdock (*Arctium Lappa*), or solution of sodium salicylate (2), + fldext. hydrastis (1) + water (5), or tincture or infusion of lobelia, grindelia, or sassafras, cocaine solution 4-8 p. c. (to relieve burning and itching), aristol, glycerite of phenol, opium—no oils, vaselin, alcohol, these being solvents of poison serve to disseminate it, low diet, saline purgatives, quietness. Used in chronic eczema, skin diseases, erysipelas, rheumatism, incontinence of urine, etc. Dose, gr. 2-5-15 (.13-.3-1 Gm.); tincture (fresh leaves bruised and macerated with equal weight of alcohol), $\text{m}_{\frac{1}{10}}-1$ (.006-.06 cc.); juice (expressed from leaves and preserved with alcohol) is soluble in ether and possesses all the virtues of the plant; fluidextract, $\text{m}_{\text{v}}-30$ (.3-2 cc.). *R. Toxicoden'dron*, properly more or less shrubby, .6-1 M. (2-3°) high, erect, leaflets crenately lobed, pubescent, called also Poison Ivy (Oak)—merely a variety of *R. radicans*. *R. diversiloba*, Pacific coast; leaves with 3-5-lobed, pinnatifid leaflets. *R. Vernix (venenata)*, Canada, United States, swamps, 3-6 M. (10-20°) high; leaves of 7-13 entire leaflets; fruit yellow; called poison-sumac(h), -dogwood, -elder, and yields most toxicodendrol. *R. pu'mila*, S. Carolina, procumbent shrub; leaves pinnate with 11 toothed acuminate leaflets; fruit red, hairy. All of these are poisonous, but *R. Vernix* the most so, as when in flower it so taints the surrounding air that sensitive persons become poisoned by simple exposure to the effluvium.

3. *Pista'cia Lentis'cus*, *Mastiche*, *Mastic*, *N.F.*—The concrete resinous exudation with not more than 1 p. c. of foreign organic matter; Mediterranean Basin (Spain, France, Italy, Morocco, Greece, etc.), Island of Scio, Grecian Archipelago, etc. Small tree, 3-4.6 M. (10-15°) high, branched, bark smooth, brownish-gray; leaves paripinnate; leaflets 3-5 pairs, lanceolate, entire, mucronate, sessile; flowers small, dioecious; fruit drupe, 6 Mm. ($\frac{1}{4}$ ') thick, orange-red. Resin (mastic), subglobular, lenticular pear-shaped tears, 3 Mm. ($\frac{1}{8}$ ') broad, pale yellow, greenish-yellow, transparent, glass-like luster, surface sometimes dusty, brittle, plastic when chewed; odor slight balsamic; taste mild, terebinthinate; loses plasticity and deepens in color with age. Secretes in long ducts in the bark from which it is obtained by making longitudinal or transverse incisions in stem and branches, whereupon it slowly exudes, becoming within 2-3 weeks sufficiently hard to be collected carefully in soft-lined baskets. There are two varieties: 1, Separate tears (best, recognized by *N.F.*); 2, Agglutinated tears (allowed to run to the ground, often collected with sand, bark, etc.—inferior); yield 10 pounds (4.5 Kg.), per plant; solvents: chloroform, not less than 97 p. c. in ether, nor less than 80 p. c. in alcohol; contains volatile oil 1-2 p. c., alpha-resin (mastic(h)ic acid) 90 p. c., beta-resin (masticin), soluble in ether, oil of turpentine, bitter principle. Stimulant, diuretic, protective (solution); bronchial, vesical catarrhs, leucorrhea, gastric

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debility, chronic diarrhea, toothache (saturated ethereal solution in cavity allowed to harden—temporary filling), masticatory (preserves teeth), fumigation; in alcohol, oil of turpentine as varnish for maps, etc.; seldom used internally. Dose, gr. 15–30 (1–2 Gm.); 1. *Pilulæ Aloes et Mastiches*, $\frac{2}{3}$ gr. (.04 Gm.); 2. *Solutio Mastiches Chloroformica Composita*, Pulp Capping Varnish, 30 p. c., + balsam of Peru 30, chloroform q. s. 100—should be kept in small, well-stoppered bottles.

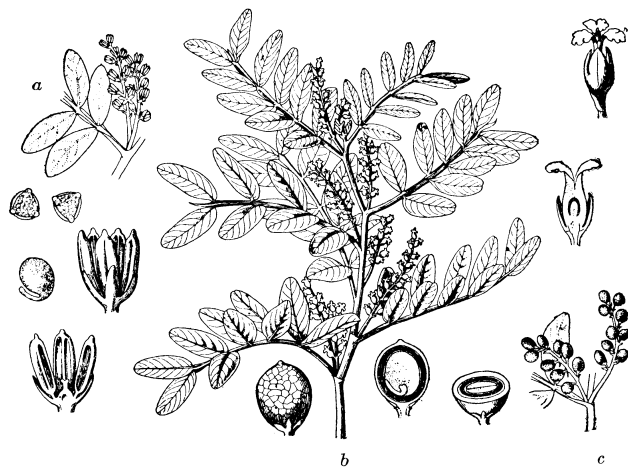


FIG. 247.—*Pistacia Lentiscus*: a, staminate branch; b, pistillate branch; c, fruit branch, $\frac{1}{2}$ nat. size; also flowers, pistil, pollen, fruit, and embryo, enlarged.

4. *Euonymus atropurpureus*, *Euonymus*, *Wahoo Bark*, N.F.—Celastraceæ. The dried bark of the root with not more than 5 p. c. of adhering wood, nor 2 p. c. of other foreign organic matter, yielding not more than 4 p. c. acid-insoluble ash; United States, east of the Mississippi. Ornamental shrub, 1.5–4.6 M. (5–15°) high; wood white; leaves oval, serrate; flowers dark purple cymes; fruit smooth, 4-lobed crimson capsule. Bark, usually transversely curved pieces, occasionally single quills 2–7 Cm. ($\frac{4}{5}$ –3') long, bark 1–4 Mm. ($\frac{1}{25}$ – $\frac{1}{6}$) thick, light weight, grayish, wrinkled, soft scaly cork, transverse lenticels (fissures); inner surface grayish-white, striate and porous, fracture short with silky fibers of caoutchouc-like substance; odor distinct; taste bitter, acrid. Powder, light brown—starch grains, cork, secretion cells, starch-bearing parenchyma, calcium oxalate rosettes, but no prisms; solvents: hot water, diluted alcohol; contains euonymin, volatile oil 1.3 p. c., resins, atropurpurin, fixed oil, bitter extractive. Laxative, diuretic, tonic, antiperiodic, expectorant; constipation, torpid liver, dropsy, pulmonary affections; overdoses—gastro-intestinal irritant. Owing to its uncertain and irregular absorption, hence toxic (cumulative) action, physicians should watch its tolerance and thereby

regulate its dosage. Dose, \mathfrak{z} ss-1 (2-4 Gm.); 1. *Extractum Euonymi* (diluted alcohol), dose, gr. 1-6 (.06-.4 Gm.); 2. *Fluidextractum Euonymi* (diluted alcohol), dose, \mathfrak{z} ss-1 (2-4 cc.). Decoction, 5 p. c., Infusion, 5 p. c. each, \mathfrak{z} j-2 (30-60 cc.); *euonymin* ("Eclectic"), root-bark—brownish; stem-bark—greenish, gr. $\frac{1}{2}$ -3-6 (.03-.2-.4 Gm.). *E. americana*, *Strawberry Bush*, low or trailing, with crimson capsules. *E. europæus*, common *Spindletree* of hedges, 2.5-6 M. (8-20°) high, cultivated, flowers greenish-yellow, capsules pale red, arillus orange-red; emetic, purgative. Both poisonous to cattle.



FIG. 248.—*Euonymus atropurpureus*: a, outer surface of root-bark; b, inner surface of root-bark, nat. size.

5. *Paullinia Cupa'na*, *Guarana*, *N.F.*—Sapindacæ. A dried paste consisting chiefly of the crushed seed, yielding not less than 4 p. c. of caffeine; N. and W. Brazil, Guiana, Venezuela. Woody climbing shrub; leaves imparipinnate; flowers yellowish; fruit size of grape, small horse-chestnut, 6-ribbed, splitting into 3 divisions, exposing 3 rounded brownish seed, size of filberts. Paste (guarana), usually cylindrical sticks 3-5 Cm. ($1\frac{1}{2}$ -2') thick, elliptical cakes, dark reddish-brown, hard, heavy; fracture uneven, often fissured in the center; internally pale reddish-brown, coarsely granular; odor slight; taste slightly astringent, bitter. Powder, light pinkish-brown—parenchyma, altered and unaltered starch grains, sclerenchymatous cells with thick yellowish non-lignified walls. *Test*: 1. Place .001 Gm. on slide, + 1 drop of gold chloride T. S., let stand—crystals of caffeine and gold chloride separate in orthorhombic plates and needles; solvent: 75 p. c. alcohol; contains caffeine (guanine) 3-5 p. c., tannin 26 p. c., resin, volatile oil, fixed oil, catechin, saponin, starch, gum, ash 2-5 p. c. Nervine, stimulant, tonic, astringent—similar to coffee, tea, maté; produces gaiety, restlessness, quick perception, wakefulness; slows pulse, impairs appetite, occasions vesical irritation; nervous sick headache (migraine), such as occurs with menstruation and debauch, attended with bloodshot eyes and throbbing head; diarrhea of phthisis, convalescence, general tonic. Native Indians used powder mixed with cassava or chocolate as food, and the grated (filed—1-2 teaspoonfuls) suspended in cold sweetened water (1 cup) as their habitual exhilarating

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yellow beverage, similar to our coffee and tea, which in excess may cause palsy; however, readily controlled by effort. Dose, gr. 15-60 (1-4 Gm.); 1. *Fluidextractum Guaranæ* (75 p. c. alcohol)—contains 3.6-4.4 p. c. of caffeine, dose, $\mathfrak{m}\text{xv}$ -60 (1-4 cc.): Preps.: 1. *Elixir Guaranæ*, 20 p. c., + aromatic elixir 20, comp. elixir of taraxacum q. s. 100; 2. *Elixir*



FIG. 249.—*Paullinia Cupana*: a, leafy branch with flowers; b, branch with ripe fruit, $\frac{1}{2}$ nat. size; also male and hermaphrodite flowers, pistil, stamens, and fruit, enlarged.

Guaranæ et Apii, 15 p. c., + fldext. celery fruit 15, fldglycer. glycyrrhiz., 3, glycerin 6, elix. aromatic q. s. 100, dose, each, $\mathfrak{z}\text{j}$ -3 (4-12 cc.). Extract, gr. 2-5 (.13-.3 Gm.); Infusion, 5 p. c., $\mathfrak{z}\text{j}$ -2 (30-60 cc.), Syrup, $\mathfrak{z}\text{ij}$ -4 (8-15 cc.); Tincture (extract 1, alcohol 30), $\mathfrak{z}\text{j}$ -4 (4-15 cc.). *Sapindus marginatus*, *S. Saponaria*, *Wild China Tree*; S. United States. Fruit, resembling that of azedarach, used as antiperiodic;

fruits of many species of this genus substituted for soap—soap berries—in the tropics.

6. *Ilex verticilla'ta* (*Pri'nos verticilla'tus*), *Prinos*, *Black Alder*, *Winter-berry*.—Ilicaceæ (Aquifoliaceæ). The bark, U.S.P. 1820–1880; N. America, swamps; shrub, 2–2.5 M. (6–8°) high; leaves serrate, pubescent beneath; flowers white; fruit scarlet berry, size of pea. Bark thin, fragments 1 Mm. ($\frac{1}{2}\frac{1}{5}$ ') thick, brown-ash color, with white patches, black dots and lines; inner surface greenish, striate, bitter, astringent; contains, tannin, resin, bitter principle. Astringent, tonic, alterative, febrifuge, substitute for cinchona; diarrhea, fevers, ulcers, etc. Dose, 5ss–1 (2–4 Gm.); decoction, fluidextract.

7. *I. paraguayen'sis* (*paraguayen'sis*), *Maté*, *Paraguay Tea*.—Brazil. Leaves contain caffeine .2–1.6 p. c., tannin 10–16 p. c., volatile oil, stearoptene, wax, glucoside, proteins 5 p. c., ash 4–8 p. c.

43. RHAMNACEÆ. Buckthorn Family.

Ram-na'se-e. L. *Rhamn-us* + aceæ, Gr. *ράμνος*, the buckthorn, Christ's-thorn, fr. Celtic *ram*, a tuft of branches—*i. e.*, collection of thorns, some species thorny. Trees, shrubs. Distinguished by spiny habit; calyx 4–5-parted; petals and stamens distinct, perigynous, 4–5, opposite each other; sepals valvate; petals involute; ovary 2–5-celled, superior or inferior; fruit dry or fleshy, 2–4-celled, each cell 1-seeded; universal; acrid purgative, bitter tonic, febrifuge, dyes; fruits edible.

Genus: 1. **Rhamnus**.

CASCARA SAGRADA. CASCARA SAGRADA, U.S.P.

Rhamnus Purshiana, *De Candolle*, { The dried bark, collected at least one year before being used for making medicinal preparations.

Habitat. N. Idaho, west to the Pacific (N. California).

Syn. Casc. Sagr., *Rhamnus Purshiana*, U. S. P., 1900, Chittam Bark, Sacred-, Persian-, Persiana or Purchiana Bark, Bearberry, Bear (Shittim) Wood; *Rhamni Purshiani* Cortex.

Rham'nus. L. see etymology, above, of Rhamnaceæ.

Pur-shi-a'na. L. of Pursh, after Frederick Pursh (L. *Purshia*), author of *Flora Americae Septentrionalis*, 1817.

Cas'ca-ra Sa-gra'da. L. Sp. *cascara*, bark, + *sagrada*, sacred—holy bark—*i. e.*, so considered by many natives, on account of its medicinal properties.

PLANT.—Small tree, 4.5–6 M. (15–20°) high; twigs pubescent; leaves 5–15 Cm. (2–6') long, 2.5–7.5 Cm. (1–3') wide, thin, elliptic, apex obtuse, base rounded, pubescent beneath, dull green, dentate, petioles short, downy; flowers large, umbellate cymes; fruit drupe, black, obovoid, 8 Mm. ($\frac{1}{3}$ ') long, 3-lobed, 3-seeded. BARK, usually flattened, transversely curved pieces, occasionally quills, 1–5 Mm.

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($\frac{1}{2}$ – $\frac{1}{5}$ ') thick; dark brown, brownish-red, longitudinally ridged, grayish or whitish lichen patches, sometimes numerous lenticels, occasionally moss; inner surface longitudinally striate, light yellow, dark reddish-brown, dark brown (old matured bark); fracture short with projections of bast-bundles in inner bark; odor distinct; taste bitter, slightly acrid. POWDER, light brown, olive-brown—broken bast-bundles, crystal-fibers containing calcium oxalate monoclinic prisms; stone cells, more or less adhering; fragments reddish-brown cork; masses of parenchyma and medullary ray cells, red upon addition of alkali; starch grains spheroidal, .003–.008 Mm. ($\frac{1}{8}$ $\frac{1}{2}$ $\frac{1}{5}$ – $\frac{1}{3}$ $\frac{1}{2}$ $\frac{1}{5}$ ') broad. *Tests*: 1. Shake .1 Gm. + hot water (10) occasionally until cold, filtrate + ammonia T. S. (10)—orange-yellow. 2. Macerate .1 Gm. + alcohol (10 drops), boil with water (10 cc.), cool, filter; shake filtrate + ether (10 cc.)—yellow ethereal layer separates; of this shake 3 cc. + ammonia T.S. 3 cc.—separated ammoniacal solution + water (20 cc.)—retains distinct yellowish-red. *Solvent*: diluted alcohol. *Dose*, gr. 15–60 (1–4 Gm.).



FIG. 250.—*Rhamnus Purshiana* (Cascara Sagrada): A, B, flowering branches; 1, flower cluster; 2, flower, vertical section, magnified; 3, fruit.

ADULTERATIONS.—Barks of allied species: Formerly the smaller quills of *R. californica*, with medullary rays irregularly curved and grouped; in powder often find *R. Frangula*, which, owing to absence of stone cells and its longer bast-fibers, may be recognized; to this latter ammonia imparts deeper color.

Commercial.—Obtain bark in the spring from young trunks and large branches, dry carefully; should not be taken from old trunks, as that

has different taste and characteristics. The emetic action of green bark is due to a hydrolytic ferment, which is destroyed either by aging or moderately heating (38° C.; 100° F.) for 48 hours.

CONSTITUENTS.—Emodin (non-laxative), isoemodin, resin, tannin 2 p. c., glucose, volatile oil (yellowish-green, odorous), fixed oil (rhamnol arachidate, glycerides of linolic and myristic acids) 2 p. c., rhamnol (alcohol identical with quebrachol), $C_{20}H_{34}O$, hydrolytic ferment (non-gripping), syringic acid (not preëxisting in the bark, but from a substance of unknown nature by the action of acids), ash 6–8 p. c. The active principle, undetermined chemically, but possibly a glucosidal derivative, is obtained by precipitating aqueous solution of the alcoholic extract with lead subacetate, treating precipitate with ethyl-acetate, thereby yielding a non-crystalline, sticky mass containing laxative constituent. The “cascarin” and “purshianin” of previous investigators are regarded now simply as emodin with impurities, these latter constituting the medicinal entity, as purshianin gr. $\frac{1}{5}$ (.013 Gm.) is purgative. The constituents of fresh (1-year) and matured (3-year) bark seem not to differ.

PREPARATIONS.—1. *Extractum Cascaræ Sagradæ*. Extract of Cascara Sagrada. (Syn., Ext. Casc. Sagr., Extract of Rhamnus Purshiana; Powdered Extract of Cascara Sagrada; Br. Extractum Cascaræ Sagradæ Siccum; Fr. Extrait de Cascara Sagrada; Ger. Amerikanisch Faulbaumrindenextrakt.)

Manufacture: Macerate 3 hours 90 Gm. with boiling water 400 cc., percolate until exhausted (500 cc.), evaporate to dryness, pulverize, add dried starch q. s. 30 Gm. (to preserve powdered condition); mix powders thoroughly, pass through fine sieve and transfer it to small, wide-mouthed bottles and stopper them tightly. Dose, gr. 2–8 (.13–.5 Gm.).

2. *Fluidextractum Cascaræ Sagradæ*. Fluidextract of Cascara Sagrada. (Syn., Fldext. Casc. Sagr., Fluidextract of Rhamnus Purshiana; Br. Extractum Cascaræ Sagradæ Liquidum; Fr. Extrait fluide de Cascara Sagrada; Ger. Cascara Sagradafluidextrakt.)

Manufacture: Similar to Fluidextractum Glycyrrhizæ, page 317; evaporate to 75 cc., cool, add gradually alcohol 25 cc., and, if necessary, water q. s. 100 cc. Dose, ℥x–30 (.6–2 cc.).

3. *Fluidextractum Cascaræ Sagradæ Aromaticum*. Aromatic Fluidextract of Cascara Sagrada. (Syn., Fldext. Casc. Sagr. Arom., Aromatic (Tasteless) Fluidextract of Rhamnus Purshiana; Fr. Extrait fluide aromatique de Cascara Sagrada; Ger. Bitterloses Cascara Sagradafluidextrakt.)

Manufacture: Slake lime 6 Gm. with water q. s., mix it with cascara sagrada 100 Gm. + magnesium oxide 6 Gm. (to remove bitterness), moisten uniformly with boiling water 200 cc., macerate in shallow dish for 48 hours, percolate with boiling water until exhausted, evaporate to 50 cc.; while warm dissolve in it pure extract of glycyrrhiza 4 Gm., cool, add glycerin 20 cc., alcohol 20 cc. in which have been

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dissolved gluside .1 Gm., oil of anise .25 cc., oil of cinnamon .02 cc., oil of coriander .01 cc., methyl salicylate .02 cc., and water q. s. 100 cc. Here the magnesium oxide forms with the bitter principle (acid resin) a magnesium salt, insoluble in the menstruum, while the oxymethyl-anthraquinone is soluble. Dose, $\mathfrak{m}\text{x}-30$ (.6-2 cc.).

Preps.: 1. *Elixir Cascaræ Sagradæ*, N.F., 50 p. c., + elix. glycyrrh. aq. 50. 2. *Elixir Cascaræ Sagradæ Compositum*, N.F., 12.5 p. c., + fldext. senn. 7.5, fldext. jugland. 6.5, elix. arom. q. s. 100. Dose, each, $\mathfrak{z}\text{j}-2$ (4-8 cc.).

4. *Fluidglyceratum Cascaræ Sagradæ*, N.F., 100 p. c. Dose, $\mathfrak{m}\text{xv}-30$ (1-2 cc.). 5. *Fluidglyceratum Cascaræ Sagradæ Aromaticum*, N.F., 75 p. c., + fldglycer. glycyrrhiz. 25, lime 2, mag. oxid. pond. 2, +. Dose, $\mathfrak{m}\text{xv}-30$ (1-2 cc.).

Unoff. Preps.: *Aromatic Syrup of Cascara* (Br.), 40 p. c., $\mathfrak{z}\text{ss}-2$ (2-8 cc.), *Cordial*, $\mathfrak{z}\text{j}-2$ (4-8 cc.), *Tincture*, 15 p. c., $\mathfrak{z}\text{ss}-2$ (2-8 cc.).



FIG. 251.—*Rhamnus Purshiana*: transverse section, magnified 10 diam.

PROPERTIES.—Purgative, tonic, febrifuge, increases secretions of stomach, liver, pancreas; not usually given as a single cathartic, but where frequent repetition is required; it operates in 6-10 hours, and wears well, as generally increased quantities are not needed

when habitually used; it regulates action of the bowels, and acts best when given on empty stomach in concentrated form. Fresh bark nauseates and gripes, owing to a ferment which in time changes, so that matured official bark and its preparations should be without these properties. The purgative action is claimed by some to be due largely to resins, tonic to bitter principle.

USES.—Habitual constipation due to torpor of the colon, dyspepsia, hemorrhoids.

Allied Plants:

1. *Rhamnus Frang'ula*, *Frangula*, *Buckthorn Bark*, N.F.—The dried bark with not more than 2 p. c. of foreign organic matter; Europe, N. Asia—hedges. Slender straggling bush, 3-4.5 M. (10-15°) high, non-thorny; leaves oval, entire; flowers whitish; fruit (berry) size of a pea; green, white, yellow, pink, red, finally black; 2-3-seeded. Bark, varying length quills, frequently flattened, crushed, .5-1 Mm. ($\frac{1}{50}-\frac{1}{25}$ ') thick, purplish-black, numerous light-colored transverse lenticels, occasional lichens; inner surface smooth, brownish, purplish blotches, striate—red with solution of alkalis; fracture short, inner layer fibrous; odor distinctive; taste slightly bitter. Powder, yellowish-brown—cork and parenchyma tissue, calcium oxalate rosettes, bast-fibers with yellowish lignified walls, crystal-fibers with calcium oxalate prismatic crystals, starch grains; no stone cells (dist. from *R. Purshiana*); solvent: diluted alcohol; contains frangulin, $\text{C}_{21}\text{H}_{20}\text{O}_9$ (rhamnoxanthin) .04 p. c.—by hydrolysis yields emodin and rhamnose, $\text{C}_6\text{H}_{12}\text{O}_6$, while

emodin, $C_{15}H_{10}O_5$, + rhamnose = frangulin + water; also emodin 1–3.8 p. c., isoemodin, frangulic acid, chrysophan, resin, tannin, ash 5–6 p. c. Purgative, tonic, diuretic—when fresh emetic, severe intestinal irritant causing much pain, when modified by age resembles rhubarb, senna, although milder; dropsy, costiveness, constipation of pregnancy (fldext. \mathfrak{M}_{xx} (1.3 cc.) ter die); parasitic skin affection—itch, etc. (ointment of fresh bark). Dose, \mathfrak{zss} –1 (2–4 Gm.); 1. *Fluid-extractum Frangulae* (exhaust with boiling water, add one-fourth alcohol—preservative), dose, \mathfrak{zss} –1 (2–4 cc.): Prep.: 1. *Elixir Catharticum Compositum*, 12.5 p. c., + fldext. senn. 10, fldext. rhei 6.2, liq. pot. hydrox. .45, sp. menth. pip. 1.4, elix. arom. q. s. 100, dose, \mathfrak{zj} –4 (4–15 cc.). Decoction, 5 p. c., \mathfrak{zss} –1 (15–30 cc.); Extract, gr. 2–8 (.13–.5 Gm.).

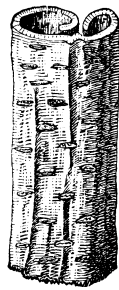


FIG. 252.—*Rhamnus Frangula*: bark, natural size.

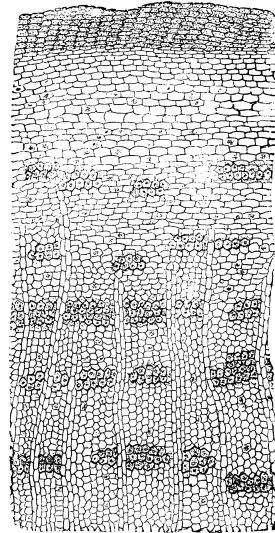


FIG. 253.—Frangula bark: transverse section, magnified 80 diam.

2. *R. cathartica*, *Buckthorn Berries*, *Baccæ Spinæ Cervinæ*, N.F.—The dried ripe fruit with not more than 5 p. c. of unripe fruit or other foreign organic matter; Europe, N. Asia—naturalized in N. America. Small tree 3–4.5 M. (10–15°) high, short branches, thorny; leaves 2.5–5 Cm. (1–2') long, 2.5 Cm. (1') broad; flowers greenish. Fruit, Sept., size of a pea, flattened, globoid, 4–8 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') broad, purplish-black, wrinkled, 3–4-celled, each cell with a brown seed-like nutlet—pedicel lacking; odor faint, unpleasant; taste sweetish, then nauseating, bitter; colors saliva—purplish-red; unripe fruit—discarded, greenish-brown, firm, furrowed, pedicel attached, very bitter. Powder, dark

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brown—epidermal cells, parenchyma—some with an amorphous substance, calcium oxalate rosettes, sarcocarp cells, some with yellow oily content; stone cells, calcium oxalate prisms, fixed oil, aleurone grains; solvent: diluted alcohol; contains emodin-autranol, gesterin, rhamno-

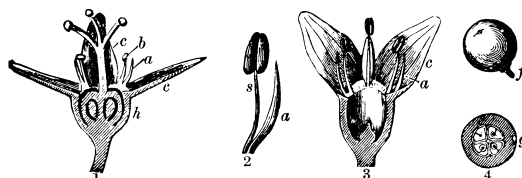


FIG. 254.—*Rhamnus cathartica*: 1-3, the imperfect pistillate and staminate flowers; 2, stamens—s, fertile, a, sterile; 4, f, fruit; g, cross-section of fruit.

cathartin (a glucoside of emodin)—emodin, rhamnonigrin, resin (containing emodin), rhamnose, glucose, fixed oil, quercetin and rhamnin (yellow coloring matter), ash 5 p. c. Cathartic—similar to cascara sagrada; chiefly in veterinary practice. Dose, \mathfrak{ss} -1 (2-4 Gm.); 1. *Fluidextractum Rhamni Cathartice* (diluted alcohol), dose, \mathfrak{ss} -1



FIG. 255.—*Vitis vinifera*: in fruit.

(2-4 cc.): Prep.: 1. *Syrupus Rhamni Cathartice*, 20 p. c., + ol. fœnic., $\frac{1}{50}$, ol. cinnam. $\frac{1}{50}$, syrup q. s. 100, dose, \mathfrak{ss} -3 (4-12 cc.). Decoction, 5 p. c.—expressed juice made into syrup. Fresh juice with alum or lime yields the pigment—*sap green*. *R. caroliniana*, *Carolina (Southern) Buckthorn*, New York-Texas, is a shrub or small tree; leaves oblong, serrate; flowers short-peduncled; fruit purple, 3-seeded.

3. *Vitis vinifera*, *Grape Vine*.—Vitaceæ. The fermented juice (white wine, red wine) of fresh fruit, U.S.P. 1820-1900; W. Asia, cultivated universally. Climbing perennial shrub; stem woody, brownish, long, tortuous; leaves 5-10 Cm. (2-4') long, 5-lobed, roundish, cordate; flowers greenish; fruit ovoid berry, 12-25 Mm. ($\frac{1}{2}$ -1') broad, pericarp thin,

green, yellow, purple, red; pulp juicy, greenish, sweet, acidulous; seed few, pyriform; grapes contain sugar 12-30 p. c., potassium bitartrate, calcium tartrate, calcium phosphate, potassium sulphate, sodium chloride, tannic acid, malic acid, albumin, pectin, etc.; argol—potassium bitartrate, tartaric acid. 1. *Vinum Album*, White Wine.

Obtained by fermenting for several weeks the juice of fresh grapes freed from seeds, stems, skins; contains 7–12 (8.5–15 vol.) p. c. of alcohol, and includes Sherry, Lisbon, Teneriffe, Madeira, Rhenish, Hock, Moselle, French, California, etc. 2. Vinum Rubrum, Red Wine. Obtained by fermenting juice of fresh grapes in the presence of their skins; contains 7–12 (8.5–15 vol.) p. c. of alcohol, and includes Claret, Port, Burgundy, etc. Stimulant, depressant, astringent, tonic, diaphoretic; fevers, general debility, irritable stomach, ulceration, gangrene, tetanus, old age.

44. MALVACEÆ. Mallow Family.

Mal-va'se-e. L. *Malv-a* + aceæ, fem. pl. of *malvaceus*, of mallows; *malva*, mallow, fr. Gr. *μαλακός*, soft, mild—*i. e.*, owing to its emollient properties or soft, downy leaves. Herbs, shrubs, trees. Distinguished by stamens monadelphous, anthers 1-celled, seed reniform; flowers regular; sepals 5; petals 5; pistils several, united; albuminous, superior; temperate climate, tropics; demulcent, tough fibers, hairs as cotton.

Genera: 1. *Althæa*. 2. *Gossypium*.

ALTHÆA. ALTHEA, U.S.P.

Althæa officinalis, { The dried root deprived of the brown, corky
Linné. { layer and small roots.

Habitat. Europe, Western and Northern Asia; naturalized in salt marshes, New England, New York, Australia; cultivated in Europe.

Syn. Marsh Mallow Root, Marsh Mallow, White Mallow, Mortification Root, Sweetweed, Wymote; Fr. Racine de Guimauve, Guimauve; Ger. Radix Althææ, Eibischwurzel, Eibisch.

Al-thæ'a. L. fr. Gr. *ἀλθαῖνω*, to heal, cure—*i. e.*, its medicinal qualities (Dioscorides).

Of-fi-ci-na'lis. L. see (*Smilax officinalis*, page 122.

PLANT.—Perennial herb .6–1.3 M. (2–4°) high, having several woolly stems; flowers large, 2.5–5 Cm. (1–2') in diameter, purple. ROOT, slenderly tapering, 15–30 Cm. (6–12') long, 1–2 Cm. ($\frac{2}{5}$ – $\frac{4}{5}$ ') thick; usually cut into small pieces, 5 Mm. ($\frac{1}{5}$ ') thick, whitish, longitudinally furrowed, frequently spirally twisted and covered with somewhat loosened bast-fibers (hairy); fracture fibrous (bark), short, granular (wood); internally yellowish-white; bark 1–2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') thick, porous (due to mucilage cells) and separated from slightly radiating wood by grayish cambium zone; odor slight; taste sweetish, mucilaginous. POWDER, whitish—many starch grains up to .03 Mm. ($\frac{1}{333}$ ') in diameter, usually with long central cleft; groups of fibers with thick, more or less lignified walls; tracheæ, scalariform thickenings or bordered pores, few calcium oxalate crystals in rosette aggregates. *Tests:* 1. Macerate 1 Gm. for 30 minutes in water 10 cc., stirring occasionally, filter through purified cotton—pale yellow, neutral mucilage, + a few

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drops of sodium hydroxide T. S.—turns deep yellow; mucilage does not have a sour or ammoniacal odor. Leaves (*Althææ Folia*, Marsh Mallow Leaves, *N.F.*). The dried leaves with not more than 5 p. c. stems and fruits or other foreign organic matter. Crumpled or matted, gray-green, densely and finely tomentose, petioles 1–6 Cm. ($\frac{2}{5}$ – $\frac{2\frac{2}{5}}{5}$) long; blades 3–15 Cm. ($1\frac{1}{5}$ –6') long, 3–10 Cm. ($1\frac{1}{5}$ –4') broad, thin, cordate, rounded at base, acute, doubly serrate-dentate, lobed, 2–6 principal veins from midrib in the petiole; odor slight, scarcely characteristic; taste mucilaginous. Powder, grayish-green—stellate and glandular hairs, calcium oxalate in rosette aggregates, stomata, mucilage cells, pollen grains. *Solvents*: water—cold, dissolving asparagin, mucilage, sugar; hot, also starch. Dose, ʒss–1 (2–4 Gm.).

FIG. 256.—*Althæa officinalis*.

ADULTERATIONS. — **ROOT:** Belladonna root, when young and peeled, resembles althea, but distinguished by absence of hair-like bast-fibers, and by possessing visible yellowish wood bundles; old dark-colored althea roots sometimes are whitened with calcium oxide or sulphate, which subside to the bottom upon soaking in water, thereby readily being detected; root sometimes marketed cut in small cubes, rendering admixtures more likely; **POWDER:** Starchy substances recognized by shape of starch granules.

Commercial.—Plant during first 2 years produces only a tap-root, which soon thereafter becomes tough, woody, inert, and much branched, the branches having little medicinal value; the unscraped root is yellowish-brown, non-fibrous, and should be collected (late autumn) from cultivated plants, peeled, and dried carefully; leaves and flowers sometimes used.

CONSTITUENTS.—**ROOT:** Asparagin (althein, amido (-succinamide) -succinic acid, asparamide) 1–2 p. c., Mucilage (bassorin, althea mucilage, upon which value depends) 35 p. c., Starch 37 p. c., pectin 11 p. c., betaine, sugar 11 p. c., fat 1.25 p. c., ash 4–8 p. c. Leaves: similar but less mucilage.

Asparagin, $C_4H_8O_5N_2 \cdot H_2O$.—Obtained by putting the thick, viscid, mucilage of althea into a dialyzer, with water outside; asparagin passes into the water, which upon evaporation yields the crystals. These are colorless, neutral, transparent, lustrous, sp. gr. 1.520, soluble in water (47), acids, alkalies, converted by these latter into ammonia and aspartic acid; therapeutically inactive. Dose, gr. 5–10 (.3–.6 Gm.).

PREPARATIONS.—ROOT: 1. *Massa Hydrargyri*, 15 p. c. 2. *Pilulæ Ferri Carbonatis*, $\frac{1}{6}$ gr. (.01 Gm.). 3. *Pilulæ Phosphori*, 1 gr. (.06 Gm.). 4. *Syrupus Althææ*, N.F., 5 p. c., + alcohol 3, glycerin 10, sucrose 70, water q. s. 100. Dose, \mathfrak{zj} –4 (4–15 cc.). 5. *Species Pectorales*, *Breast Tea*, N.F., 40 p. c., + coltsfoot 20, glycyrrhiza 15, anise, mullein

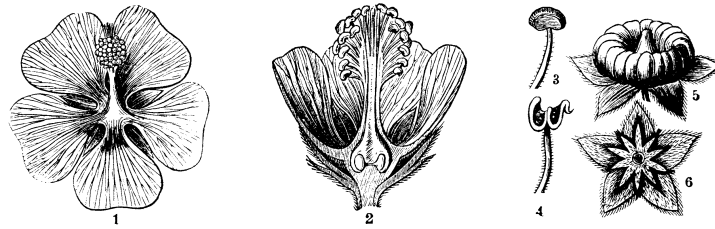


FIG. 257.—*Althæa officinalis*: 1, expanded flower; 2, vertical section of flower; 3, stamen; 4, stamen after discharge of pollen; 5, fruit; 6, outside calyx as seen from beneath.

flowers, āā 10, orris 5. LEAVES: 1. *Species Emollientes*, *Emollient Cataplasma*, N.F., 20 p. c.—althæa leaves, mallow leaves, melilot, matricaria, linseed, āā 20 Gm., hot water q. s. 100. Poultice.

Unoff. Preps.: Decoction, Infusion, each, 5 p. c., \mathfrak{zj} –4 (30–120 cc.). Ointment.

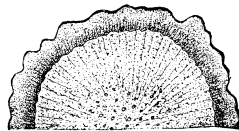


FIG. 258.—*Althæa*: transverse section, magnified 2 diam.



FIG. 259.—*Malva sylvestris*: showing flowers, leaves, and fruit.

PROPERTIES.—ROOT and LEAVES: Demulcent, emollient, protective.

USES.—Inflammations of pulmonary, digestive, and urinary organs, mucous membranes; skin eruptions, herpes, psoriasis, enema (decoction) for vaginal and rectal irritation. In pharmacy, the powdered root being very absorbent, is used to harden pills, troches, electuaries, etc. *A. ro'sea*, *Hollyhock*.—Levant, formerly cultivated in gardens for flowers (petals—*Flores Malvæ Arboreæ*), 7.5–12.5 Cm. (3–5') broad, nearly sessile, composed of tomentose calyx and 5 purple petals.

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Allied Plants:

1. *Mal'va sylves'tris* and *M. rotundifo'lia*, *Malvæ Folia*, (*High and Low*) *Mallow Leaves*, *N. F.*—The dried leaves with not more than 10 p. c. of other parts of the plants, nor 5 p. c. of foreign organic matter; Europe, Asia, cultivated in United States. Biennials—former erect, 1 M. (3°) high, latter procumbent, spreading; flowers reddish-purple, bluish; with ammonia—green, with acids—red. Leaves (*M. sylvestris*), orbicular, reniform, cordate, 10–11 Cm. (4–4½') long, 15–20 Cm. (6–8') broad, 3–7-lobed, petioles up to 10 Cm. (4') in length, palmate, crenate-dentate, pubescent; (*M. rotundifolia*), orbicular, up to 8 Cm. (3½') broad, cordate, 5–7-lobed, palmate, teeth blunt, less pubescent, petioles up to 20 Cm. (8') in length; inodorous, taste bland, mucilaginous—on chewing. Powder, light green—non-glandular hairs, stomata, pith and spongy parenchyma, stem fibers, tracheæ, mucilage cells, calcium oxalate rosette crystals; solvent: water; contains mucilage, pectin, tannin, ash 16 p. c. Demulcent, emollient; dysentery, catarrh, kidney troubles. Dose, ʒss–1 (2–4 Gm.); 1. *Species Emollientes*, 20 p. c. *Abu'tilon* and *Hibis'cus* species possess similar medicinal properties and may be used satisfactorily one for the other.

GOSSYPIUM. COTTON.

1. GOSSYPIUM PURIFICATUM. Purified Cotton, *U.S.P.*
2. OLEUM GOSSYPH SEMINIS. Cottonseed oil, *U.S.P.*

Gossypium herbaceum,
Linné, or other species.

- | | |
|---|---|
| { | <ol style="list-style-type: none"> 1. The hairs of the seed of cultivated varieties, freed from adhering impurities and linters, and deprived of fatty matter. 2. The refined fixed oil from the seeds of cultivated varieties. |
|---|---|

Habitat. C. Asia, India, China, Arabia, N. E. Africa, Egypt; cultivated in United States, W. Indies, C. and S. America, N. Africa, Australia, Spain.

Syn. 1. Gossyp. Purif., Absorbent Cotton, Gossypium, Cotton, Cotton Wool; Fr. Coton; Ger. Gossypium depuratum, Gereinigte Baumwolle. 2. Ol. Gossyp. Sem., Cotton Seed Oil; Fr. Huile (de Coton) de Semences de Cotonnier; Ger. Baumwollsaamenöl.

Gos-syp'i-um. L. fr. Ar. *Goz*, *Gothn*, a soft, silky substance—*i. e.*, the hairs of the seeds.

Her-ba'ce-um. L. *herbaceus*, grassy, herby—*i. e.*, the plant habit.

PLANT.—Small biennial or triennial shrub; stem branching, 1.5–3 M. (5–10°) high, more or less woody; leaves hoary, palmately 3–5-lobed; flowers large, 5–7.5 Cm. (2–3') long and wide, yellow, purple spot near the claw; fruit capsule or boll 4–5 Cm. (1½–2') long, 3–5-celled, opening by as many valves when ripe, revealing loose, white tuft of long, slender hair that surrounds each one of the numerous seeds. **HAIRS OF THE SEED**, in white, soft, fine filaments, 12–37.5 Mm.

($\frac{1}{2}$ – $1\frac{1}{2}$ ') long; under microscope hollow, flattened, twisted bands, spirally striate, slightly thickened edges; odorless; almost tasteless; insoluble in ordinary solvents. *Tests*: 1. Compress in the hand, throw upon cold water—readily absorbs latter and sinks. 2. Incinerate 5 Gm.—ash .2 p. c. 3. Thoroughly saturate 10 Gm. with water 100 cc., with glass rod press out 2 separate portions, 25 cc. each; first portion, + 3 drops of phenolphthalein T. S.—no pink color (abs. of alkali); second portion, + 1 drop of methyl orange T. S.—no pink color (abs. of acid). 4. Exhaust 10 Gm. with ether q. s. 200 cc., evaporate to dryness—residue not over .6 p. c. (abs. of fatty matter). 5. Extract 10 Gm. with alcohol q. s. 50 cc.; observed downward through a column 20 Cm. in depth—may show yellowish color, but no blue or green (abs. of dyes). *Impurities*: Alkali, acid, fatty matter, dyes, water-soluble substances. *Solvent*: Ammoniated cupric oxide T. S. **OIL OF THE SEEDS**, a pale yellow, oily liquid, odorless, nearly odorless, bland taste, slightly soluble in alcohol; miscible with ether, chloroform, petroleum benzin, carbon disulphide, sp. gr. 0.918; on cooling below 12° C. (54° F.) particles of solid fat separate, and at –5 C. (23° F.) nearly or quite a solid. *Tests*: 1. Oil and carbon disulphide equal volumes + sulphuric acid (sp. gr. 1.6–1.7)—reddish-brown color rapidly produced. 2. Mix 2 cc. with 2 cc. of a mixture of equal vols. amyl alcohol and a 1 p. c. solution of precipitated sulphur in carbon disulphide, and immerse to one-third depth in boiling saturated aqueous solution of sodium chloride—red color in 10–15 minutes. Dose, ʒij–8 (8–30 cc.).

SUBSTITUTIONS.—I. **HAIRS**: *Bahme'ria ni'vea*, fiber may be used for cotton, lint, etc. II. **OIL**: 1, Brazil or Para Nut Oil; nuts 2.5–5 Cm. (1–2') long, 3-edged, brownish-gray kernel, white, almond taste; yield 60 p. c. oil; 2, Oleum Fagi, Beech Oil, from fruit of *Fagus sylvestrica*, kernels yield 22 p. c. oil; yellow, sp. gr. 0.922, congeals at –17.5° C. (0° F.).

Commercial.—Cotton was known to the Arabians, Egyptians, and Chinese in the 10th century, and was carried to Spain by the Moors in the 16th century. The ancient Egyptians possibly were unacquainted with it, as their mummy fibers are all linen, and no seeds or paintings of plants are found in the tombs. However, in Peru mummy clothing from earliest date contain cotton, consequently here may be its original habitat. Many species now give similar products, but our own is thought to be from *G. barbadense*, Barbados Islands, W. Indies. Chapman refers long-staple or Sea Island cotton, which we cultivate, to *G. ni'grum*, and short-staple or Upland cotton to *G. al'bum*. The hairs are removed by hand or mill (cotton gin) from the seeds, and owing to the latter containing fixed oil, 15–20 p. c., a portion of it becomes absorbed by the attached fiber and must be eliminated before adapted for general use. Purification is effected by boiling carded cotton in 5 p. c. solution of potassium or sodium hydroxide, washing with water to remove soap, expressing, adding 5 p. c. solution of chlorinated lime, allowing to stand half an hour, washing, expressing, adding acidulated

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(HCl 5 p. c.) water, washing, expressing—a process that may be repeated if necessary, removing 7–10 p. c. of weight, chiefly fat. The oil is obtained by cracking off testa, grinding and expressing kernels; at first it is thick, reddish-brown, turbid from albumen and mucilage, which mostly subside on standing, yielding orange-colored *clarified oil*; when this is treated with boiling water or superheated steam albuminoids are coagulated, giving lighter colored *refined oil*, which upon being bleached (agitated with alkaline solution and heated) yields *winter-bleached oil*; the loss in refining is 5–10 p. c., and as such is official. It is exported extensively for olive oil adulteration, for which demand a line of tanked steamers ply regularly between New Orleans and Europe, each having a capacity of 500,000–1,000,000 gallons; 12,000–20,000 barrels (1894–3788 Kl.).



FIG. 260.—*Gossypium herbaceum*: a, outside calyx; f, fruit.



FIG. 261.—*Gossypium herbaceum*: cotton fiber, magnified 250 diam.

CONSTITUENTS.—I. HAIRS: Cellulose ($C_6H_{10}O_5$)_x, inorganics 1.5 p. c., fixed oil 7–10 p. c. II. OIL: Olein, palmitin, linolein, glyceride of linoleic acid, and non-saponifiable yellow coloring matter.

PREPARATIONS.—I. HAIRS: 1. *Pyroxylinum*. Pyroxylin. (Syn., Pyroxylin, Soluble Gun Cotton, Colloxylin, Collodion Cotton, Lana Collodii; Fr. Fulmicoton soluble; Ger. Kollodiumwolle.)

Manufacture: Macerate purified cotton in a cooled mixture of 14 vols. of nitric acid and 22 vols. of sulphuric acid until the cotton is soluble in a mixture of 1 vol. of alcohol and 3 vols. of ether, remove adhering acid by washing first with cold, then boiling water, dry in small portions at 60° C. (140° F.). It is a yellowish-white matted mass of filaments, resembling raw cotton in appearance, harsh to the touch, exceedingly inflammable, burning, when unconfined, very rapidly with luminous flame, less explosive than cellulose hexanitrate; kept in well-closed bottles exposed to light, decomposes with evolution of nitrous vapors, and carbonaceous residue; consists chiefly of cellulose tetranitrate, $C_{12}H_{16}O_6(NO_3)_4$. *Tests*: 1. Soluble slowly but completely

in 25 parts of a mixture of 1 vol. of alcohol and 3 vols. of ether; soluble in acetone, glacial acetic acid, and precipitated from these solutions on the addition of water. 2. Saturate .5 Gm. with alcohol in a dish in cold water, ignite from top; when combustion complete, heat dish to redness—ash .3 p. c. 3. Stir 1 Gm. + water 20 cc. for 10 minutes, filter—filtrate shows no acid reaction; 10 cc. evaporated to dryness on water-bath—residue not more than .0015 Gm. (abs. of soluble substances). Should be kept dark, dry, in cartons packed loosely.

Prep.: 1. *Collodion*. Collodion. (Syn., Collod.; Fr. Collodion; Ger. Collodium, Kollodium.)

Manufacture: Add alcohol 25 cc. to pyroxylin 4 Gm., shake, add ether 75 cc., shake until dissolved; cork well, set aside until clear, decant from any sediment. It is a clear, slightly opalescent, syrupy liquid; colorless, slightly yellowish; odor of ether; highly inflammable, and when exposed in thin layer leaves a transparent, tenacious film; sp. gr. 0.770; mixed with equal volume of distilled water a viscid, stringy mass (pyroxylin) separates; aqueous liquid not acid. Should be kept cool, remote from fire, in well-closed containers.

Prep.: 1. *Collodium Flexile*. Flexible Collodion. (Syn., Collod. Flex.; Fr. Collodion élastique; Ger. Collodium elasticum, Elastisches Kollodium.)

Manufacture: Shake in a tared bottle collodion 95 Gm., castor oil 3, camphor 2, until latter dissolved. Should be kept cool, remote from fire, in well-closed containers.

Preps.: 1. *Collodium Bituminis Sulphonati*, N.F., 90 p. c.

2. *Collodium Salicylicum Compositum*, N.F., 90 p. c.

3. *Collodium Stypticum*, N.F., 90 p. c.; each should be kept cool, in tightly-stoppered bottles.

2. *Gossypium Stypticum*, N.F.—macerate 100 Gm. for 1 hour in solution of ferric chloride 80 cc., glycerin 16, water 225, press until it weighs 300 Gm., dry; keep in well-closed glass containers. II. OIL:

1. *Linimentum Camphoræ*, 80 p. c. 2. *Ampullæ Camphoræ*, N.F., q. s.

3. *Unguentum Picis Compositum*, N.F., 34 p. c.

Unoff. Preps.: I. HAIRS: *Medicated Cottons* (borated, benzoinated, chlorinated, phenolated (carbolated), salicylated, iodoform, mercuric (bi)chloride, hemostatic, etc.); *Iodine Collodion*, 5 p. c.; *Iodoform Collodion*, 5 p. c., *Croton Oil Collodion*, 10 p. c. II. SEED: *Cottonseed Tea* (mucilaginous drink for dysentery, diarrhea, etc.).

PROPERTIES.—I. HAIRS: Protective. II. OIL: Demulcent, nutrient.

USES.—I. HAIRS: Dressing in burns, scalds, erysipelas, blisters, surgical wounds; prevents entrance of organic germs that cause supuration and septic disease. Cotton batting maintains local heat in pneumonia, rheumatism, and may be made into pessaries. II. OIL: Like olive and almond oils in pharmacy, liniments, etc., in culinary use for lard; to adulterate olive oil, in preparing woollen cloth, morocco leather, lubricating machinery, etc.

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Derivative Product:

1. *Gossypii (Radicis) Cortex, Cotton Root Bark, N.F.*—The recently gathered air-dried bark of the root of one or more cultivated varieties with not more than 5 p. c. of wood or other foreign organic matter. Root-bark, in flexible bands, quilled pieces, up to 30 Cm. (12') in length, 1 Mm. ($\frac{1}{25}$ ') thick, orange-brown, smooth, usually finely wrinkled, fissured, roughened from exfoliation of corky layers, fuzzy; inner surface light brown, striate; fracture tough, fibrous, separable into fibrous layers; odor slight; taste slightly acrid. Powder, brownish—numerous bast-fibers, cortical parenchyma, starch grains, secretory reservoirs, medullary ray cells, calcium oxalate rosette crystals; solvents: diluted alcohol, boiling water; contains resin (acrid, colorless, soluble in water, becoming red on exposure and insoluble) 8 p. c., fixed oil, tannin, starch, ash 7 p. c. Emmenagogue, oxytocic, uterine hemostatic, similar to ergot, but less reliable; dysmenorrhea, amenorrhea, uterine tumors and hemorrhages—popular among negroes (who brought it from Africa) in Southern States for inducing abortion. Dose, $\overline{3}$ ss–1 (2–4 Gm.); 1. *Fluidextractum Gossypii Corticis* (alcohol), dose, $\overline{3}$ ss–1 (2–4 cc.). Decoction— $\overline{3}$ iv (120 Gm.) + water Oij (900 cc.), evaporated to Oj (450 cc.), $\overline{3}$ ij (60 cc.), every half hour. *G. barbadense*, *G. arborescens*, *G. religiosum* (fibers yellow), etc., furnish products which may be used similarly to the official.

45. STERCULIACEÆ. Silk Cotton Family.

Ster-ku-li-a'se-e. L. *Sterculia* + aceæ, from *stercus*, excrement, *Sterculius*—God of—*i. e.*, named from the fetid flowers or fruit of certain species. Trees, shrubs. Distinguished from Malvaceæ by anthers 2-celled and flowers sometimes unisexual by abortion; calyx 5, corolla 5, twisted; tropics, temperate climates; demulcent, emetic, purgative.

Genus: 1. **Theobroma.**

THEOBROMA. CACAO (CHOCOLATE TREE).

Oleum Theobromatis. Oil of Theobroma, *U.S.P.*

Theobroma Cacao. } The fat obtained from the roasted seeds.
Linné.

Habitat. S. America (Brazil), C. America, Mexico, W. Indies; cultivated in the tropics, largely in some of the W. Indies.

Syn. Semen (Fabæ) Cacao; Ol. Theobrom., Butter of Cacao, Cacao Butter, Oleum Theobromæ; Fr. Cacao, Fèves du Mexique, Beurre de Cacao; Oleum Cacao; Ger. Kakaobohnen; Kakaobutter.

The-o-bro'ma. L. fr. Gr. *θεός*, a god, + *βρώμα*, food, food of the gods—*i. e.*, its delicious qualities.

Ca-ca'o. L. Sp. from Mexican *kakahuati*—*i. e.*, its native name.

PLANT.—Handsome tree 9–12 M. (30–40°) high, round branches, bark gray, smooth; leaves 20–22.5 Cm. (8–9') long, 6 Cm. ($2\frac{2}{3}$ ') wide,

lanceolate, acute, round base, entire, veins prominent beneath, petiole 2.5 Cm. (1') long, thickened at both ends; young leaves pink; flowers pale pink, calyx and corolla 2.5 Cm. (1') broad, alike in color; fruit large, 15–17.5 Cm. (6–7') long, broadly fusiform, with 10 shallow furrows and blunt ridges, tuberculated, pendulous, single or 2–3 together, at first yellow, then red, purple, pericarp thick, tough, 5-celled; seed many, closely packed in tiers, size of almonds, angular from pressure, immersed in copious, sweet buttery pulp, seed-coats 2, brownish.

CONSTITUENTS.—SEEDS: Fixed oil 50 p. c., starch 16 p. c., theobromine 1.5–4.5 p. c., caffeine, proteins 18 p. c., sugar .6 p. c., cacao-red 5–6 p. c., volatile odorous principle, ash 3.6–4.6 p. c.



FIG. 262.—*Theobroma Cacao*.

Oleum Theobromatis. Oil of Theobroma.—This fat (concrete fixed oil) is a yellowish-white solid (lighter colored with age), faint, agreeable odor, bland, chocolate-like taste, usually brittle below 25° C. (77° F.), soluble in ether, chloroform, petroleum benzin, benzene, boiling dehydrated alcohol, slightly in alcohol, sp. gr. 0.973, melts at 30–35° C. (86–95° F.); contains stearin 40 p. c., palmitin, laurin, small amounts of glycerides of acetic, butyric, formic, linoleic, and arachidic acids. *Test:* 1. Dissolve 1 Gm. in ether 3 cc. in test-tube at 17° C. (63° F.), immerse test-tube in ice-cold water—liquid not turbid nor does it deposit white flakes in less than 3 minutes, and after congealing should clarify at 15° C.; 59° F. (abs. of wax, stearin, tallow). Dose. ʒss–1 (2–4 Gm.).

ADULTERATIONS.—Wax, stearin, tallow, etc.

Commercial.—The seed when taken from the fruit (size of cucumber but with pointed ends, consisting of shells 12 p. c. and kernels 88 p. c.)

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and dried, still retain astringency and bitterness (kernel), which may be overcome by roasting, or sweating and fermenting in heaps for 1 week, or burying in a box in clayed soil ("clayed," "claying"—best and yellowish) for 3 days, then throwing seed into heaps, covering with leaves for a week, thereby destroying tannin and bitter principle, and developing the derivative constituents on which the properties of chocolate partly depend, then drying. The oil is extracted afterward by: 1, Expression; 2, Decoction; 3, Solution (benzin, carbon disulphide, chloroform, ether), the first process being considered best, and consisting in roasting, discarding shells, grinding kernels, heating at 70° C. (158° F.), subjecting mass to hydraulic pressure between hot iron plates or rollers, then running oil into rectangular molds, where it soon congeals. The residual dryish, oleaginous pulp (expressed cake, oil cake), still containing variable amounts of oil, is utilized as cocoa or chocolate—the former containing the least oil, and both darkened in color and lightened in flavor by an alkali. Chocolate (fr. Ind. *chocolat*), as a confection consists usually of expressed cake finely ground, sugar, vanilla, cinnamon, annatto, etc., molded into varying shapes. Either cocoa or chocolate may be boiled with milk, or milk and water, sweetened, to form a valuable nutritive drink in convalescence from acute diseases. Both are subject to much adulteration with starch, rice flour, barley flour, sassafras nuts, chestnuts, clove, butter, lard, coco-nut shells, etc.

PREPARATIONS.—(Unoff.) *Emulsion. Ointments. Suppositories.*

PROPERTIES.—Nutrient, demulcent, emollient.

USES.—Seldom internally, only as suppositories, when it acts as an excipient or carrier for other medicine. Externally in cosmetic ointments, pill coating, abraded or inflamed surfaces.

Derivative Products:

1. **Theobrominæ Sodio-Salicylas. Theobromine Sodio-Salicylate**, $C_7H_7O_2N_4Na + NaC_7H_5O_3$, *U.S.P.*—(Syn., Theobrom. Sodio- Sal., Diuretin; Fr. Theobromine et Salicylate de Soude; Ger. Theobromin-natriumsalicylate.) Obtained by mixing aqueous solutions of equal molecules of sodium theobromine and sodium salicylate, evaporating to dryness. It is a white, odorless powder, sweetish, saline, somewhat alkaline taste, gradually absorbs carbon dioxide liberating theobromine, becoming incompletely soluble in water, frequently develops a characteristic odor, soluble in water (1), slightly in alcohol; contains, when dried to constant weight, theobromine 46.5 p. c., salicylic acid 35 p. c., losing water 10 p. c. *Tests:* 1. Ignited—residue produces intensely yellow flame and effervesces with acids. 2. Aqueous solution (1 in 20) colorless, clear, opalescent; aqueous solution (1 in 100), slightly acidulated with acetic acid, + ferric chloride T. S.—violet. 3. .05 Gm. theobromine (separated in assay), + hydrochloric acid 1 cc. + potassium chlorate .1 Gm., dry on water-bath—reddish-yellow residue which becomes purple when moistened with 1 drop of ammonia T. S. 4. Dissolve .1 Gm. in sulphuric acid 2 cc.—no effervescence (abs. of car-

bonate); produces only slight color (abs. of readily carbonizable substances). 5. Dissolve 1 Gm. in water 10 cc., add a few cc. sodium hydroxide T. S., shake with chloroform 10 cc., separate chloroform layer, evaporate to dryness (constant weight)—residue does not exceed .005 Gm. (abs. of caffeine). *Impurities*: Caffeine, sodium carbonate, water, readily carbonizable substances. Should be kept in well-closed containers. Dose, gr. 5–15 (.3–1 Gm.), 5–6 times daily, in dilute solution, capsule, wafer, followed by water.

PROPERTIES AND USES.—Diuretic, nervous stimulant; cardiac dropsy, nephritis (chronic, acute), dyspnea, coughs; very slight action on heart and circulation; may produce headache, irregular pulse, vomiting, diarrhea, gastric irritation (avoided by small doses and weak solutions); owing to greater solubility far superior to theobromine. *Incompatibles*: Acids, fruit syrups (decomposing and precipitating theobromine), bicarbonates, borates, phosphates, ferric salts, chloral hydrate, wines, etc.

2. *Theobromine* (dimethylxanthine), $C_7H_8O_2N_4$.—This is obtained by exhausting the kernels with hot water, straining, precipitating with lead acetate, filtering, removing lead with hydrogen sulphide, filtering, evaporating, and treating residue with hot alcohol, from which whitish, bitter crystals deposit. It is a weak base (alkaloid) not altered by solution of potassium hydroxide, slightly soluble in water, alcohol, ether, forms salts (hydrochloride, nitrate, salicylate, etc.), and is related to caffeine, this latter being its methyl derivative—methyltheobromine, into which theobromine may be converted by treating theobromine silver with methyl iodide.

3. *Cacao Præparatum, Cocoa, Prepared Cacao (Chocolate), N.F.*—A powder prepared from the roasted, cured kernel of the ripe seed. It is brownish-red; numerous oil globules, protein grains, starch grains; odor and taste chocolate-like, free from sweetness; yields 6 p. c. of crude fiber, 15 p. c. of starch, and when extracted with ether, 18–25 p. c. of fat—the fatty residue shows not more than 3 p. c. of cocoa shells, and is without spicy odor and taste. Dose *ad libitum*; 1. *Syrupus Cacao*, 5 p. c., + tr. vanill. $\frac{1}{5}$ p. c., alcohol 5, sucrose 80, aq. dest. q. s. 100; 2. *Tabellæ Santonini*, 1 gr (.06 Gm.); 3. *Tabellæ Santonini Compositæ*, 1 gr. (.06 Gm.).

Allied Plants:

1. *Cola nitida, Kola, Cola, N.F.*—The dried cotyledon of this or other species with not more than 1 p. c. of foreign organic matter, yielding not less than 1 p. c. of caffeine; W. Africa, W. Indies; cultivated. Tree 15–20 M. (50–65°) high, smooth stem, leaves 15–20 Cm. (6–8') long, lanceolate-ovate, acuminate, flowers, staminate and pistillate, yellowish, fruit yellowish-brown, 5 segments, rough, woody, follicle 10–13 Cm. (4–5') long, each segment 1–3-seeded. Cotyledon (seed) irregularly plano-convex, broadly oval, circular, 2.5–5 Cm. (1–2') long, heavy, hard, tough; brown, outer surfaces wrinkled, inner lighter and smoother, slightly incurved and sharp; odorless; taste slightly

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astringent. Powder, reddish-brown—numerous starch grains, some altered, many show lamellæ and circular hilum or a central fissure, many parenchyma cells; solvent: diluted alcohol; contains caffeine (kola-tannate) 2.7–3.6 p. c., theobromine, starch 34–42 p. c., tannin, kola-red, kolatin, volatile oil—kolanin is a mixture of kola-red and caffeine, kolatine (only in fresh nuts, which should not be used, action



FIG. 263.—*Cola nitida*: a, leafy branch, $\frac{1}{4}$ nat. size; also longitudinal section of fruit, cross and natural longitudinal section of seed showing embryo enlarged.

opposite to caffeine). Stimulant, tonic, nervine, diuretic, astringent, similar to coffee, but resembles coca in aiding the endurance of fatigue without food; neuralgia, headache, migraine, diarrhea, indigestion, weak and irregular heart. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Kolæ* (67 p. c. alcohol), dose, \mathfrak{z} ss–1 (2–4 cc.). Elixir, 8 p. c., \mathfrak{z} j–3 (4–12 cc.); Tincture, 15 p. c. (diluted alcohol), \mathfrak{z} j–2 (4–8 cc.).

46. THEACEÆ (TERNSTRØEMIACEÆ). Tea Family.

The-a'se-e. L. *The-a* + aceæ, tea, fr. Chinese *Téh* or *Toha*—*i. e.*, native name simulating *Dea*, God. Trees, shrubs. Distinguished by alternate leaves; large showy solitary axillary flowers, sepals 5, petals 5, crenulate, stamens monadelphous; ovary 2-several-celled, superior; fruit 3-5-celled, woody capsule, dehiscent; tropics; stimulant, astringent, sedative.

Genus: **1. Thea.**

THEA. TEA.

Caffeina. **Caffeine (Theine)**, $C_8H_{10}N_4O_2 \cdot H_2O$, *U.S.P.*

<p>Thea sinensis, <i>Linné</i>, and Coffea arabica, <i>Linné</i>.</p>	{	<p>Trimethyl-xanthine, a feeble basic substance (alkaloid) obtained from the leaves of the former, and seeds of the latter (Rubiaceæ), also occurring in other plants; chiefly prepared synthetically.</p>
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Habitat. S. E. Asia, China, India, Japan; cultivated.

Syn. Thea Bohea, Black Tea, Thea viridis, Green Tea; Fr. Thé; Ger. Thee.

The'a. L. see etymology, above, of Theaceæ.

Si-nen'sis. L. (Chinensis) Chinese, of or belonging to China—*i. e.*, its chief habitat.

PLANT.—Evergreen shrub 1.2-2 M. (4-6°) high, much branched, bark brown, young twigs downy; leaves 5-10 Cm. (2-4') long, petiolate, acute at both ends, oval, irregularly serrate, veins prominent, dark green; flowers in winter, 2.5 Cm. (1') wide, yellowish-white; fruit 3-celled trigonous capsule, with thin brown woody pericarp; diluted alcohol or boiling water exhausts the leaves. Dose, 5j-2 (4-8 Gm.).

ADULTERATIONS.—Prussian blue, indigo, turmeric, gypsum; the three first impart color to water, the last soon deposits; various leaves, recognized by shape, venation, margin, etc.

Commercial.—The plant, springing from seed, begins to yield satisfactory leaves in 3 years, and at 7 attains perfection, being about the height of a man. Three collections are made yearly (Feb., Apr., June), the first, consisting mostly of young leaves, having greatest value. There are two varieties: 1. *Green*, collected more carefully and quickly dried, and containing most tannin; 2. *Black*, owing to slower process, undergoing partial fermentation, which changes color and often impairs quality.

CONSTITUENTS.—Caffeine (Theine) 1-5 p. c., volatile oil .6-1 p. c., theophylline (isomeric with theobromine), adamine, tannin 11-21 p. c., boheic acid, albumin, resin, wax, ash 4-6 p. c. (14 p. c. being phosphoric acid); leaves yield 40 p. c. of aqueous extract.

Theophyllina. **Theophylline**, $C_8H_{10}N_4O_2 \cdot H_2O$, *U.S.P.*— (*Syn.*, Theophyll., Dimethylxanthine; *Synthetic*—Theocine; *Ger.* Theophyllum, Theophyllin, Theocin.) This organic base (alkaloid),

THEACEÆ

isomeric with theobromine, is obtained sparingly from tea leaves, but mostly synthetically by a German patent under the name of theocine, wherein ammonia, carbon dioxide, potassium cyanide, acetic and formic acids are employed in a series of 12 reactions, and in fact becomes our first organic plant base (alkaloid) made on a commercial scale by strictly synthetic methods. It is a white, crystalline odorless powder, bitter taste, permanent, soluble in solutions of potassium hydroxide and in ammonia water, in alcohol (80), water (120), more readily in hot water, sparingly in ether; saturated aqueous solution neutral; melts at 271°C . (520°F .). *Tests*: 1. Dissolve .2 Gm. in 5 cc. of

FIG. 264.—*Thea sinensis*.

potassium hydroxide T. S., or in 5 cc. of ammonia T. S.—clear solution (dif. from caffeine, theobromine, paraxanthine). 2. Dissolve .2 Gm. in 5 cc. of sulphuric acid—only faint yellow (abs. of readily carbonizable substances). 3. Dissolve .01 Gm. in hydrochloric acid 1 cc., add potassium chlorate .1 Gm., evaporate to dryness, invert dish over one containing a few drops of ammonia T. S.—residue purple, destroyed by fixed alkalies. 4. Aqueous solution with tannic acid T. S.—precipitate, soluble in excess of reagent; when dried to constant weight—loses 9.5 p. c. (water); incinerate .1 Gm.—ash negligible. *Impurities*: Caffeine, theobromine, paraxanthine, readily carbonizable substances.

PROPERTIES AND USES.—Claimed to be the best diuretic, increasing amount of urine as well as solids; cardiac affections, nephritis, dropsy; similar to caffeine and theobromine, but much more effective; may produce gastric disturbances, renal irritation, which can be obviated by using its salt—theophylline sodio-acetate. Dose, gr. 3-8 (.2-.5 Gm.), in warm tea.

PREPARATIONS.—(Unoff.): *Fluidextract*, dose, ℥xv-60 (1-4 cc.). *Infusion (Tea)*, dose, *ad libitum*.

PROPERTIES AND USES.—Similar to coffee, under Rubiaceæ, page 580.

Allied Plants:

1. *Thea* (*Camellia*), after George Joseph Camel or Camelli, a Dutch Jesuit missionary and botanist) *japonica*.—Japan. An ornamental shrub with poisonous seed. *T. oleosa* (*Camellia oleifera*) and *T. drupifera*. Seeds resemble those of *T. sinensis* and yield a bland fixed oil—that of *T. drupifera* being fragrant.

47. GUTTIFERÆ (CLUSIACEÆ). **Gamboge (Mangosteen)**
Family.

Gut-tif'e-re. L. fem. pl. *Guttifer—gutta*, a drop, + *ferre*, to bear—*i. e.*, plants yield gum or resinous substances (juice) in drops. Trees or shrubs, allied to Hypericaceæ and Malvaceæ. Leaves coriaceous; flowers perfect; stamens many, distinct, mon- or poly-adelphous; sepals 2-8, often unequal, petaloid; petals 2-8 +; ovary 1-celled, superior; fruit edible; seed oily; tropics; purgative, timber.

Genus: 1. **Garcinia**.

CAMBOGIA. GAMBOGE, U.S.P.

Garcinia Hanburyi,
Hooker filius. { The gum-resin with not more than 1 p. c.
foreign organic matter, yielding not more
than 1 p. c. acid-insoluble ash, nor less than
65 p. c. alcohol-soluble extractive.

Habitat. Annam, Camboja (Cambodia), Siam, Cochin-China.

Syn. Cambog., Pipe Gamboge, Gummi-resina Guttæ (Gutti), Gutta Gamba, Cambodia; Fr. Gomme-gutte; Ger. Gutti, Gummigutt.

Gar-cin'i-a. L. named after Laurent Garcin, French botanist and oriental traveler, who first described it in 1734.

Han-bu'ry-i. L., in memory of Daniel Hanbury, named by Sir Joseph Dalton Hooker.

Cam-bo'gi-a. L. usually called Cambodia, a French protectorate in farther India, where it is indigenous.

Gamboge. The trade name, corruption of Camboge.

PLANT.—A tree 10.5-15 M. (35-50°) high, with many spreading branches; bark orange-brown, thick; leaves 10-17.5 Cm. (4-7') long, laurel-like; flowers Feb., dioecious, small, yellow, in 4's, staminate ones on pedicels (*pedicula'ta*) 6 Mm. ($\frac{1}{4}$ ') long; fruit May-June, size

GUTTIFERÆ

of crab apple, 3 Cm. ($1\frac{1}{5}$ ') in diameter; smooth, orange-green color, with 4 dissepiments, each having 1 seed 12–18 Mm. ($\frac{1}{2}$ – $\frac{3}{4}$ ') long. GUM-RESIN (gamboge), in hard, brittle, cylindrical pieces, usually hollow in center, 10–20 Cm. (4–8') long, 2–5 Cm. ($\frac{4}{5}$ –2') thick, grayish-orange-brown, longitudinally striate; fracture brittle, conchoidal, smooth, dull orange-red surface; odorless; taste acrid. POWDER, bright yellow—few or no starch grains; mounted in chloral hydrate T. S. all particles slowly dissolve leaving a few scattered fragments of vegetable tissues. *Tests*: 1. Dissolves completely by successive treatments

FIG. 265.—*Garcinia Hanburyi*.

of ether or alcohol, and water. 2. Rub with water—yellow emulsion, darker and almost transparent upon adding ammonia T. S.; + iodine T. S.—not green (abs. of starch); not more than 35 p. c. should be insoluble in alcohol. *Solvents*: alcohol or ether dissolves at least 65 p. c. Dose, gr. $\frac{1}{2}$ –5 (.03–.3 Gm.).

ADULTERATIONS.—Wheat and rice flour, sand, stones, nails, spikes, powdered wood or bark—mostly in the cake variety, giving greater hardness and coarser fracture; when many fragments of rice paper present—“ricey.”

Commercial.—Gamboge secretes in latex-tubes (ducts) in the middle bark and to some extent in the pith, alburnum, leaves, flowers, and fruit; it is at first a yellow milky juice obtained in drops from broken leaves, twigs, or artificial incisions, being caught in leaves, cocoanut shells or bamboo joints. There are two varieties: 1, *Pipe (Roll, Fine)*, the best, resulting from making, at the beginning of the rainy season, June–Oct., a spiral incision in the bark half around the tree trunk from the ground upward a number of feet, and collecting the slowly exuding juice in a hollow bamboo joint placed at the lower end of the incision, requiring 1–2 months to fill and harden, in which the contraction toward the sides often affords a central cylindrical cavity; upon cracking off the bamboo shell, that usually imparts its markings, the contents are ready for market; trees should only be tapped biennially and each should yield 3 bamboo joints 50 Cm. (20') long, 4 Cm. (1½') thick; 2, *Cake (Lump, Saigon, Cochin, Coarse)*, inferior, resulting from collecting the juice in leaves and various vessels, being subjected to exposure and adulteration, thereby becoming less uniform and brittle with dull brownish non-conchoidal fracture; usually in masses, 2–3 pounds (.7–1 Kg.), sometimes much larger, being pressed or run into boxes or tubs. Enters market via Canton, Calcutta, Singapore, Saigon, Bangkok, etc.

CONSTITUENTS.—Gum 16–25 p. c., resin (cambogic acid) 66–80 p. c., volatile oil, phenol ester, methyl alcohol and other alcohols, isovitinic and acetic acids, liquid with fruity odor resembling an aldehyde or ketone, ash 1–3 p. c.

Gum.—Soluble in cold water like gum arabic (*arabin*), but not identical with it, as it is not precipitated by lead acetate, ferric chloride, sodium silicate, or sodium borate.

Resin.—Soluble in ether and alcohol, forming golden-yellow tinctures, also in alkaline solutions with red color, from which it is precipitated unaltered by acids. It has acid characteristics, hence sometimes called cambogic acid, and upon it the coloring matter and medicinal properties depend; with salts of heavy metals forms precipitates called cambogiates.

PREPARATIONS.—1. *Pilulæ Hydrargyri Chloridi Mitis Compositæ (Pilulæ Catharticæ Compositæ)*, ¼ gr. (.016 Gm.).

Unoff. Prep.: *Pilula Cambogiæ Composita*, 16 p. c. +, dose, gr. 4–8 (.26–.5 Gm.).

Poisoning: Similar to aloe, colocynth, elaterin, etc.

PROPERTIES.—Drastic, hydragogue cathartic; in small repeated doses diuretic. Usually produces much griping, nausea and vomiting when taken in full doses, so that generally it is combined with other cathartics, as calomel, jalap, potassium bitartrate or carbonate, etc.; it greatly irritates the alimentary canal, especially the small intestine, when taken in excess, and gr. 60 (4 Gm.) have occasioned death; it augments intestinal glands' secretion, but not of bile, and mostly passes in the feces, but some is absorbed, causing yellow urine.

GUTTIFERÆ

USES.—Liver trouble from malaria; renal dropsy, uremic conditions, congestion of the brain, tenifuge (combined usually with tenicides), vermifuge, dropsy; very uncertain in veterinary practice. Mostly used as pigment in water-color painting. The powder when rubbed up with water shows strongly the "Brownian movement" under the microscope—infinitesimal particles (gamboge, carmine, etc.) suspended in water or other liquid in very delicate equilibrium, and sensitive to slightest change of temperature, which causes movement—physical, not vital.

Allied Plants:

1. Several guttiferous plants of Southern India, not restricted, however, to the Cambodia province, as is the official, are almost identical with this latter and yield a similar juice: *Garcinia Morel'la* (staminate flowers sessile), Ceylon, S. India; *G. travanco'rica*, Travancore; *G. picto'ria*, Madras peninsula, etc.; *G. Mangosta'na*, *Mango Fruit*, India, astringent; *G. purpu'rea* (*in'dica*), India; the seed of this are exposed to the sun and then boiled in water, when 10–20 p. c. of a fixed oil (kokum-butter) is obtained.

2. *Canell'la Wintera'na* (*al'ba*), *Canella*, *Canellæ Cortex*, *White Cinnamon*, *N.F.*—Canellaceæ. The dried rossed bark with not more than 2 p. c. of foreign organic matter; W. Indies. Tree 9–15 M. (30–50°) high, recognized by whitish bark, leaves thick; flowers white, aromatic; fruit, berries 12 Mm. ($\frac{1}{2}$ ') long, blackish. Bark, in quills, usually 5–15 Cm. (2–6') long, 1–4 Cm. ($\frac{2}{5}$ – $1\frac{3}{4}$ ') broad, irregular fragments, periderm mostly removed, pale orange-brown, scaly, shallow fissures, ridges; inner surface pale yellow, smoothish; fracture short and sharp; odor slight; unless heated—cinnamon-like; taste aromatic, warm, bitter, mucilaginous. Powder, light brown—numerous stone cells, calcium oxalate rosettes, starch grains, oil cells; solvent: diluted alcohol; contains volatile oil (having eugenol) 1 p. c., resin 8 p. c., bitter principle, calcium oxalate, starch. Aromatic stimulant, tonic, condiment; atonic dyspepsia, menorrhagia, amenorrhea—due to anemia. Dose, gr. 5–30 (.3–2 Gm.); 1. *Pulvis Aloes* (80) *et Canellæ* (20), *Hiera Picra*, dose, gr. 5–10 (.3–.6 Gm.).

FIG. 266.—*Viola tricolor*.

3. *Helian'themum canaden'se*, *Helianthemum*, *Rock-rose*, *Frost-wort* (*-weed*), U.S.P. 1850–1870.—Cistaceæ. The dried herb; N. America. Hoary perennial. 15–45 Cm. (6–18') high, terete, reddish; leaves 1–3 Cm. ($\frac{2}{3}$ – $1\frac{1}{2}$ ') long, 4–8 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') broad, oblong, entire; flowers, 2 kinds, yellow; fruit ovoid capsule; odor slightly aromatic; taste astringent, bitter; solvent: diluted alcohol; contains volatile oil, fixed oil, wax, tannin, glucoside. Tonic, astringent, alterative; prurigo; large doses emetic. Dose, gr. 5–30 (.3–2 Gm.); Decoction, Extract, Fluidextract (diluted alcohol).

4. *Viola tri'color*, *Pansy*.—Violaceæ. The flowering herb, U.S.P. 1880; Europe, N. America, cultivated. Plant 10–30 Cm. (4–12') high, angular; leaves roundish, cordate; flowers variegated (yellow, whitish, blue, purplish); taste bitter; contains salicylic acid .1 p. c., bitter principle, resin. Alterative, expectorant; large doses emetic, cathartic; skin diseases, scrofula, syphilis, bronchitis, nephritis. Dose, gr. 15–60 (1–4 Gm.); in decoction, infusion, extract. *V. peda'ta*, *Bird's-foot* or *Blue Violet*. The herb and rhizome, U.S.P. 1820–1870; Europe, N. America. Plant acaulescent; leaves 3–5-divided; flowers bluish; rhizome 25 Mm. (1') long, 18 Mm. ($\frac{3}{4}$ ') thick, bitter, acrid. Used as the preceding.

48. FLACOURTIACEÆ (BIXACEÆ). Arnotto Family.

Fla-court-i-a'se-e. L. *Flacourt-um(-i)* + aceæ—*i. e.*, after Étienne de Flacourt (1607–1660), a French traveler and botanist; governor of Madagascar, 1648–1655. Small trees and thorny shrubs, 1–10 M. (3–30°) high. Distinguished by alternate, stipulate, leathery, dentate leaves; diœcious flowers, sepals 4–7, slightly cohering, petals equal or wanting, stamens hypogynous, ovary roundish, style none or filiform, stigmas several; fruit 1-celled, often edible, pulp reddish, sweet, wholesome; seeds numerous; E. and W. Indies, Africa; wood, coloring matter, fixed oils valuable; perfumery, culinary, purgative, astringent.

Genera: 1. **Taraktogenos**. 2. **Hydnocarpus**.

CHAULMOOGRA. CHAULMOOGRA.

Oleum Chaulmoogræ. Chaulmoogra Oil, U.S.P.

Taraktogenos Kurzii, *King*,
or certain species of **Hydno-**
carpus. } The fixed oil expressed from the seeds.

Habitat. S. Asia; India, Siam, Burma, China, Africa.

Syn. Kalan Tree; Ol. Chaulmoog., Chaulmugra, Chaulmaugra, Oleum Gynocardia; Fr. Huile de Chaulmougra (Chaulmougère); Ger. Chaulmugroöl.

Ta-rak'to-ge'nos. L. fr. Gr. *ταρακτός*, confused, disordered, jumbled up, + *γένος*, genus, race—*i. e.*, genus that was overlooked and once confused with *Hydnocarpus*.

Kur'zi-i. L. named by Prof. Geo. King (1890) in honor of Prof. Sulpiz Kurz, author of *Forest Flora* of British Burma, and curator, Royal Botanical Gardens, Calcutta.

Hyd-no-car'pus. L. fr. Gr. *ὑδνον*, edible fungus-truffle, + *καρπός*, fruit—*i. e.*, alluding to superficial appearance of fruit.

Chaul-moo'gra. L. fr. native Asiatic (Burmese) name.

PLANT.—Large tree, 7–15 M. (21–40°) high, smooth, pale yellowish bark, straight trunk, branches at right-angles, but drooping down; fruit size of large orange, light fawn color, velvety; seed numerous, irregularly imbedded in fleshy pulp, brownish-yellow, 2–3 Cm. ($\frac{4}{5}$ –1 $\frac{1}{5}$ ') long, more or less angular flattened, not as broad, roundish ends.

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CONSTITUENTS.—SEEDS: Fixed oil, 25–50 p. c., starch, proteins, tannin, coloring matter, ash 1–5 p. c.

Oleum Chaulmoogræ. Oil of Chaulmoogra.—This fixed oil is a yellow, brownish-yellow liquid, or below 25° C. (77° F.), a whitish, soft solid; characteristic odor, somewhat acrid taste; soluble in benzene, chloroform, ether, petroleum benzin, sparingly in alcohol, sp. gr. 0.950; contains palmitin, linolein, but chiefly glycerides of two fatty acids—chaulmoogric, $C_{18}H_{32}O_2$, and hydnocarpic, $C_{16}H_{28}O_2$; both acids are optically active but differ from ordinary fatty acids in having a five atom carbon ring with an unstable hydrogen atom; both acids are readily converted into ethyl esters having therapeutic advantages over the oil; both acids form crystals that melt at 60–68° C. (140–155° F.). *Tests:* 1. Dissolve 1 Gm. in 15 cc. of a mixture of equal vols. alcohol and ether previously neutralized with $\frac{N}{10}$ sodium hydroxide, using 5 drops

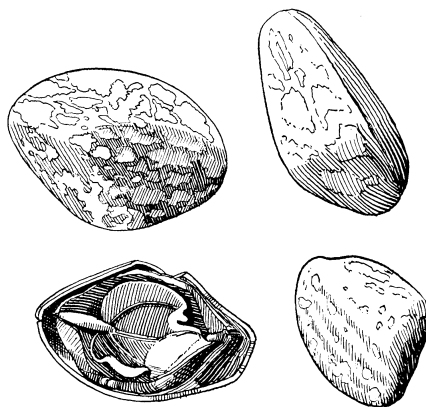


FIG. 267.—*Taraktogenos Kurzii*: whole seed; longitudinal section.

phenolphthalein T. S., indicator, when titrated with $\frac{N}{10}$ sodium hydroxide to pink color—1.8–5 cc. should be required (abs. of free acid); forms salts—sodium chaulmoograte, sodium hydnocarpate, etc. Should be kept cool, dark, in well-closed containers. Dose, \mathfrak{M} v–30 (.3–2 cc.).

Æthylis Chaulmoogras. Ethyl Chaulmoograte, U.S.P.—(Syn., Æthyl. Chaulmoog.; Fr. Chaulmougrè d'éthyle; Ger. Chaulmeströl, Antilep-röl). This mixture of ethyl esters of the fatty acids (chaulmoogric and hydnocarpic) of chaulmoogra oil, obtained by fractionating, is a clear, pale, yellow liquid, with slight fruity odor, miscible with alcohol, chloroform, ether, insoluble in water, sp. gr. 0.904. *Test:* 1. 1 cc. in 10 cc. neutralized alcohol, using 2 drops phenolphthalein T. S.—requires not more than .1 cc. $\frac{N}{10}$ sodium hydroxide for neutralization (abs. of free acid); its fluidity is its chief advantage over the oil, although

it has a more agreeable taste and is less irritating when injected. Should be kept in well-closed containers. Dose (mouth, intramuscular injection), $\mathfrak{M}\text{xv}$ –60 (1–4 cc.).

ADULTERATIONS.—Various hydnocarpus oils not agreeing with physical and chemical properties of oil of chaulmoogra; gynocardia oil.

Commercial.—The seeds are washed, dried in the sun, shelled, crushed and subjected to hydraulic pressure; yield 25–32 p. c. oil (best); extraction with ether or other volatile solvents—35–41 p. c. There are several varieties: 1. True Oil of Chaulmoogra (*Taraktogenos Kurzii*); 2. Lukrabo Oil (*Hydnocarpus anthelmin'tica*), Siam, imported, as are the seeds, into China, where it is called Tafungtsze; 3. Oil from *Hydnocarpus Wightia'na*, synonymous with *H. inebria'ns*, yields a very similar and effective oil.

PROPERTIES.—Alterative, germicide, antiseptic, counter-irritant, blood-purifier; large doses toxic to dogs and rabbits causing vomiting, loss of appetite (central origin), destructive of blood corpuscles (hemolytic); in fatal intoxication—fatty degeneration of liver, irritation of kidneys; only two cases of fatty embolism of lungs, in man (hypodermic injection)—no serious poisoning so far reported.

USES.—Leprosy—practically a specific against *Lep'ra bacillus*, when it must be used freely, internally and externally for 2–3 years, supplemented by nourishing diet to maintain bodily vigor; action may be due to stimulation of leukocytosis, or to its powerful germicidal effect, exceeding 100 times that of phenol; may have solvent power on the waxy coating of acid-fast bacilli, and may be absorbed by alimentary tract; but intramuscular injection gives best results; hypodermic injections of ethyl esters into leprosy nodules cause them to swell to an ultimate recession, 50 p. c. of the cases being curable; also used for sores, wounds, sprains, bruises, tuberculous ulcers of larynx, and with doubtful effect on *Tubercle bacillus*.

Allied Plants:

1. *Tur'nera diffu'sa*, or *T. aphrodisi'aca*, *Damia'na*, *Turnera*, *N. F.*—Turneraceæ. The dried leaf with not more than 15 p. c. of stems nor 3 p. c. of other foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; W. Mexico, S. California, Texas. Leaves obovate, 10–25 Mm. ($\frac{2}{3}$ –1') long, 4–10 Mm. ($\frac{1}{5}$ – $\frac{2}{3}$ ') broad, short-petioled, acute, cuneate base, 2–10-toothed on each side, smooth, light green; lower surface densely tomentose (*T. diffusa*), or glabrous, with few hairs on ribs (*T. aphrodisiaca*); frequently some reddish twigs; flowers yellowish, globose pods; odor aromatic; taste characteristic, aromatic, resinous. Powder, yellowish-green—stomata, hairs, tracheæ, few tracheids from stem, calcium oxalate crystals in rosettes or prisms, starch grains; solvent: diluted alcohol; contains volatile oil (amber-colored, aromatic odor, warm camphoraceous taste) .5 p. c., damianin (bitter principle), 2 resins 6.4 p. c., tannin 3.5 p. c., starch, ash 10 p. c. Aphrodisiac, tonic, stimulant, laxative; sexual impotence, in conjunction with strychnine, phosphorus. Dose, $\mathfrak{Z}\text{ss}$ –2 (2–8 Gm.); 1. *Fluidextractum*

FLACOURTIACEÆ

Damianæ (75 p. c. alcohol), dose, ʒss-2 (2-8 cc.); Infusion—substitute for tea.

2. *Passiflora incarnata*, *Passion Flower (Vine)*, *N.F.*—Passifloraceæ. The dried flowering and fruiting top with not more than 5 p. c. of stems over 8 Mm. ($\frac{1}{3}$ ') thick or other foreign matter; S. United States (Va., N. C.). Slender climbing plant; stems glabrous, pubescent, variable length, 6-8 Mm. ($\frac{1}{4}$ - $\frac{1}{3}$ ') thick, striate, woody, hollow; bark thin, greenish, purplish; wood porous, fracture uneven, fibrous; leaves broken, thick, glabrous or pubescent, orbicular, cordate, 3-5-lobed, serrate; many tendrils; flowers yellow, corona purplish, monadelphous in a tube; fruit, many-seeded berry; seed flat, yellowish; odor and taste

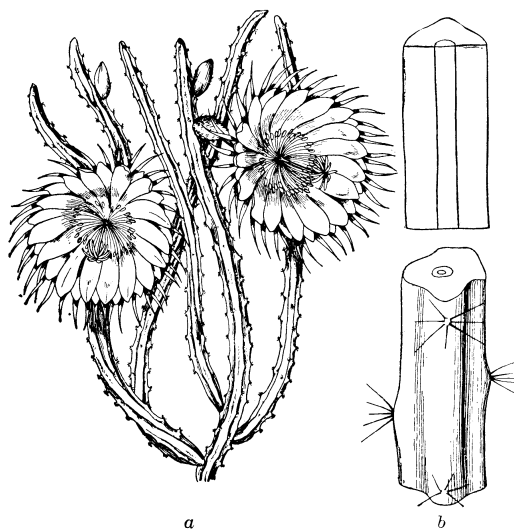


FIG. 268.—*Selenicereus grandiflorus*: a, flowering stem; b, section of stem, showing cross and longitudinal sections.

slight. Powder, light green—non-glandular hairs, pith and wood parenchyma, tracheæ, chlorenchyma and epidermal cells, stomata, calcium oxalate rosettes; solvent: diluted alcohol; contains alkaloid, ash 3-12 p. c. Narcotic, anodyne, nerve sedative; insomnia, restlessness, neuralgia, convulsions, epilepsy, tetanus; burns, hemorrhoids, diarrhea. Dose, gr. 5-10 (.3-6 Gm.); 1. *Tinctura Passifloræ*, 20 p. c. (diluted alcohol), dose, ℥x-30 (.6-2 cc.); Inspissated juice of leaves, ʒj-4 (4-15 cc.).

3. *Car'ica Papa'ya*, *Pawpaw*, *Melon Tree*; *Papayotin*, *Papain*, *Caricin*.—An albuminous ferment from the fruit; Tropical America. Tree 6 M. (20°) high, stem 30 Cm. (12') thick, fruit approximates the size of one's head, and contains an acrid, astringent, bitter, milky

juice, which soon separates into a coagulum and aqueous liquid, from which latter papayotin is precipitated upon the addition of alcohol. It is a whitish, hygroscopic powder, inodorous, tasteless, soluble in water, glycerin, active in neutral, acid, but more so in alkaline solutions; it converts starch into maltose, albuminoids into peptones, and emulsifies fats; should digest 200 times its weight. Papoid, Caroid, etc., are weaker forms (dried juice); slightly inferior to pepsin, greatly inferior to pancreatin. Dose, gr. 2-5 (.13-.3 Gm.).

4. *Selenicereus grandiflorus*, *Cactus Grandiflorus*, *Night Blooming Cereus*, *N.F.*—Cactaceæ. The fresh succulent stem of the wild growing plant; Mexico, W. Indies, cultivated. Small shrub, .3-1 M. (1-3°) high; stem green, fleshy, branching; flowers white, sessile, large, fragrant, opening at night, petals and stamens numerous; fruit white berry, size of an egg. Stem (drug) in pieces of varying length, 1.5-4 Cm. ($\frac{3}{5}$ -1 $\frac{3}{5}$ ') thick, 5-9-angled, angles 2 Cm. ($\frac{4}{5}$ ') apart with tufts of 9-12 acicular spines, each 5 Mm. ($\frac{1}{5}$ ') long, and same number of bristles 1 Cm. ($\frac{2}{3}$ ') long, branched roots at irregular intervals; odor strong, herby; taste acidulous, mucilaginous; solvent: alcohol; contains cactine, acid resinous glucoside, resins, calcium oxalate. Cardiac stimulant (tonic), diuretic, similar to digitalis, but non-cumulative, counter-irritant; cardiac palpitation and weakness, heart failure from valvular disease, angina pectoris, aortic regurgitation, dropsies, low fevers, Graves' disease, tobacco toxemia, sexual exhaustion.



FIG. 269.—*Daphne Mezereum*.

Dose, gr. 5-10 (.3-.6 Gm.); 1. *Tinctura Cacti Grandiflori*, 50 p. c. (alcohol), dose, ℥xv-30 (1-2 cc.). Decoction, 5 p. c., 5j-2 (4-8 cc.); Fluidextract.

5. *Daphne Mezereum*, *D. Gnidium*, or *D. Laureola*, *Mezereum*, *Mezereon*, *N.F.*—Thymelæaceæ. The dried bark from aerial portions with not more than 2 p. c. of foreign organic matter; Europe, Siberia, New England. Small slender herbs, .3-1.3 M. (1-4°) high, branching; leaves 5-7.5 Cm. (2-3') long, obovate, sessile, entire; flowers fragrant, tubular, rose red (1), white (2), yellowish-green (3); fruit ovate, bright red (1), scarlet (2), purplish-black (3). Bark in flexible, tough quills, flattened strips up to 90 Cm. (3°) in length, .3-1 Mm. ($\frac{1}{5}$ - $\frac{1}{2}$ ') thick, yellowish-brown (1), purplish-brown (2), purplish-gray (3), smooth, numerous lenticels, brownish-black apothecia, corky layer easily separable from middle bark, inner surface yellowish-white, satiny, lustrous, finely striate; fracture tough, fibrous; odor slight; taste at first slight, increasingly pungent, acrid. Powder, light grayish-brown—numerous bast-fibers, attenuated ends, walls free from pores, brownish cork cells, starch-bearing medullary rays, few starch grains; solvents;

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diluted alcohol, boiling water; contains acrid resin, acrid volatile oil, daphnin, wax, sugar, yellow coloring matter, malic acid; by dry distillation yields umbelliferon. Alterative, stimulant, diuretic, diaphoretic, sialagogue, vesicant; syphilis, scrofula, rheumatism, skin diseases; externally—local irritant like cantharides, applied to indolent ulcers to make them again active, also to maintain discharges from setons, fly blisters, etc. *Poisoning*: Have vomiting, purging, cold sweats, prostration, collapse, convulsions, death—evacuate stomach with warm demulcent drinks, then milk, fatty oils, opium, stimulants. Dose, gr. 1-10 (.06-.6 Gm.); 1. *Fluidextractum Mezerei*, (67 p. c. alcohol): Prep.: 1. *Linimentum Sinapis Compositum*, 20 p. c. 2. *Fluidextractum Sarsaparillæ Compositum*, 3 p. c. Decoction; Extract. *Daphne salicifolia*; Mexico—leaves used natively as a vesicant; fruits of the various species contain 31 p. c. of fixed oil.

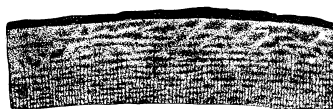


FIG. 270.—Mezereum: transverse section, magnified 15 diam.

6. *Lophoph'ora* (*Anhalo'nium*) *William'sii* (*Lewinii*), *Mescal(e) Buttons*; Mexico.—This small succulent cactus yields the mescal buttons (upper layer of turnip-shaped stem, consisting of ovoid tubercles, dried) which are used by the Rio Grande Indians to produce intoxication—similar to cannabis, during religious ceremonies; contain anhalonine (similar to pellotine), mescaline, anhalonidine, lopophorine. Heart and respiratory stimulant, tonic, adjuvant to digitalis, narcotic; slightly slows pulse, produces mental and physical weariness, sleep without untoward symptoms; excessive quantities produce spasms resembling strychnine poisoning; pneumothorax, tuberculosis, angina pectoris, asthmatic dyspnea, hysteria. Dose, (pellotine), gr. $\frac{1}{2}$ -2 (.03-.13 Gm.); Fluidextract, m_v-10 (.3-.6 cc.).

49. LYTHRACEÆ (PUNICACEÆ). Loosestrife Family.

Lith-ra'se-e. L. *Lythr-um* + aceæ, fr. Gr. *λίθρον*, gore—*i. e.*, from its purple flowers. Herbs, shrubs, often 4-sided; distinguished by containing astringent principle, coloring agent. Leaves exstipulate; calyx tubular, persistent, bearing deciduous petals and stamens; lobes valvate; petals 4-7, wrinkled; stamens 4-14, perigynous, inserted below petals; ovary 1-2-6-celled, superior; ovules many; style 1; stigma rarely 2-lobed; fruit capsule, membranous, dehiscent, surrounded by non-adherent calyx-tube; seeds many, exalbuminous; temperate climates, tropics; astringent, dye.

Genus: 1. **Punica.**

GRANATUM. POMEGRANATE, U.S.P.

Punica Granatum, { The dried bark of the stem or root, with not
Linné. { more than 2 p. c. wood, or other foreign
 organic matter.

Habitat. S. W. Asia, India, Persia, Arabia, China, Japan, E. and W. Indies; naturalized in subtropics, S. United States, etc.; cultivated for fruit, ornamental flowers.

Syn. Granat., Pomegranate Bark, Grenadier, Punic (Carthaginian, Garnet) Apple; Granati Cortex; Fr. Écorce de (Grenadier) Balaustier; Ger. Granatrinde.

Pu'ni-ca. L. *punicus*, of or belonging to Carthage, near which city it is said to have first been found, or fr. *puniceus*, scarlet—*i. e.*, the color of its flowers.

Gra-na'tum. L. *granatus*, having many grains or seeds, fr. *granum*—*i. e.*, the many-seeded fruit.

Pome'gran-ate. L. *pomum*, a fruit, + *granatus*, grained.

PLANT.—Shrub or small tree, 4.5 M. (15°) high, branches angular, with spiny ends; young shoots and buds red; leaves 2.5–5 Cm. (1–2')

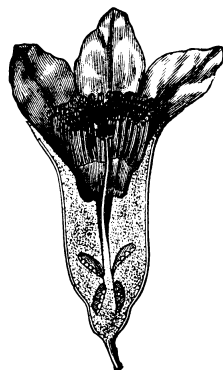


FIG. 271.—*Punica Granatum*: flower.



FIG. 272.—*Punica Granatum*: flowering branch.

long, shining, lanceolate, entire, half evergreen; flowers June–Sept., large; calyx shining, scarlet, tubular, 3 Cm. (1½') long; corolla crimson, 5–7 petals; fruit (balausta), 5–10 Cm. (2–4') broad, resembles an orange, quince, or tomato, 5–8-angled over the dissepiments, short-necked at top. Internally, below the median line, divided by a dia-

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phragm into two stories—upper with 5–9 irregular cells, lower and smaller with 1–3 vertical partitions (cells); seed angular 12 Mm. ($\frac{1}{2}$ ') long, so numerous that they, with the thin surrounding edible pulp, fill entire fruit. BARK (stem), in pieces 2–8 Cm. ($\frac{4}{5}$ – $3\frac{1}{5}$ ') long, .5–3.5 Mm.

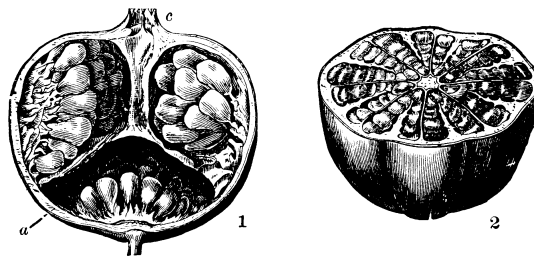


FIG. 273.—*Punica Granatum*: 1, longitudinal cross-section; 2, transverse cross-section; a, inner rind and ovules; c, the remaining calyx.

($\frac{1}{50}$ – $\frac{1}{4}$ ') thick, yellowish-brown, with patches of grayish lichens, elliptical lenticels, furrows or abraded patches of cork, wrinkled; inner surface light yellow, finely striate; fracture short, phelloderm dark green; inner bark yellowish-green; (root) in transversely curved pieces



FIG. 274. — Granati cortex: bark of the root.

yellowish-brown, conchoidal depressions, irregular patches of cork; internally dark yellow, medullary rays extending nearly to outer surface; odor slight; taste astringent, bitter, nauseous. POWDER, yellowish-brown—calcium oxalate in rosette aggregates, numerous starch grains, .002–.01 Mm. ($\frac{1}{2500}$ – $\frac{1}{2500}$ ') broad, whitish cork, stone cells, long wood fibers, tracheæ. Tests: 1. Macerate 1 Gm. for 1 hour in distilled water 100 cc., add to 10 cc. of yellow filtrate 1 drop of ferric chloride T. S.—bluish-black precipitate; to another 10 cc. add 40–50 cc. of calcium hydroxide T. S.—orange-brown flocculent precipitate. Should be kept in tightly-closed containers. Solvents: boiling water; diluted alcohol. Dose, 5ss–2 (2–8 Gm.).

SUBSTITUTIONS. — 1, *Buxus semper-virens*, Boxwood Bark; 2, *Berberis vulgaris*, Barberry Bark; neither contain tannin, hence infusions do not precipitate blue-black with iron like pomegranate bark; they also are very bitter, and the former has a nearly white inner surface; 3, *Granati Fructus Cortex*; this contains tannin 19–28 p. c., extractive 21 p. c., gum 34 p. c., and has the same effect as the bark.

Commercial.—Root-bark is three times stronger in alkaloids than stem-bark, but both deteriorate rapidly with age owing to the alka-

loids undergoing decomposition; the white-flowered plant yields the richest bark which is imported chiefly in the dry state from France, Italy, although we use much of our native product. In addition to bark occasionally the flowers, fruit, rind, and acidulous seed-coating are employed domestically; some prefer the bark from uncultivated plants.

CONSTITUENTS.—Tannic acid 20–22 p. c., Alkaloids 1.71 (black-flowered)–2.43 (red-flowered)–3.75 p. c. (white-flowered)—Pelletierine (punicine) .5–1.5 p. c., iso-pelletierine, methyl-pelletierine, pseudo-pelletierine (granatonine), mannite (punicin, granatin), gallic acid, sugar, gum, pectin, calcium oxalate, ash 10–16 p. c.

Tannic Acid, $C_{20}H_{16}O_{13}$.—This is a mixture of gallotannic acid and punicotannic (granatotannic) acid, the latter insoluble in alcohol, ether, precipitates gelatin, tartar emetic, iron salts, with dilute acids splits into sugar and ellagic acid.

Pelletierine, $C_8H_{15}ON$ (in honor of Pelletier).—This is obtained by mixing bark with milk of lime, displacing with water, exhausting percolate with chloroform. It is regarded by Tanret, its discoverer, to be the anthelmintic constituent, and is a colorless, oily, aromatic alkaloid, resinifying on exposure, soluble in water, alcohol; forms crystalline salts (nitrate, sulphate, tannate, etc.)—considered to be a mixture of the several alkaloids. Dose, gr. 3–8 (.2–.5 Gm.).



FIG. 275.—Granati cortex: transverse section, magnified 10 diam.

Pelletierinæ Tannas, Pelletierine Tannate, U.S.P.—(Syn., Pellet. Tann., Punicine Tannate; Fr. Tannate de Pelletierine; Ger. Pelletierinum tannicum, Gerbsaures (Pelletierin) Punicin.) This is a mixture in varying proportions of the tannates of four alkaloids (punicine, iso-punicine, methyl-punicine, pseudo-punicine), and is obtained by mixing ground bark with milk of lime, percolating with water until exhausted, shaking out percolate with chloroform, and chloroformic solution of free alkaloids with very dilute sulphuric acid; to neutral solution of mixed sulphates add solution tannic acid, whereby tannates are precipitated, dry. It is a light yellow, odorless, amorphous powder, astringent taste and weak acid reaction, soluble in water (250), alcohol (16), ether (420), warm dilute acids, insoluble in chloroform; ash from .2 Gm.—negligible. *Tests:* 1. Aqueous solution with ferric chloride T. S.—blue-black color. 2. Cold solution of .1 Gm. in 4 cc. of distilled water + 1 cc. of diluted hydrochloric acid, + platinic chloride T. S.—no precipitate (abs. of many foreign alkaloids). 3. Dissolve .5 Gm. in sodium hydroxide T. S., shake with 4 successive portions of chloroform, 10, 5, 5, 5 cc., acidulate combined solutions with .1 cc. of hydrochloric acid, evaporate to apparent dryness, dissolve residue in 5 cc.

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alcohol, evaporate, dry 1 hour—residue not less than 20 p. c. Should be kept dark, in small, well-closed containers. Dose, gr. 3–8 (.2–.5 Gm.) in ℥j (30 cc.) of water.

PREPARATIONS.—1. *Fluidextractum Granati*. Fluidextract of Pomegranate. (Syn., Fldext. Granat., Fluid Extract of Pomegranate; Fr. Extrait fluide d'Écorce de (Grenadier) Balaustier; Ger. Granatrinden-fluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st menstruum: alcohol 50 cc., water 40, glycerin 10; 2d menstruum: diluted alcohol. Dose, ℥ss–1 (2–4 cc.).

Unoff. Preps.: *Decoction*, 20 p. c., ℥ss–2 (15–60 cc.). *Rind*, gr. 15–30 (1–2 Gm.).

PROPERTIES.—Anthelmintic, tenifuge, astringent.

USES.—The ancients knew its value as a vermifuge (Celsus, Dioscorides, Pliny). In Hindustan, Mohammedan physicians used it in tenia, one of whom made public the secret in 1804; French physicians prefer the wild-grown plant. Externally and internally astringent; large doses occasion vomiting, purging, cramps, numbness in the legs, giddiness, dim vision, increased urine. The rind is also astringent in diarrhea, leucorrhea, hemorrhage, cancerous and other ulcers of uterus and rectum; intermittent fever. For tape-worm take decoction made by boiling bark ℥ij (60 Gm.) + water Ojss (.7 L.) down to Oj (.5 L.); give this in 3 divided doses at hour intervals in the morning on empty stomach. It is well, a couple of hours after administration, to follow with castor oil ℥j (30 cc.) or compound tincture of jalap ℥j (30 cc.). The worm should be passed sitting in a tepid sitz-bath, thus preventing the expelled portion tearing from the head by its weight; it passes usually in a knotted mass. Pomegranate may also be used for tanning, dyeing; the fruit as a refreshing, cooling article of food.

50. MYRTACEÆ. Myrtle Family.

Mer-ta'se-e. L. *Myrt-us* + aceæ, Gr. *μύρτος*, myrtle, fr. *μύρον*, perfume—*i. e.*, characteristic of some species. Trees, shrubs; distinguished by aromatic, pungent properties (vol. oil); stamens 8–10 +; leaves exstipulate, opposite, dotted with marginal vein; calyx and petals 4–5; ovary inferior, 1–6-celled; fruit dry or succulent; seeds exalbuminous; temperate climates, tropics; aromatic, stimulant, carminative (vol. oil), diaphoretic, antispasmodic, astringent, spices, perfumery, edible fruit; timber.

Genera: 1. **Caryophyllus**. 2. **Melaleuca** (Cajuputi). 3. **Eucalyptus**.

CARYOPHYLLUS. CLOVE, U.S.P.

Caryophyllus <i>aromaticus,</i> <i>Linné.</i>	{	The dried flower-buds with not more than 5 p. c. stems nor 1 p. c. other foreign organic matter, yielding not less than 15 p. c. volatile ether-soluble extractive nor more than 10 p. c. crude fiber nor .75 p. c. acid-insoluble ash.
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Habitat. Molucca (Spice or Clove) Islands, five in number, N. E. of Celebes, now mostly abandoned there, but cultivated in Indian Ocean islands, Amboyna group, Sumatra, Malacca, Penang, etc., S. America, Brazil, Guiana, Cayenne, Africa, Zanzibar, West Indies.

Syn. Caryoph., Cloves, Mother Cloves, Caryophylli Aromatica; Br. Caryophyllum; Fr. Girofle, Clous (aromatiques) de Girofle; Ger. Gewürznelken; Flores Caryophylli, Nägelein.

Car-y-o-phyll'us. L. fr. Gr. κάρυον, a nut, + φύλλον, a leaf—*i. e.*, referring to the appearance of flower buds.

Ar-o-mat'i-cus. L. aromatic, fragrant—*i. e.*, its aromatic aroma, odor.

Clove. L. *clavus*, a nail—*i. e.*, the resemblance of its dried flowers.

PLANT.—Handsone evergreen tree, 9–12 M. (30–40°) high, much branched, forming a pyramidal crown; bark yellowish; leaves 10 Cm. (4') long, 5 Cm. (2') wide, entire, smooth, glandular, parallel veins to midrib, petiolate; flowers 15–20, rose-color, cymes; fruit berry-like. **FLOWER-BUDS** (clove), tack-shaped, 10–17.5 Mm. ($\frac{3}{8}$ – $\frac{3}{4}$) long, dark



FIG. 276.—*Caryophyllus aromaticus*.

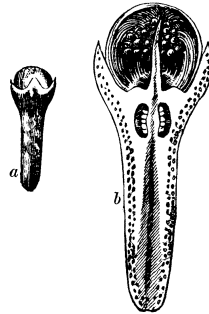


FIG. 277.—*Caryophyllus*: a, natural size; b, longitudinal section magnified.

brown, consisting of a stem-like, solid, inferior ovary, obscurely 4-angled, terminated by 4 calyx teeth, and surmounted by a nearly globular head, consisting of 4 petals enclosing numerous curved stamens and 1 style; odor strongly aromatic; taste pungent, aromatic, followed by slight numbness; pressed strongly between thumbnail and finger—volatile oil visible; should not float horizontally on water; stems, separate or attached, sub-cylindrical, 4-angled, 25 Mm. (1') long, 4 Mm. ($\frac{1}{8}$) thick, simple, branched, jointed, less aromatic than flower-buds. **POWDER**, dark brown—parenchyma fragments with large oil reservoirs, spiral tracheæ, few bast-fibers, calcium oxalate rosette aggregates, numerous tetrahedral pollen grains. *Tests*: 1. Stone cells irregular or polygonal, with thick porous walls and large lumina, often filled with yellowish-brown amorphous substance—few or absent (abs. of less than 5 p. c. of stems). 2. No starch grains present (abs. of clove fruit or cereals). *Solvents*: alcohol (volatile oil,

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resin); water (odor—part of volatile oil but none of the pungent resin). Dose, gr. 5–10 (.3–.6 Gm.).

ADULTERATIONS.—**FLOWER-BUDS:** Clove-stalks, 2 Mm. ($\frac{1}{12}$ ') thick, brown, contain volatile oil 4–5 p. c., for which they are imported as well as for their well-defined stone cells; mother clove (clove fruit, anthophylli) collected just before ripe, 2.5 Gm. (1') long, resemble clove, but thicker, lighter, weaker, with 4-lobed calyx, each cell 1–2-seeded, contain volatile oil 2–4 p. c.; exhausted clove, such as have undergone partial or complete exhaustion and distillation; pimenta, different shape and aroma; an artificial clove molded from a paste has been reported; **POWDER:** All of the above—detected chiefly by peculiar starch grains, stone cells, and weakness of the preparations; cassia; ginger; sand; starch; flour; pepper shells. **OIL:** That from which eugenol has been abstracted or foreign eugenol added; clove-stem oil, alcohol, oils of turpentine, cinnamon, pimenta and copaiba, petroleum, fixed oils, phenol.

Commercial.—Trees yield when 6 years old, reach perfection at 12, and thence decline until, at 20, they perish. Clove (flowers, buds) at first are white, then green, pink, and bright red, being collected at the pink stage by hand-picking on ladders and platforms, or by beating the trees with bamboos and catching the falling buds upon outspread cloths, after which they are dried by sun or slowly by fire. Each tree yields 5 pounds (2.3 Kg.), which are disposed of at 10 cents per pound (.5 Kg.). Clove was unknown to the ancients, having been brought to Europe by the Arabians and Venetians, while the Portuguese and Dutch long monopolized the trade. Now mostly from Zanzibar, the finest from Penang, some from Pemba, or via Bombay; however, much of our supply is from W. Indies, Cayenne, Guiana, etc. There are three varieties: 1, *Molucca (Amboyna)*, thickest, heaviest, darkest, most oily and aromatic; two annual harvests, June, Dec., in the Moluccas; 2, *Sumatra (Bencoolen)*, considered by some of equal high grade as the preceding; 3, *S. American*, usually not so fine, but the freshest, contain volatile oil 10–15 p. c.

Clove(s) that are light (floating horizontally on water), small, soft, wrinkled, of pale color, feeble taste and smell, often without corolla bud or "head," are inferior from having been treated with a menstruum, or careless picking (including immature green and red buds) and drying (which should be done quickly and without exposure to bad weather), and should not be used direct or in obtaining the oil.

CONSTITUENTS.—Volatile oil 18 p. c., eugenol, eugenin (white pearly scales, isomeric with eugenol—red with nitric acid), $C_{10}H_{12}O_2$, caryophyllin, tannin 10–13 p. c., resin (tasteless) 6 p. c., gum 13 p. c., vanillin, furfural, green wax, cellulose 28 p. c., water 18 p. c., ash 4–8 p. c. (of which .5 p. c. is insoluble in hydrochloric acid).

Oleum Caryophylli. Oil of Clove, U.S.P.—(Syn., Ol. Caryoph., Clove Oil, Oil of Cloves; Fr. Essence de Girofle; Ger. Oleum Caryophyllorum, Nelkenöl, Eugenol.) This volatile oil distilled from the

dried flower-buds (clove) with water or steam, and usually 3 p. c. of sodium chloride, to raise the ebullition-point possibly to 109.5° C.; (229° F.), is a colorless, pale yellow liquid, darker and thicker by age and exposure, characteristic odor and taste of clove, soluble in 2 vols. of 70 p. c., alcohol, levorotatory, sp. gr. 1.038–1.060; contains at least 82 (80–90) p. c. of eugenol, $C_{10}H_{12}O_2$ (heavy portion—phenol), caryophyllene, $C_{15}H_{24}$ (light portion, polymeric with terpene, $C_{10}H_{16}$, sp. gr. 0.918—sesquiterpene), also 2–3 p. c. of eugenol acetate; methylamylketone (gives odor), vanillin, furfural (causes oil to darken), methyl alcohol. *Tests*: 1. Shake oil (1) with hot distilled water (20)—shows only slight acid reaction; filtrate with 1 drop of ferric chloride T. S.—transient grayish-green color, but not blue or violet (abs. of phenol). Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, m-j-5 (.06–.3 cc.).

Eugenol. **Eugenol**, $C_{10}H_{12}O_2$, *U.S.P.*—(Syn., Eugenolum, Eugenin, Caryophyllic Acid, Eugenin Acid, Allylguaiacol, Ethylmethyl-pyrocatechol, Para-oxy-metamethoxyallyl benzol.) This unsaturated, aromatic phenol (found also in oils of bay, canella, camphor, cinnamon (Ceylon), sassafras, pimento, Massoi bark) is obtained by shaking oil of clove with excess of 5–10 p. c. solution of sodium hydroxide in a separator, drawing off resulting solution of eugenol sodium, washing aqueous liquid with ether, decomposing with diluted sulphuric acid, washing separated eugenol with sodium carbonate solution (to remove adhering acid), distilling with steam or *in vacuo*. It is a colorless, pale yellow, thin liquid, strongly aromatic odor of clove; pungent, spicy taste; darker and thicker on exposure to air; miscible with alcohol, chloroform, ether, fixed oils, soluble in 2 volumes of 70 p. c. alcohol; mixed with hot distilled water (1 in 20) very slightly acid, sp. gr. 1.067, boils at 253° C. (488° F.); optically inactive and strongly refractive. *Tests*: 1. Dissolve 1 cc. in sodium hydroxide T. S. (12), add distilled water (18)—clear solution, turbid on exposure to air (abs. of hydrocarbons). 2. Shake 1 cc. with distilled water (20); to 5 cc. of clear filtrate add 1 drop of ferric chloride T. S.—transient, grayish-green, not blue or violet (abs. of phenol); upon eugenol alone the value of oil of clove depends. Should be kept cool, dark, in well-closed containers. Dose, m-j-5 (.06–.3 cc.).

Caryophyllin, $C_{10}H_{16}O$.—Obtained by treating ethereal extract of clove with water, filtering and treating the resulting precipitate with ammonia to purify; occurs in tasteless, inodorous silky needles, soluble in ether, slowly in alcohol, colored red with sulphuric acid, and by oxidation with nitric acid yields crystals of caryophyllinic acid, $C_{20}H_{32}O_6$.

PREPARATIONS.—CLOVE: 1. *Tinctura Lavandulae Composita*, $\frac{1}{2}$ p. c. 2. *Tinctura Rhei Aromatica*, 4 p. c. 3. *Pulv. Arom. Rubefac.*, *Rubefac. Spice Powder*, *N.F.*, 30 p. c., + cinnam. 30, zingib. 20, capsic. 20. 4. *Pulv. Cret. Arom.*, *N.F.*, 3 p. c.: Prep.: 1. *Pulv. Cret. et Opii Arom.*, *N.F.*, 97.5 p. c. 5. *Pulv. Myric. Co.*, *Composition Powder*, *N.F.*, 5 p. c. 6. *Syr. Senn. Arom.*, *N.F.*, $\frac{2}{3}$ p. c. 7. *Tr. Arom.*, *N.F.*, 2 p. c.

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8. *Tr. Opii Crocat.*, N.F., $\frac{3}{5}$ p. c. 9. *Tr. Viburn. Opul. Co.*, N.F., 5 p. c. OIL: 1. *Acet. Arom.*, N.F., $\frac{1}{10}$ p. c. 2. *Dentif.*, N.F., $\frac{1}{20}$ p. c. 3. *Fldglycer. Casc. Sagr. Arom.*, N.F., $\frac{1}{10}$ p. c. 4. *Lavat. Ori.*, N.F., 1 p. c. 5. *Liq. Pepsin, Arom.*, N.F., $\frac{1}{20}$ p. c. 6. *Nebul. Arom.*, N.F., $\frac{1}{5}$ p. c. 7. *Ol. Ricin. Arom.*, N.F., $\frac{1}{10}$ p. c. 8. *Sp. Card. Co.*, N.F., $\frac{1}{2}$ p. c. 9. *Syr. Eriodict. Arom.*, N.F., $\frac{1}{10}$ p. c. EUGENOL: 1. *Mist. Ol.-Balsam*, N.F., $\frac{2}{5}$ p. c.

Unoff. Preps.: *Infusion* (Br.) 2.5 p. c., $\frac{3}{5}$ ss-1 (15-30 cc.). *Inf. Aurant. Co.* (Br.), .5 p. c. *Tinct.*, 25 p. c. (Fr. alc.), $\frac{3}{5}$ ss-1 (2-4 cc.).

PROPERTIES.—Stimulant, stomachic, carminative, antiemetic, aromatic, antispasmodic, rubefacient, germicide, antiseptic. Increases circulation, temperature, digestion, nutrition; excreted by kidneys, skin, liver, bronchi—stimulating and disinfecting each.

USES.—Nausea, vomiting, flatulence, colic, indigestion, condiment, corrective; externally in rheumatism, neuralgia, toothache (oil + oil of peppermint + chloral hydrate, āā q. s.), in liniments, etc.; spice powder (poultice)—over stomach to expel gas, relieve colic, on nape of neck for infantile convulsions.

Allied Plant:

1. *Eugenia Jambola'na, Jambul, Java Plum.*—E. Indies. Large tree producing edible fruit; all parts astringent, but seed and bark also arrest formation of sugar in diabetes; seed 1.2 Cm. ($\frac{1}{2}$) long, a third as thick, oval, one end truncate, blackish-gray, hard, heavy, little odor and taste; capsules, fluidextract. Dose, gr. 5-10 (.3-.6 Gm.).

CAJUPUTUM. CAJUPUT.

Oleum Cajuputi. Oil of Cajuput, U.S.P.

Melaleuca Leucadendron, Linné, { The volatile oil distilled from the
var. **Cajeputi**, var. **minor**, +. { fresh leaves and twigs, and recti-
fied by steam distillation.

Habitat. E. India Islands, Celebes, Bouro, Amboyna, Moluccas, Philippines, Cochin China, Australia.

Syn. Kayu-putu, White Tree (Wood), Pepperbark; Ol. Cajup., Cajuput Oil, Oil of Cajeput, Oleum Cajeputi; Fr. Huile (Essence) de Cajeput; Ger. Cajeputöl.

Mel-a-leu'ca. L. fr. Gr. μέλας, black + λευκός, white,—*i. e.*, bark of the trunk is blackish, that of the branches is whitish.

Leu-ca-den'dron. L. fr. Gr. λευκός, white, + δένδρον, a tree—*i. e.*, general appearance of the tree.

Caj-e-pu'ti (better **Caj-u-pu'ti**). L. fr. Malay, *kayu*, tree, + *putih*, white—*i. e.*, appearance of the branches.

Minor. L. *minor*, *minus*, less, smaller—*i. e.*, plant smaller than other species, also smaller flower-heads and leaves.

PLANTS.—Small trees, 9-12 M. (30-40°) high; bark gray, brittle, splitting into thin layers; leaves 5-10 Cm. (2-4') long, blade twisted, lanceolate; flowers 5-7.5 Cm. (2-3') long, greenish to whitish, silky, pubescent, spikes; fruit woody, hard, sessile, dehiscing into 3 valves.

CONSTITUENTS.—Volatile oil, mucilage, pectin.

Oleum Cajuputi. Oil of Cajuput.—This oil, obtained by water or steam distillation, is a colorless, yellowish (greenish—usually due to copper) liquid, peculiar, agreeable, distinctly camphoraceous (cineol) odor, aromatic, slightly bitter taste, soluble in 1 vol. of 80 p. c. alcohol, sp. gr. 0.918, levorotatory; contains 50–67 p. c. of cineol (cajuputol, eucalyptol), $C_{10}H_{18}O$, also the alcohol terpineol, $C_{10}H_{17}OH$, several terpenes—*l*-pinene, etc., valeric and benzoic aldehydes, which upon oxidation impart acid reaction. It is imported mostly from Celebes (Macassar), Bouro (islands), some from Singapore, Java, Manila, in emptied beer and wine bottles, 25 packed in a crate, or in copper cans (rare). Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, Mij –10 (.13–.6 cc.), emulsion, pill, on sugar; externally in liniments.



FIG. 278.—*Melaleuca Leucadendron* var. *Cajuputi*—small branches with leaves, buds, and flowers; 1, vertical section of fruit; 2, transverse section of ovary; 3, vertical section of flower.

ADULTERATIONS.—Copper from shipping cans (rare), many cheaper oils, as camphor, rosemary, turpentine (French turpentine, owing to its *l*-pinene, being difficult to detect), also these sometimes colored with resin of milfoil, all rendering action with iodine more violent.

PREPARATION.—(Unoff.): *Spiritus Cajuputi* (Br.), 10 p. c., dose, Mv –20 (.3–1.3 cc.).

PROPERTIES.—Same as oil of clove; carminative, stimulant, diaphoretic, vermifuge, parasiticide, rubefacient, counter-irritant.

USES.—Rheumatism, myalgia, spasmodic affections of the stomach and bowels, catarrh of bladder, low fevers, gout, colic, cholera morbus, dysmenorrhea, laryngitis, bronchitis, toothache, chilblains.

Allied Plants:

1. *Pimenta officinalis*, *Pimenta*, *Allspice*, *N. F.*—The dried, nearly ripe fruit with not more than 3 p. c. of foreign organic matter nor .4 p. c. of acid-insoluble ash; C. and S. America, W. Indies, cultivated. Handsome evergreen tree, 9–12 M. (30–40°) high; bark smooth, gray; leaves 10–15 Cm. (4–6') long, oval-oblong, entire, bright green, pellucid-punctate; flowers white. Fruit, subglobular, 4–7 Mm. ($\frac{1}{6}$ – $\frac{1}{4}$ ') broad,

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apex with 4 calyx teeth, dark brown, glandular-punctate, pericarp brittle 1 Mm. ($\frac{1}{2}$ – $\frac{1}{3}$) thick, 2-celled, each cell 1-seeded; odor and taste, particularly the pericarp, aromatic, distinctive. Powder, dark brown—numerous starch grains with central cleft, many stone cells with lumina often filled with yellowish amorphous substance, oil secretion reservoirs with oil, parenchyma cells with tannin masses; stem fragments few, characterized by non-glandular hairs, calcium oxalate rosettes, tracheid-like wood tissues and long bast-fibers; yield of crude fiber does not exceed 25 p. c.; solvents: alcohol extracts the virtues, water absorbs the flavor, and, if hot, some constituents; contains

volatile oil 3–4 p. c., resin, fixed oil 6–8 p. c., tannin, sugar, gum, ash 6 p. c. Dose, gr. 5–30 (.3–2 Gm.).

Oleum Pimentæ, *Pimento Oil*, *Oil of Pimenta (Allspice)*, *N.F.*—This volatile oil distilled from the fruit, yielding not less than 65 p. c., by volume, of eugenol, comes over in two fractions mixed together, one light, the other heavy; it is a colorless, yellow, or reddish liquid, darker with age, characteristic odor and taste of allspice; soluble (clear) in equal volume of 90 p. c. alcohol, in 2 vols. of 70 p. c. alcohol, sp. gr. 1.033, levorotatory. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\text{m}j$ –5 (.06–.3 cc.). Fruit: 1. *Tinctura Guaiaci Composita*, 3.2 p. c. (diluted alcohol). *Water*—25 Gm. + water 1000, distil 500 cc.; *Infusion*, 5 p. c. Oil: 1. *Liquor Pepsini Aromaticus*, $\frac{1}{4}$ –



FIG. 279.—*Pimenta officinalis* (Pimenta).

p. c. 2. *Spiritus Myrciæ Compositus*, $\frac{1}{2}$ p. c. Stomachic, carminative, condiment; flatulency, nausea, intestinal colic, corrective to griping purgatives—similar to clove.

2. *Pimenta acris*, *Myrcia*, *Bay*, *Wild Clove*; *Oleum Myrciæ*, *Oil of Bay*, *N.F.*—The volatile oil distilled from the leaves; W. Indies, Jamaica, cultivated. Tree, beautiful, fragrant, 9–12 M. (30–40°) high; leaves 5–8 Cm. (2–3') long, oval, coriaceous, pellucid-punctate, exhaling aroma when bruised similar to clove (volatile oil); flowers small, white with red tinge; fruit globular berry, size of a pea, blackish, resembling allspice; contains volatile oil, tannin. *Oleum Myrciæ*, is a yellowish liquid, pleasant aromatic odor, pungent, spicy taste, with equal volume of alcohol (acid reaction), acetic acid, or carbon disulphide—slightly turbid solutions, sp. gr. 0.976, levorotatory; contains eugenol 65 p. c., chavicol, myrcene, phellandrene, citral. *Impurities*:

Oil of pimenta, oil of clove, phenol. Should be kept cool, dark, in small well-stoppered, amber-colored bottles. Astringent, tonic, stimulant, perfume; nervous headache, faintness, chafing, hair washes, perfumery; 1. *Spiritus Myrciæ Compositus*, *Bay Rum*, $\frac{4}{5}$ p. c., + oil of orange, oil of pimenta, $\bar{a}\bar{a}$, $\frac{1}{20}$ p. c., alcohol 61, water q. s. 100; better grades made by distilling leaves with St. Croix rum (Jamaica, imported bay rum).

EUCALYPTUS. EUCALYPTUS, U.S.P.

Eucalyptus globulus, *Labillardière*. { The dried scythe-shaped leaf, with not more than 3 p. c. of stems, fruits, or other foreign organic matter.

Habitat. Australia (Tasmania, Victoria); cultivated in subtropics, Europe, N. Africa, S. United States (California, Florida, etc.); rich valleys, moist slopes of wooded hills.

Syn. Eucalypt., Blue Gum Leaves, Gum Tree (Wood), Fever Tree of Australia, Blue Gum-tree, Woolly Butt, Iron Bark Tree; Fr. Feuilles d'Eucalyptus; Ger. Eucalyptus-blätter.

Eu-ca-lyp'tus. L. fr. Gr. *eu*, well, good, + *καλυπτός*, covered—*i. e.*, the calyx-limb covers the flower bud before expansion and afterward, at anthesis, falls off in the shape of a lid or cover—the outer operculum of the bud (not the inner of united petals).

Glob'u-lus. L. *globulus*, *globulosus*, a little ball, globular—*i. e.*, the thick button-like form of the fruit.

PLANT.—Rapid-growing tree, 60–90 M. (200–300°) high, 3–6 M. (10–20°) thick (the largest being 141 M. (470°) high, 27 M. (87°) in circumference—*E. amygdalina*); bark ash-color; flowers Nov.–Dec., hermaphrodite, pedunculate, pinkish-white, buds very glaucous, consisting of calyx-tube covered by conical lid (operculum) of calyx-limb and united petals, fruit capsules, 18 Mm. ($\frac{3}{4}$ ') broad, half-globular, 4–5-ribbed, dehiscing at apex, many-seeded. **LEAVES (LEAF)**.—Blades lanceolate, curved, 8–30 Cm. (3–12') long, 2–7.5 Cm. ($\frac{4}{5}$ –3') broad, acute, base unequal, rounded; petiole twisted, 5–35 Mm. ($\frac{1}{5}$ –1 $\frac{2}{5}$ ') long; margin uneven, revolute, coriaceous, both surfaces pale yellowish-green, glaucous, glandular-punctate, numerous small circular brown dots of cork; veins of the first order anastomosing to form a vein nearly parallel with margin; stomata deeply depressed (level or elevated in spurious leaves); odor aromatic, taste aromatic, bitter, cooling. **POWDER**, light green—fragments of epidermis with stomata nearly invisible, chlorenchyma with broken oil reservoirs, brownish cork, bast-fibers, tracheæ, calcium oxalate in rosette aggregates. **Solvents**: diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—**LEAVES**: Various leaves having stomata level with leaf-surface, not deeply depressed as in genuine; **POWDER**: Should not reveal epidermal fragments with guard-cells of stomata visible upon vertical view, nor should any fragments, without stomata, exhibit wavy epidermal cells upon vertical view; **OIL**: Oils of various

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species of *Eucalyptus* containing much phellandrene, castor oil 12–20 p. c.

Commercial.—The blue-gum tree of Tasmania (exuding blue-gum), discovered by Labillardière, French botanist, 1792, and introduced into Europe, 1856, is sensitive to cold, but under favorable conditions attains the height of 15 M. (50°) in 6 years; there are 135 species,

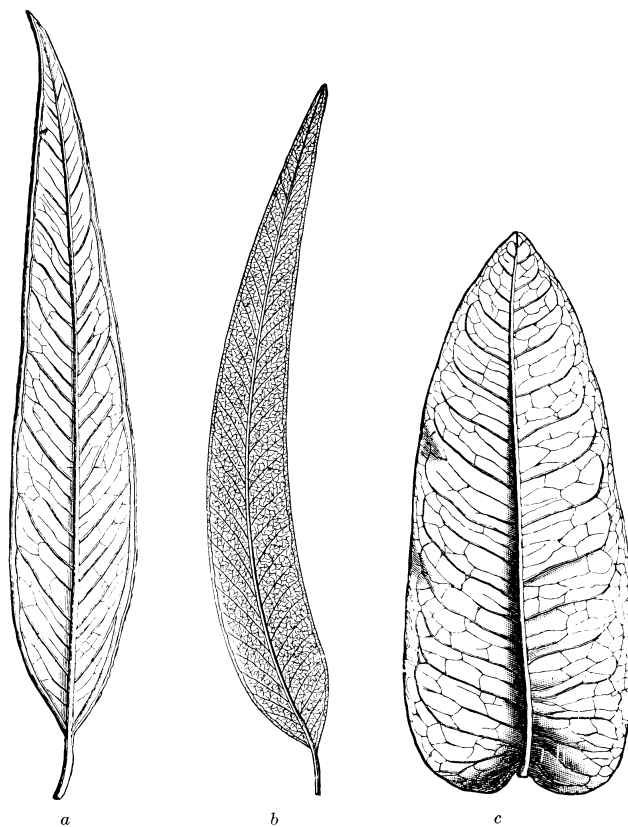


FIG. 280.—*Eucalyptus globulus*: a, b, leaves from old twig; c, from young twig.

the wood of many being hard, resinous and valuable. The aborigines knew something of its virtues, while the Spaniards used it for fever and ague, 1867, but Drs. Brunel and Ramel extolled and proved its antiperiodic properties, 1868–1869. Leaves are picked, dried carefully, and enter trade very little broken, those that are ovate, equilateral, thin and sessile, “junior,” being rejected; only the Australian variety

should be used, as they vary less in the yield of oil; however, most of our supply comes from California.

CONSTITUENTS.—Volatile oil 6 p. c., tannin, cerylic alcohol, 3 resins (1 acid, crystallizable), eucalyptic acid.

Oleum Eucalypti. **Oil of Eucalyptus**, *U.S.P.*—(Syn., Ol. Eucalypt., Eucalyptus Oil; Fr. Essence d'Eucalyptus; Ger. Eukalyptusöl.) This volatile oil, distilled from the fresh leaves (old leaves containing very little oil) of this and other species, is a neutral, colorless, pale yellow liquid, characteristic, aromatic, somewhat little camphoraceous odor, pungent, spicy, cooling taste, soluble in 4 vols. of 70 p. c. alcohol, sp. gr. 0.915, dextrorotatory; congeals at not below -15.4°C . (4°F .); contains at least 70 p. c. of eucalyptol (cineol), $\text{C}_{10}\text{H}_{18}\text{O}$, 20 p. c. of cymene, $\text{C}_{10}\text{H}_{14}$, eudesmol, $\text{C}_{10}\text{H}_{16}\text{O}$, phellandrene, $\text{C}_{10}\text{H}_{16}$, eucalyptene, $\text{C}_{10}\text{H}_{18}$, terpene—*d*-pinene (small amount), $\text{C}_{10}\text{H}_{14}$, also a little valeric, butyric and capronic aldehydes; with hydrochloric acid yields eucalypteol (eucalyptene hydrochloride), $\text{C}_{10}\text{H}_{16}\cdot 2\text{HCl}$, in white hygroscopic, aromatic crystals; with phosphoric oxide yields eucalyptolene, thickish liquid. *Tests*: 1. Mix oil (2) with glacial acetic acid (4), add 20 p. c. aqueous solution of sodium nitrite (3), stir gently—no crystals of phellandrene nitrite (abs. of other eucalyptus oils containing much phellandrene). *Impurities*: Castor oil 12–20 p. c., etc. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\text{m}\nu$ –15 (.3–1 cc.).

Eucalyptol. **Eucalyptol**, $\text{C}_{10}\text{H}_{18}\text{O}$, *U.S.P.*—(Syn., Cineol, Cajuputol; Fr. Eucalyptol, Oxyde de Terpilène; Ger. Eucalyptolum, Eukalyptol, Zineol.) This substance obtained from oil of eucalyptus and other sources (cajuput, canella, curcuma, laurus, mentha, rosemary, salvia, santonica) is the most valuable constituent of eucalyptus oil, being neutral and with a definite chemical composition, which is not true of the oil, and may be obtained by distilling the volatile oil and placing in a freezing mixture that portion coming over between 150 – 176°C . (302 – 347°F .), from which it crystallizes in long, colorless needles; a more satisfactory method is to treat the oil with hydrochloric acid gas or phosphoric acid, add warm water to separate eucalyptol on the surface, then wash with dilute alkali solution and distil. It is a colorless liquid, characteristic, aromatic, distinctly camphoraceous odor, pungent, spicy taste; slightly soluble in water, miscible with alcohol, chloroform, ether, glacial acetic acid, fixed or volatile oils, sp. gr. 0.922, boils at 176°C . (349°F .), congeals at 0°C . (32°F .). *Tests*: 1. Optically inactive (dist. from oil of eucalyptus, many other volatile oils); alcoholic solution (1 in 10)—neutral. 2. Place 1 cc. in freezing mixture, add gradually phosphoric acid (1)—solid, white, crystalline mass (eucalyptol-phosphoric acid), + warm water—eucalyptol separates. 3. Shake 5 cc. with sodium hydroxide T. S. (5)—eucalyptol volume not diminished (abs. of phenols, etc.). 4. Shake 1 cc. with distilled water (20), after liquids separate, add to aqueous layer 1 drop ferric chloride T. S.—no violet color (abs. of phenols). *Impurities*: Oil of eucalyptus, volatile oils, saponifiable oils, phenols. Dose, $\text{m}\nu$ –15 (.3–1 cc.).

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PREPARATIONS.—LEAVES: 1. *Fluidextractum Eucalypti*. Fluidextract of Eucalyptus. (Syn., Fldext. Eucalypt., Fluid Extract of Eucalyptus; Fr. Extrait fluide d'Eucalyptus; Ger. Eucalyptusfluidextrakt.)

Manufacture: Similar to Fluidextractum Sarsaparillæ, page 126; menstruum: 75 p. c. alcohol, reserve first 80 cc. Dose, \mathfrak{m}_{xv} –60 (1–4 cc.). OIL: 1. *Curatio Paraffini*, N.F., 2 p. c. EUCALYPTOL: 1. *Nebula Eucalyptolis*, N.F., 5 p. c., + light-liquid petrolatum 95. 2. *Petroxolinum Eucalyptolis*, N.F., 20 cc. in 100 cc. product. 3. *Liquor Antisepticus*, N.F., $\frac{1}{2}$ p. c. 4. *Liquor Aromaticus Alkalinus*, N.F., $\frac{1}{10}$ p. c. 5. *Liquor Pepsini Antisepticus*, N.F., $\frac{1}{20}$ p. c. 6. *Nebula Aromatica*, N.F., $\frac{1}{5}$ p. c. 7. *Nebula Mentholis Composita*, N.F., $\frac{1}{5}$ p. c. 8. *Petroxolinum Sulphuratum Compositum*, N.F., 3 cc. in 100 cc. product. 9. *Pulvis Antisepticus*, N.F., $\frac{1}{10}$ p. c.

Unoff. Preps.: LEAVES: *Extract*, gr. 2–10 (.13–.6 Gm.). *Infusion*, \mathfrak{z}_{j} –2 (30–60 cc.). *Tincture*, 15 p. c., \mathfrak{z}_{ss} –2 (2–8 cc.). OIL: *Unguentum Eucalypti* (Br.), 10 p. c. *Water (Aqua)*, \mathfrak{z}_{j} –4 (4–15 cc.).

PROPERTIES.—Antiperiodic, antipyretic, expectorant, stimulant, astringent, antiseptic, disinfectant, diaphoretic; like quinine arrests white blood corpuscle movement; increases flow of saliva, gastric juice, heart action, appetite, digestion; large doses produce indigestion, diarrhea, vomiting, muscular weakness, low temperature, renal and cerebral congestion, paralyzed respiration, death; destroys low forms of life, reduces arterial tension and enlarged spleen. It antagonizes malaria thus: 1, its dead leaves elevate the low moist soil; 2, being a rapid grower, its leaves, roots, etc., absorb much malarial soil-water and noxious germs, thus causing the surrounding country to become dry, thereby purifying the atmosphere; 3, its enormous foliage protects large areas from direct sun-rays which favor the generation of animalculæ; 4, its aseptic emanations purify the air. Owing to these properties it is cultivated largely in malarial districts, to render them sanitative, and to reclaim infected localities, as portions of Australia, Jamaica, Roman Campagna, etc. It is eliminated by skin, bronchia, kidneys, lungs, with more or less irritation, imparting odor to breath and urine.

USES.—Intermittent fever, genito-urinary and pulmonary catarrh, chronic bronchitis, mucous membrane affections, asthma (smoked with stramonium). Used when quinine is contra-indicated, intermittents, typhoid, scarlatina, whooping-cough, cancer, hemorrhages; externally—as antiseptic in ulcers, gonorrhea, spongy gums, gleet, deodorizer in diseases with disagreeable odor, preventive of putrefaction; spray beneficial in diphtheria, gangrene of lungs, fetid bronchitis. Tincture (1) added to cod-liver oil (100) removes fishy flavor; the leaves deter moths entering woolen cloth; bark used for tanning, dyeing.

Incompatibles: Agents aiding waste, alkalies, mineral acids, salts.

Synergists: Aromatic bitters, antispasmodics, copaiba, cubeb, oil of turpentine, etc.

Bosisto found the yield of volatile oil from 100 pounds (45.5 Kg.) of leaves from each of the several species to vary considerably: *E.*

globulus—12 ounces (.3 L.), the only one having eucalyptol to an appreciable extent, *E. amygdali'na*, *Peppermint Tree*—50 ounces (1.5 L.); *E. dumo'sa*—30 ounces (.9 L.); *E. obli'qua*, *Stringy-bark Tree*—8 ounces (.2 L.); *E. Leucox'ylon* (*Siderox'ylon*, *Iron-bark Tree*—16 ounces (.5 L.); *E. oleo'sa*, *Mallee Tree*—20 ounces (.6 L.).

Allied Plants:

1. *Eucalyptus rostra'ta*; *Eucalyptus Gummi*, *Eucalyptus Gum* (*Kino*), *Red Gum*, *N.F.*—A dried gummy exudation from the bark of this and other species; Australia. Many species (50), all large trees, yield this product from cavities and hand-made incisions, when it is dried by artificial heat—the yield per tree about the same as of ordinary kino. It is in reddish-brown grains, angular masses, in thin layers transparent ruby-red; brittle, forming plastic mass adhering to teeth when chewed, coloring saliva red; odor slight, taste very astringent. Powder, dark reddish-brown—angular fragments with conchoidal fracture, thinner pieces yellowish-brown; aqueous solution faintly acid, reddish—intensified by an alkali; diluted solution + ferric chloride T. S.—dark green color, more concentrated—dark green precipitate; almost completely soluble in alcohol without becoming plastic; 80–90 p. c. soluble in water, solubility lessens with age; contains kino-tannic acid 45–50 p. c., kino-red, catechin, pyrocatechin, volatile oil, ash 2 p. c. Properties and Uses: similar to kino. Dose, gr. 5–15 (.3–1 Gm.); 1. *Trochisci Eucalypti Gummi*, 1 gr. (.06 Gm.), + tragacanth 1 gr., acacia 2 gr., sucrose 6 gr., oil of orange $\frac{1}{20}$ M., fldext. rose $\frac{1}{2}$ M.

2. *Ara'lia racemo'sa*, *Aralia*, *American Spikenard*, *Spignet*, *N.F.*—*Araliaceæ*. The dried rhizome and roots with not more than 5 p. c. of stem-bases or other foreign organic matter; United States, Georgia to Canada, west to Rocky Mountains. Large perennial herb, 1 M. (40') high, branched, leaflets ovate, cordate, serrate; flowers small, greenish-yellow. Rhizome, 12 Cm. (5') long, 5 Cm. (2') thick, scaly, pale brown, internally whitish, frequently cut longitudinally, nodes approximate, prominent stem-scars, 3 Cm. (1 $\frac{1}{2}$ ') broad, fracture fibrous; roots numerous, .5–.7 M. (20–30') long, 5–25 Mm. ($\frac{1}{2}$ –1') thick; odor aromatic, taste mucilaginous, pungent, slightly acrid. Powder, yellowish—starch grains, calcium oxalate rosettes, tracheæ, lignified cells with walls showing simple pores (dist. fr. *A. nudicaulis*); solvent: diluted alcohol; contains resin, volatile oil, starch, pectin. Stimulant, diaphoretic, alterative; syphilis, chronic rheumatism and cutaneous affections; locally to sluggish ulcers. Dose, gr. 30–60 (2–4 Gm.); 1. *Fluidextractum Araliæ*, (67 p. c. alcohol), dose, 5ss–1 (2–4 cc.).

3. *Ara'lia spino'sa*, *Hercules' Club*, *Prickly Elder*.—The bark, U.S.P. 1820–1870; East and west N. America. Prickly tree, 3–9 M. (10–30°) high, leaflets crowded at summit; flowers white; bark in quills, curves, gray, prickly, inside yellowish, aromatic, acrid; contains araliin. volatile oil, resin. Stimulant, diaphoretic, demulcent (emetic, cathartic), alterative; rheumatism, skin eruptions, syphilis, colic, dyspepsia, toothache, vomiting, nervousness; externally antidote to rattlesnake-

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bites; in infusion, decoction, tincture, masticatory. Dose, gr. 30–60 (2–4 Gm.).

4. *A. nudicaulis*, Wild, *Virginian, False Sarsaparilla*.—The root (rhizome), U.S.P. 1820–1870; N. America. Small shrub, stem scarcely above ground, leaf single, petiole .3 M. (1°) high; leaflets ovate, serrate, flowers greenish. Root .3 M. (1°) long, 5 Mm. ($\frac{1}{8}$ ') thick, annulate, brownish-gray, inside whitish, spongy pith, aromatic odor and taste; contains volatile oil, resin, starch. Stimulant, diaphoretic,

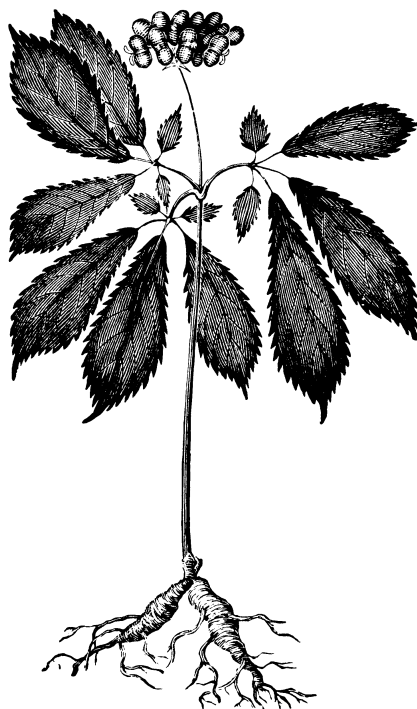


FIG. 281.—*Panax (Aralia) quinquefolium*.

alterative—like sarsaparilla, in infusion, decoction. Dose, gr. 30–60 (2–4 Gm.).

5. *Pa'nax quinquefo'lium (Aralia quinquefo'lia), Panax, Ginseng*.—The root, U.S.P. 1840–1870; N. America. Small shrub, .3 M. (1°) high, smooth, leaflets 5's, serrate; flowers yellowish, fruit scarlet; root 5–12.5 Cm. (2–5') long, fusiform, annulate, branched, brownish-yellow, wood yellowish, sweetish, aromatic; contains panaquilon, resin, volatile oil, starch, gum. Stimulant, demulcent, stomachic; infusion, decoction,

tincture. The *Chinese Ginseng* (*Aralia Gin'seng*) is very similar to this, slightly larger. Used natively as nervine, aphrodisiac. Dose, 5ss–2 (2–8 Gm.).

51. UMBELLIFERÆ. Parsley (Carrot) Family.

Um-bel-lif'-e-re. L. *Umbelliferæ*—*umbrella*, umbel, + *ferre*, to bear—*i. e.*, flowers borne in umbels. Herbs, shrubs. Distinguished by possessing aromatic, stimulant volatile oils; flowers in umbels; stems hollow; leaves usually compound; fruit cremocarp, with vittæ (oil-tubes), indehiscent; calyx adnate to ovary; petals and stamens 5, inserted on fleshy epigynous disk; ovary 2-celled, inferior; seeds 1 in each carpel, albumen horny; temperate climates; aromatic, carminative, stimulant, tonic (vol. oil), narcotic, poisonous (acrid juice), antispasmodic (gum-resin).

Genera: 1. *Coriandrum*. 2. *Carum*. 3. *Pimpinella*. 4. *Fœniculum*. 5. *Ferula*.

CORIANDRUM. CORIANDER, *N.F.*

Oleum Coriandri. Oil of Coriander, *U.S.P.*

Coriandrum sativum, { The volatile oil distilled from the dried ripe
Linné. fruit.

Habitat. C. Asia, S. Europe (China, Italy; cultivated in the United States, Europe).

Syn. Coriand., Coriander Seed, Coliander; Br. Coriandri Fructus; Fr. Coriandre; Ger. Koriander(samen); Ol. Coriand., Coriander Oil; Fr. Essence de Coriandre; Ger. Korianderöl.

Co-ri-an'drum. L. fr. Gr. *κόρις*, a bed-bug—*i. e.*, from a resemblance in odor of the leaves, also the entire plant and fruit when young.

Sa-ti'vum. L. *sativus*, sown, cultivated—*i. e.*, kind used, in contradistinction to the wild-grown.

PLANT.—Annual herb, odor of bed-bugs; stem .3–.6 M. (1–2°) high, solid; leaves bi- or tripinnate; leaflets linear, pointed, lobed, light green, resembling parsley; flowers June, white, rose-colored, umbels small, 4 Cm. (1½') broad, 5–8-rayed. Fruit—Coriandrum, Coriander (Seed), *N.F.*—The dried ripe fruit with not more than 5 p. c. of other fruits, seeds, or other foreign organic matter, yielding not more than 1.5 p. c. of acid-insoluble ash, nor less than .5 p. c. of volatile ether-soluble extractive; mericarps usually coherent, but easily separated, cremocarp nearly globular, 2–5 Mm. (¼–½') broad, yellowish-brown, apex with 5 calyx teeth and short stylopodium; mericarps 2, each with 5 prominent, straight primary ribs and 4 distinct secondary ribs; commissural surface deeply concave with 2 vittæ; odor and taste agreeably aromatic. Powder, light brown—chiefly endosperm and lignified tissues of pericarp, many calcium oxalate crystals in rosettes,

UMBELLIFERÆ

aleurone grains, numerous globules of fixed oil, yellow oil tubes (vittæ); solvents: alcohol, water partially. Dose, gr. 10–30 (.6–2 Gm.).

CONSTITUENTS.—Volatile oil .5–1 p. c., fat 13 p. c., tannin, malic acid, mucilage, ash 7 p. c.

Oleum Coriandri. **Oil of Coriander.**—This volatile oil, distilled with water or steam from the dried ripe fruit crushed between rollers, is a colorless, pale yellow liquid, characteristic odor and taste of coriander, soluble in 3 vols. of 70 p. c. alcohol, sp. gr. 0.870, dextrorotatory; contains a terpene—*d*-pinene, $C_{10}H_{16}$, 5 p. c., geraniol, borneol, and an alcohol—linalool (coriandrol), $C_{10}H_{18}O$, 45–90 p. c., from which 1 molecule of H_2O may be withdrawn, leaving $C_{10}H_{16}$. Should meet the requirements of the tests for heavy metals in volatile oils and be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\mathfrak{m}\text{j}$ –5 (.13–.3 cc.).

ADULTERATIONS.—FRUIT: Stems, fragments of leaves; OIL: Oils of turpentine, sweet orange, cubeb and cedar-wood—all recognized by being less soluble in 70 p. c. alcohol.

Commercial.—Coriander was popular with the ancients; in the fresh state all parts upon being bruised are fetid, the fruit becoming fragrant only upon drying; when ripe plants are cut down with sickles, dried, and fruit thrashed out. Russia produces the bulk of the crop, although we grow mostly our home consumption; that from Bombay (Indian) is larger and ovoid but seldom reaches the United States.

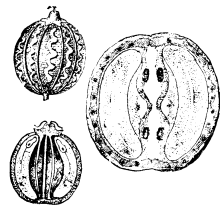


FIG. 282.—Coriandrum: fruit and longitudinal section magnified 3 diam.; transverse section magnified 8 diam.

PREPARATIONS.—OIL: 1. *Fluidextractum Cascaræ Sagradæ Aromaticum*, $\frac{1}{100}$ p. c. 2. *Spiritus Aurantii Compositus*, 2 p. c. 3. *Syrupus Sennæ*, $\frac{1}{2}$ p. c. 4. *Confectio Sennæ*, *N.F.*, $\frac{1}{2}$ p. c. 5. *Emulsa*, as preferred. FRUIT: 1. *Fluidextractum Stillingiæ Compositum*, *N.F.*, 6.3 p. c. 2. *Infusum Gentianæ Compositum*, *N.F.*, $\frac{4}{5}$ p. c. *Fluidextract*, $\mathfrak{M}\text{xv}$ –30 (1–2 cc.). *Infusion*, 5 p. c., $\mathfrak{z}\text{j}$ –2 (30–60 cc.).

PROPERTIES.—Aromatic, carminative, stimulant, stomachic.

USES.—Indigestion, flatulency, corrective to griping medicines, such as senna, rhubarb, jalap; flavoring to gin and in cooking. Oil also used in colic, rheumatism, neuralgia.

Allied Plants:

1. *Conium maculatum*, *Conium*, *Poison Hemlock*, *N.F.*—The dried full-grown, but unripe fruit with not more than 2 p. c. of foreign fruits, seeds, or other foreign organic matter, yielding not less than .5 p. c. of coniine; it is unfit for use when kept for more than 2 years, and should be carefully dried and preserved; Europe, Asia, N. Africa, naturalized in N. and S. America—waste places. Large branching herb, 2–2.5 M. (6–8°) high, stem furrowed, hollow, smooth, green, mottled with port-wine-colored spots; root biennial, fusiform, 15 Mm. ($\frac{3}{8}$) thick, exuding milky juice when cut; flowers white, small umbels;

leaves bi-pinnate, 15–30 Cm. (6–12') long, incised, dentate, mucronate, grayish-green on drying. Fruit, cremocarp, broadly oval, greenish-gray, 2 mericarps often separated, each 3 Mm. ($\frac{1}{8}$ ') long, 1.5 Mm. ($\frac{1}{16}$ ') broad, ovoid; inner flattened side with deep longitudinal groove, outer



FIG. 283.—*Conium maculatum*.

convex with 5 pale yellow crenate ribs, pericarp without oil tubes; odor slight, but with solution potassium hydroxide T. S. strongly disagreeable, mouse-like; taste characteristic, disagreeable, acrid. Powder, greenish-gray—endosperm tissue, parenchyma cells containing fixed oil, aleurone grains, calcium oxalate rosettes, lignified fibers, seed-coat fragments, starch grains, tracheae; solvent: alcohol; contains coniine (conine—liquid) .5–1.5 p. c., methylconiine, conhydrine, pseudoconhydrine, volatile oil, fixed oil, conic acid, ash 8 p. c. Sedative, narcotic, anodyne, soporific, antispasmodic, anaphrodisiac; depresses all motor nerves, beginning in peripheries, thence to spinal cord, etc., causing motor paralysis without loss of sensation; spasmodic chorea, whooping-cough, melancholia, neuralgia, delirium tremens, tetanus, asthma, epilepsy,

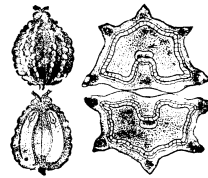


FIG. 284.—*Conium*: fruit and longitudinal section magnified 3 diam.; transverse section magnified 8 diam.

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pneumonia; scrofulous glandular sores, affections of mammary glands, to check milk secretion, etc. *Poisoning*: Vomiting, fatigue, heaviness of legs, numbness, drooped eyelids, mydriasis, vertigo, impaired speech, slow pulse, paralysis of voluntary muscles, loss of speech, and vision, death from paralysis of respiratory muscles—emetics, lavage, tannin, strychnine, diffusible stimulants, atropine, warmth, epispastics, artificial respiration. Dose, gr. 1–5 (.06–.3 Gm.); 1. *Extractum Conii* (diluted alcohol + .3 p. c. of diluted hydrochloric acid), dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.). *Fluidextract* (diluted alcohol + 2 p. c. of acetic acid), \mathfrak{Mj} –5 (.06–.3 cc.); Ointment; Tincture.

2. *Apium graveolens*, *Apii Fructus*, *Celery Fruit* (Seed), N.F.—The dried ripe fruit with not more than 5 p. c. of unsound or foreign fruits or other foreign organic matter, yielding not more than 3 p. c. of

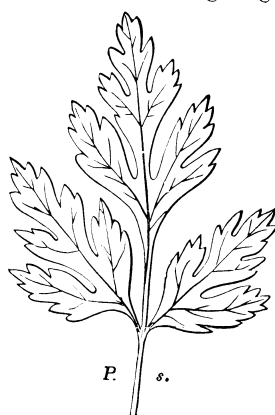


FIG. 285.—*Apium* (*Carum*—*Petroselinum*) *graveolens*: pinnate leaf.

acid-insoluble ash; S. Europe, cultivated. Biennial herb; root fusiform, white—when wild, poisonous, under cultivation, harmless; blanched stalks popular as a salad. Fruit, mericarps 2, united or separate, ovoid, 1–2 Mm. ($\frac{1}{2}$ – $\frac{1}{2}$) long, dark brown; inner surface flat, outer convex, with 5 slender ribs, 2 being marginal; odor characteristic, agreeable; taste aromatic, warm, pungent. Powder, brown, oily—pericarp fragments with yellowish oil tubes, brown secretion cells and few epidermal papillæ; tracheæ, fibers, aleurone grains, calcium oxalate rosettes; solvent: alcohol; contains volatile oil 2–3 p. c., fixed oil, ash 3–8 p. c. Carminative, stimulant, nervous sedative, flavoring (infusion, juice); bronchitis, intermittents, contusions, swollen glands. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Apii Fructus* (alcohol), dose, \mathfrak{Mxv} –30 (1–2 cc.): Prep.: 1. *Elixir Guaranæ et Apii*, 15 p. c.

3. *Eryn'gium aquat'icum* (*yuccafo'lium*), *Button Snakeroot*.—The root, U.S.P. 1820–1860; United States. Plant .6–1.8 M. (2–6°) high, leaves rigid, pointed, .3–1 M. (1–3°) long, bristly; flowers white; root tuberous, 6–12 Mm. ($\frac{1}{4}$ – $\frac{1}{2}$) long, branched, cup-shaped scars, central pith, aromatic; taste sweet, acrid, aromatic, resembles parsnip; contains volatile oil. Diaphoretic, expectorant, sialagogue, emetic; dropsy, gravel, jaundice, substitute for senega; infusion, decoction, tincture. Dose, \mathfrak{Jss} –1 (2–4 Gm.).

4. *Petroselinum sati'vum*, *Petroselinum*, *Parsley Fruit*, U.S.P. 1910.—The dried ripe fruit with not more than 5 p. c. of foreign seeds and other matter; S. Europe, Asia Minor, United States, cultivated in gardens universally. Annual herb, .6–1.2 M. (2–4°) high, stem furrowed, jointed; root biennial, conical 15 Cm. (6') long, 12 Mm. ($\frac{1}{2}$)

thick, annulate, yellowish. Fruit, cremocarp, ovoid-crescent-shaped, 2-3 Mm. ($\frac{1}{12}$ – $\frac{1}{8}$ ') long, grayish-brown, brownish on aging, mericarps 2, separate, each with 5 filiform prominent ribs, commissural surface with 2 vittæ, dorsal 1-2 vittæ, endosperm large, oily; odor and taste characteristic, aromatic, especially when bruised; solvents: alcohol, water partially; contains volatile oil 5-6 p. c., apiol (white crystals), resin, fixed oil, 12 p. c., cariol, apiin, apiolin (greenish liquid), tannin, mucilage, ash 7 p. c. Diuretic, stimulant, emmenagogue, carminative, antiperiodic, insecticide, germicide; nephritis, cystitis, dropsy, amenorrhea, dysmenorrhea (beginning 3-4 days before the menses); fresh juice in intermittents; root used similarly. Dose, gr. 10-30 (.6-2 Gm.). *Apiol*, gr. 3-8 (.2-.5 Gm.); *Oleo-resin*, Mv-15 (.3-1 cc.).

FIG. 286.—*Ethusa Cynapium*.

5. *Ethusa Cynapium*, Fool's Parsley, Small Hemlock.—Leaves non-poisonous, and sometimes carelessly mixed with those of conium—the plants, however, being distinguished easily, as *Ethusa Cynapium* has leaves of different shape, darker color, leek-like odor; occasionally have mixed also the pubescent ciliate leaflets of several species of *Chærophyllum*.

CARUM. CARAWAY, U.S.P.

Carum Carvi (Carui), *Linné.* { The dried ripe fruit, with not more than 3 p. c. of other fruits, seeds or foreign organic matter, yielding not more than 1.5 p. c. acid-insoluble ash.

Habitat. C. and W. Asia, Himalayas, Caucasus, Europe, Siberia; cultivated in England, Norway, Russia, Germany, Holland, Morocco, United States.

Syn. Caraway Seed (Fruit), Carawayseed, Carvies; Br. Carui Fructus; Fr. Carui, Carvi, Cumin des Prés; Ger. Fructus Carvi, Kümmel, Gemeiner Kümmel.

Carum. L. *careum*, fr. Gr. *κάρων*, after Caria, in Asia Minor—*i. e.*, its original habitat. *Carui* was the name used by medieval pharmacists for the drug.

Carvi. L. for *carvy*, *carvey*. Ar. *karawya*, Eng. caraway. Here frequently the word *Carui* is used, thus assimilating L. gen., as though for *Carui Semina*.

PLANT.—Biennial herb; stem .3-1 M. (1-3°) high, hollow; leaves bi- or tripinnate, deeply incised; flowers May-June, small, white, no involucre; root fleshy, fusiform, white. **FRUIT**, cremocarp, usually in 2 separated mericarps; curved, tapering, toward both ends, 3-7 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') long, 2 Mm. ($\frac{1}{12}$ ') broad, dark brown, 5 yellow filiform ribs, dorsal surface 4 vittæ, commissural surface 2, endosperm large, oily; odor and taste aromatic. **POWDER**, yellowish-brown—outer epidermal

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cells characterized by a waviness and striping of the cuticle; endosperm cells containing aleurone grains with the embedded rosette aggregates; tracheæ, lignified fibers, oil tubes. *Solvents*: alcohol; water partially. Dose, gr. 10-30 (.6-2 Gm.).



FIG. 287. — *Carum Carvi* (Carui): flower, fruit, and cross-section of fruit, enlarged.

ADULTERATIONS.—Allied and occasionally exhausted (drawn) fruits — having shriveled appearance; seeds of weeds—usually yielding starch in the powder; dirt—showing excess of ash.

Commercial.—Fruit ripens in the 2d year, August, when the plant is cut down, dried, and thrashed on cloth. There are five varieties: 1, *Holland (Dutch)*, finest; 2, *German*; 3, *English*, shortest; 4, *Mogador*, longest, lightest; 5, *American*, the result of home cultivation in gardens, being quite aromatic but smaller than the German, these two constituting nearly our total supply; yield 8-10 hundred-weight per acre; root, resembling that of parsnip, is employed as food in N. Europe.

CONSTITUENTS.—Volatile oil 5-7 p. c., fixed oil, resin, tannin, sugar, gum, ash 5-8 p. c.; no starch.

Oleum Cari. Oil of Caraway, *U.S.P.*—(Syn., Ol. Cari., Caraway Oil; Br. Oleum Carui; Fr. Essence de Carvi; Ger. Oleum Carvi, Kümmelöl, Carvon.) This volatile oil, obtained by steam distillation from the dried ripe fruit, should yield not less than 50 p. c. of carvone, and is a colorless, pale yellow liquid, characteristic odor and taste, soluble in 8 vols. of 80 p. c. alcohol, sp. gr. 0.905, dextrorotatory; contains a ketone—carvone (*d*-carvone, carvol), $C_{10}H_{14}O$, at least 50 (50-65) p. c., a terpene—carvene (*d*-carvene, citrene, hesperidene, *d*-limonene), $C_{10}H_{16}$, 35-50 p. c., and an alcohol, $C_{10}H_{17}OH$, etc. Carvone may be obtained by treating the oil with alcoholic solution of ammonium sulphide, decomposing the resulting crystals with potassium hydroxide; it is a viscid, yellowish, oily liquid, creosote odor and taste, closely related to menthol and myristicol, identical with thymol, cuminic alcohol and carvacrol, this latter being the product of distilling a mixture of caraway oil and potassium or sodium hydroxide (thus expelling carvene), decomposing residue with sulphuric acid, rectifying; useful in toothache, by inserting it into cavity. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mij-5 (.13-.3 cc.).

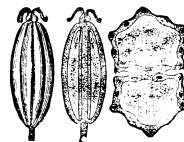


FIG. 288. — *Carum*: fruit and longitudinal section, 3 diam.; transverse section, 8 diam.

PREPARATIONS.—FRUIT: 1, *Tinctura Cardamomi Composita*, 1.2 p. c. OIL: 1, *Mistura Carminativa*, *N.F.*, $\frac{1}{20}$ p. c. 2, *Spiritus Cardamomi Compositus*, *N.F.*, $\frac{1}{20}$ p. c.

Unoff. Preps.: FRUIT: *Fluidextract*, Mx-30 (.6–2 cc.). *Infusion*, 5 p. c., 3j–2 (30–60 cc.). *Water* (Br.), 100 Gm. + water 2000 cc., distil 1000 cc. OIL: *Spirit*.

PROPERTIES.—Carminative, stimulant, diuretic, stomachic.

USES.—Flatulent colic, especially of infants, corrective to nauseous purgatives, flavoring, toothache (carvacrol), as a spice in cakes, bread, etc. The oil is used mostly, which acts externally like other essential oils, as an anesthetic, etc.

ANISUM. ANISE, *N.F.*

Oleum Anisi. Oil of Anise, *U.S.P.*

Pimpinella Anisum, *Linné*, } The volatile oil distilled from the dried
or } ripe fruits.
Illicium verum, *Hooker filius*.

Habitat. W. Asia, Egypt, S. E. Europe; cultivated in S. Europe, United States, in gardens.

Syn. Anis., Aniseed, Aneys, Aunyle, Common Anise, Sweet Cumin, Semen Anisi; Br. Anisi Fructus; Fr. Anis, Anis vert, Graines d'Anise; Ger. Anis, Anissame; Ol. Anisi, Anise Oil; Fr. Essence d'Anis; Ger. Anisöl, Anethol.

Pim-pi-nel'la. L. Medieval name, altered, from *bipinnate* or *bipinnella*—*i. e.*, the pinnate leaves; lit. "the two-winged little plant."

An'i-sum. L. fr. Gr. *άνισον*—*ἀνήθον*, Ar. *anisum*, anise, dill—*i. e.*, classic name.

Il-li'ci-um. L. *illicere*, to allure, charm—*i. e.*, in allusion to its attractive perfume.

Verum. L. *verus*, true—*i. e.*, the genuine or real type.

PLANTS.—*Pimpinella Anisum*: Annual herb .3 M. (1°) high; dentate, pinnatifid; flowers white, small, umbels 8–14-rayed. Fruit—Anisum, Anise (Seed), *N.F.*—The dried ripe fruit with not more than 3 p. c. of other fruits, seeds or foreign organic matter, yielding not more than 1.5 p. c. of acid-insoluble ash; cremocarp, broadly oval compressed, mericarps usually cohering and attached to slender pedicel 2–12 Mm. ($\frac{1}{2}$ – $\frac{1}{2}$) long, apex with 2 styles, grayish-green, seldom brownish, slightly pubescent; odor and taste agreeable, aromatic—Russian variety closely resembles conium. Powder, yellowish-brown—numerous fragments of pericarp with yellowish oil tubes, tracheæ, carophore fibers, endosperm cells, aleurone grains, calcium oxalate rosette aggregates, non-glandular hairs. *Test*: 1. Heat 1 Gm. with potassium hydroxide T. S., (10)—no mouse-like odor (abs. of conium). *Illicium verum*.—Magnoliaceæ: Small tree, 3–6 M. (10–20° high, branched; leaves pellucid-punc-

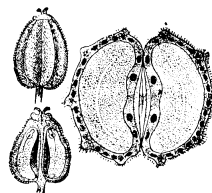


FIG. 289. — Anisum: fruit and longitudinal section magnified 3 diam.; transverse section magnified 8 diam.

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tate; flowers greenish-yellow; Fruit, star-shaped—8 stellately arranged boat-shaped carpels, 8 Mm. ($\frac{1}{3}$) long, brown, woody, wrinkled, each carpel containing 1 glossy-brown seed; solvents: alcohol, boiling water. Dose, gr. 10–30 (.6–2 Gm.).

CONSTITUENTS.—Volatile oil (anethol) 1–3 p. c., fixed oil 3–4 p. c., choline, resin, sugar, mucilage, malates, phosphates, ash 7 p. c.

Oleum Anisi. Oil of Anise. Oil of Star Anise, U.S.P.—This volatile oil is a colorless, pale yellow, strongly refractive liquid, characteristic odor and taste of anise, soluble with not more than slight cloudiness in 3 vols. of 90 p. c. alcohol; sp. gr. 0.983, increasing with age; contains a liquid body—terpenes and methyl-chavicol, $C_{10}H_{12}O$, and a stearoptene, anethol, $C_{10}H_{12}O$, 80–90 p. c., upon which the value depends, being converted by exposure or oxidation with nitric acid into anisic acid; star anise oil is the same chemically, containing anethol 80–90 p. c., *d*-pinene, *d*-phellandrene, and possibly safrol, but congeals at 1° C. (34° F.), while anise oil at 10–15° C. (50–59° F.). *Tests*: 1. Levorotatory (abs. of oils of fennel, caraway, coriander—dextrorotatory). 2. Shake with water in graduated tube—volume should not diminish; drop into water—no milkiness unless agitated (abs. of alcohol). 3. Alcoholic solution neutral; with a drop of ferric chloride T. S.—no blue or brown color (abs. of phenols). *Impurities*: Heavy metals, oil of fennel, phenols. The label must indicate definitely its specific source, and if solid material has separated, carefully warm the oil until liquefied and thoroughly mix before dispensing. Should be kept dark, in well-stoppered, amber-colored bottles. Dose, Mij –5 (.13–.3 cc.).

Anethol. Anethol, N. F.—The methyl ether of para-propenyl phenol $C_6H_4C_3H_5.OCH_3$, obtained from this and other oils (star anise, fennel), by fractionating, chilling, crystallizing; practically identical with the oil. It is a colorless, faintly yellow, highly refractive liquid at 23° C. (73° F.), sweet taste and aromatic odor of anise, solidifies at 20° C. (68° F.) to white glistening, crystalline mass, remelting at 22° C. (72° F.), soluble in ether, chloroform, alcohol (2), almost insoluble in water; sp. gr. 0.985, boils at 235° C. (455° F.); optically inactive, levorotatory (if from anise), dextrorotatory (if from fennel). *Test*: 1. Shake 10 cc. with 50 cc. saturated aqueous solution of sodium bisulphite in graduated cylinder, let stand 6 hours—no diminution of anethol volume nor crystalline deposit (abs. of aldehydes). Should be kept dark, in well-stoppered, amber-colored bottles. Dose, Mij –5 (.13–.3 cc.).

ADULTERATIONS.—FRUIT: Earthy fragments, partly exhausted fruits, recognized by shriveled appearance, chiefly, however, with conium fruit (which resembles mostly the Russian anise), but odor and taste not aromatic—becoming mouse-like with solution potassium hydroxide even when 1 p. c. present; non-hairy; consisting usually of single smooth mericarps, grooved upon the face, 5-crenate ribs (ridges) with wrinkles between them, no vittæ; POWDER: Star-anise recognized

by its peculiar sclerotic cells, earthy matter sinking when stirred in strong brine; OIL: Spermaceti 5–35 p. c., wax, petroleum, fixed oils, oils of turpentine and fennel, camphor (to raise congealing-point), alcohol, fenchone (fennel stearoptene); the two first insoluble in cold alcohol, whereas oils and camphor are mostly soluble; camphors recognized—by odor; alcohol—by milkiness to water; star-anise oil is the same chemically, but has a slight distinguishing smell and taste, also lower congealing-point (1°C. ; 34°F.).

Commercial.—Plant was known and cultivated by the Romans, while Theophrastus wrote of its aromatic properties; now grown mostly in Malta, Spain, Italy, S. Russia, Greece, Chile. There are four varieties: 1, *Spanish (Alicante)*, small, best, preferred; 2, *German (French)*, larger; 3, *Italian*, exported via Leghorn; 4, *Russian*, very short, resembling conium most; that cultivated at home supplies largely our market.

PREPARATIONS.—OIL: 1. *Aqua Anisi.* Anise Water. (Syn., Aq. Anisi; Fr. Eau d'Anis; Ger. Aniswasser.)

Manufacture: $\frac{1}{5}$ p. c. A saturated solution; similar to Aquæ Aromaticæ—triturate oil .2 cc. with purified talc 1.5 Gm., adding gradually recently boiled distilled water q. s. 100 cc. Dose, ʒij–8 (8–30 cc.).

2. *Spiritus Anisi.* Spirit of Anise. (Syn., Sp. Anisi, Essentia Anisi; Fr. Alcoolat (Esprit) d'Anis; Ger. Anisgeist.)

Manufacture: 10 p. c. Mix oil 10 cc. with alcohol q. s. 100 cc. Dose, ʒj–2 (4–8 cc.).

3. *Fluidextractum Cascaræ Sagradæ Aromaticum*, $\frac{1}{4}$ p. c. 4. *Spiritus Aurantii Compositus*, $\frac{1}{2}$ p. c. 5. *Syrupus Sarsaparillæ Compositus*, $\frac{1}{50}$ p. c. 6. *Tinctura Opii Camphorata*, $\frac{2}{5}$ p. c. 7. *Elixir Phosphori*, N.F., $\frac{1}{5}$ p. c.; 8. *Syrupus Trifolii Compositus*, N.F., $\frac{1}{50}$ p. c. 9. *Tinctura Opii et Gambir Composita*, N.F., $\frac{1}{10}$ p. c. FRUIT: 1. *Species Laxativæ*, N.F., 12.5 p. c. 2. *Species Pectorales*, N.F., 10 p. c. 3. *Tinctura Rhei Dulcis*, N.F., 4 p. c. ANETHOL: 1. *Elixir Anisi*, N.F., .35 p. c. 2. *Pulvis Rhei et Magnesiae Anisatus*, N.F., 8 p. c. 3. *Spiritus Ammoniae Anisatus*, N.F., 3 p. c. 4. *Spiritus Cardamomi Compositus*, N.F., $\frac{1}{2}$ p. c.

Unoff. Preps.: FRUIT: *Fluidextract*, m̄x–30 (.6–2 cc.). *Infusion*, 5 p. c., ʒj–8 (4–30 cc.).

PROPERTIES.—Aromatic stimulant and carminative, stomachic, once supposed a galactagogue, now doubted, although it does impart peculiar taste to secreting milk.

USES.—Flatulent colic, bronchitis, infantile catarrh. As a corrigent to griping cathartics, but here fennel is preferred; much used for flavoring food, confectionery, and in veterinary practice.

Allied Plants:

1. *Pimpinella Saxifraga* and *S. magna*; dried rhizome and roots; light yellowish-brown, aromatic, sweetish, pungent; composition, properties and uses similar to anise. Dose, gr. 10–30 (.6–2 Gm.); tincture, 20 p. c. (67 p. c. alcohol).

FŒNICULUM. FENNEL, *N.F.*

Oleum Fœniculi. Oil of Fennel, *U.S.P.*

Fœniculum vulgare, { The volatile oil distilled from the dried ripe
Miller. fruit.

Habitat. S. Europe, W. Asia; cultivated.

Syn. Fœnic., Fennel Seed (Fruit), Large, Giant, Sweet or Wild Fennel, Semen Fœniculi; Br. Fœniculi Fructus; Fr. Fenouil dulce, Fruits (Semences) de Fenouil; Ger. Fenchel (fructus, semen); Ol. Fœnic., Fennel Oil; Fr. Essence de Fenouil; Ger. Fenchelöl.

Fœ-nic'u-lum. L. fennel, dim. of *fenum* or *fœnum*, hay—*i. e.*, from a resemblance in odor.

Vul-ga're. L. *vulgaris*, common, ordinary—*i. e.*, kind growing wild, and in general use, originally not cultivated.

PLANT.—Large, perennial (biennial, annual) herb; stem .6–1.2 M. (2–4°) high, furrowed, green, glaucous, branched; rootstock thick; leaves twice pinnate, pinnæ very narrow, often only as wide as the thin petiole; flowers yellow, 15–20 in umbels, all parts with agreeable aromatic odor; sweet, aromatic taste. Fruit—Fœniculum, Fennel (Seed), *N.F.* The dried, ripe fruit of cultivated varieties with not more than 4 p. c. of foreign organic matter; mericarps usually separate, broadly elliptical 4–15 Mm. ($\frac{1}{6}$ – $\frac{3}{5}$ ') long, 1–3.5 Mm. ($\frac{1}{25}$ – $\frac{1}{7}$ ') broad, commissural surface flattened, some with a slender stalk, 2–10 Mm. ($\frac{1}{12}$ – $\frac{2}{3}$ ') long, dorsal surface convex, yellowish-green, 5 prominent ribs and short stylopodium at summit. Powder, yellowish-brown—endosperm cells with aleurone grains, calcium oxalate rosettes, oil tubes, few strongly lignified fibers, tracheæ few, fixed oil globules; solvents: alcohol (extracts virtues—volatile oil), hot water partially. Dose, gr. 10–30 (.6–2 Gm.).

CONSTITUENTS.—Volatile oil 2–6 p. c., fixed oil 12 p. c., sugar, mucilage, ash 9 p. c.

Oleum Fœniculi. Oil of Fennel.—This volatile oil distilled with water or steam, from the dried ripe fruit of cultivated varieties, is a colorless, pale yellow liquid, characteristic odor and taste of fennel, soluble in 8 vols. of 80 p. c. alcohol, 1 vol. of 90 p. c. alcohol, forming neutral solution, sp. gr. 0.963, dextrorotatory, congeals at 3° C. (37° F.); contains (about the same as oil of anise) pinene, phellandrene (C₁₀H₁₆—substances isomeric with oil of turpentine), dipentene (sometimes limonene), fenchone (bitter camphor), C₁₀H₁₆O, anethol, C₁₀H₁₂O, 60 p. c., also its isomer chavicol, anise ketone, anisic aldehyde, and anisic acid. Anethol gives largely the value, crystallizes out in the cold, and consists of two portions (1) liquid—eleoptene, (2) solid—stearoptene, the percentage of the two not always being uniform, some specimens of oil having more of the solid, while others (best) more of the liquid anethol. The oil from different sources is usually

without some of these constituents (either phellandrene, fenchone, or anethol), thus limonene occurs in the Macedonian; pinene and dipentene in the Saxon; fenchone in the Saxon, Galician, Moravian, Roumanian and Japanese, but not in the Roman and Macedonian; phellandrene in the wild (bitter), which, as a rule, has no anethol. *Tests*: 1. With ferric chloride T. S.—not blue or dark (abs. of volatile oils



FIG. 290.—*Fœniculum vulgare*: a, cross-section of fruit, b, flower with stamens.

containing phenol). 2. Dropped into water and not shaken—no milkiness (abs. of alcohol). Should be kept cool, dark, in well-stoppered amber-colored bottles, and if partly or wholly solidified must be completely liquefied by careful warming and thoroughly mixed before dispensing. Dose, Mij-5 (.13-.3 cc.).

ADULTERATIONS.—FRUIT: Exhausted fruit (yielding yellowish instead of dark brown infusion) often tinged with chrome-yellow (removed by rubbing with alcohol) and mixed with genuine, entire or ground; damaged wheat, oat, poppy and lentil seeds, stones, pieces of marble, colored yellow with iron-ochre, 16-66 p. c.; **OIL:** Alcohol, oil deprived more or less of anethol, oil of turpentine (lowering the congealing point), other volatile and fixed oils.

Commercial.—Plant variation (in size, habit, shape and cutting of leaves, number of rays in umbels, and shape of fruits) is due to the cultivation for centuries of the wild *F. vulgare*, thereby producing several well-marked new species (?) that flourish in all except cold climates, and in turn revert to the original wild form. Fruit is obtained mostly under cultivation from Germany, France, and Russia, although we produce much of our own supply; the French, German, and Indian conform to the *N.F.* description, the Russian and Japanese being

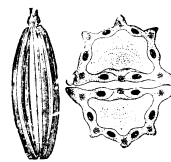


FIG. 291.—*Fœniculum* fruit: 3 diam.; transverse section, 8 diam.

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only half the size, as is also the *wild (bitter)* grown in France; all sometimes sold as *longs* and *shorts*, the former having preference. Cultivated in Italy not only for fruit, but for stem and young shoots as a vegetable, while the root is used in medicine with less satisfaction. There are five varieties: 1, *French (Roman, Sweet)*, large straight, curved, sweetish, greenish-yellow, by some referred to *F. dulce* or *F. sativum*, but under cultivation it soon reverts to the original wild form, *F. vulgare*; 2, *German (Saxon—F. vulgare)*, large, greenish, by some preferred; 3, *Indian (F. panmo'rium)*; 4, *Russian (Roumanian)*; 5, *Japanese*.

PREPARATIONS.—OIL: 1. *Aqua Fœniculi*. Fennel Water. (Syn., Aq. Fœnic.; Fr. Eau de Fenouil; Ger. Fenchelwasser.)

Manufacture: $\frac{1}{5}$ p. c. A saturated solution; similar to *Aquæ Aromaticæ*—triturate oil .2 cc. with purified talc 1.5 Gm., adding gradually recently boiled distilled water q. s. 100 cc., filter until clear. Dose, \mathfrak{z} ij–8 (8–30 cc.).

2. *Pulvis Glycyrrhizæ Compositus*, $\frac{2}{5}$ p. c. 3. *Elixir Anisi*, N.F., $\frac{1}{20}$ p. c. 4. *Elixir Catariæ et Fœniculi*, N.F., $\frac{1}{5}$ p. c. 5. *Fluidglyceratum Cascariæ Sagradæ Aromaticum*, N.F., $\frac{1}{10}$ p. c. 6. *Mistura Carminativa*, N.F., $\frac{1}{20}$ p. c. 7. *Syrupus Ficus Compositus*, N.F., $\frac{1}{10}$ p. c. 8. *Syrupus Rhamni Cathartica*, N.F., $\frac{1}{50}$ p. c.; FRUIT: 1. *Infusum Sennæ Compositum*, N.F., 2 p. c. 2. *Pilulæ Antiperiodicæ*, N.F., $\frac{1}{4}$ gr. 3. *Species Laxativæ*, N.F., 12.5 p. c. 4. *Tinctura Antiperiodica*, N.F., $\frac{2}{5}$ p. c.

Unoff. Preps.: FRUIT: *Fluidextract*, \mathfrak{m} x–30 (.6–2 cc.); *Infusion*, 5 p. c., \mathfrak{z} j–16 (4–60 cc.); *Syrup* (fruit or oil).

PROPERTIES.—Carminative, stimulant, diaphoretic, aromatic, stomachic, galactagogue; employed by the ancients very similarly.

USES.—Nausea, colic, amenorrhea, infantile flatulency; increases the secretion of milk, perspiration, mucus, urine; as a corrective to griping medicines, senna, rhubarb, etc. Much used in cattle medicines, the oil in cordials, elixirs.

Allied Plants:

1. *Angelica Archangelica*, *European Angelica*; 1. *Angelica Radix*, *Angelica Root*, N.F.—The dried rhizome and roots of this and other species with not more than 5 p. c. of stem-bases or other foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; 2. *Angelica Fructus*, *Angelica Fruit (Seed)*, N.F.—The dried ripe fruit of this and other species with not more than 3 p. c. of foreign fruits, seeds or other foreign organic matter; N. Europe, cultivated in Germany. Stout perennial herb, 1.8–2 M. (5–6°) high, purplish, smooth, hollow, jointed, leaves double pinnate; flowers greenish-white. Rhizome, short, thick, 5–10 Cm. (2–4') long, sometimes split, frequently crowned with leaf and stem-bases; roots numerous 10–20 Cm. (4–8') long, 5–7 Mm. ($\frac{1}{5}$ – $\frac{1}{3}$ ') thick at base, tapering to 1 Mm. ($\frac{1}{25}$ '), twisted together, dark brown, deep furrows; fracture short, smooth; odor aromatic, taste sweetish, pungent, aromatic, bitter. Powder, yellowish-brown—starch grains, tracheæ, brownish oil canals, parenchyma tissue

with starch, cork cells, wood-fibers, yellowish oil globules. Fruit, cremocarps oval, yellowish-brown 4-8 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') long, 3-6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') broad, 1-2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') thick, base notched, apex bearing 5 calyx teeth; mericarps joined or separate, each flat on one surface, convex upon the other, with 3 ribs, separated by grooves; odor characteristic, agreeable; taste aromatic, pungent, sweetish. Powder, light brown—spongy parenchyma, oil tubes, aleurone grains, calcium oxalate rosettes; solvent: alcohol; contain volatile oil .5 p. c., acrid resin (angelicin), angelic acid, tannin, pectin. Tonic, stimulant, carminative, diaphoretic, emetic; typhoid condition, bronchitis, intermittents; rheumatism, gout, painful swollen parts, condiment, Dose, gr. 10-30 (.6-2 Gm.); Root: 1. *Fluidextractum Angelicæ Radicis* (92 p. c. alcohol), dose, ℥xv-30 (1-2 cc.); Infusion, Tincture, Fresh juice (poisonous); Fruit: 1. *Pilulæ Antiperiodicæ*, $\frac{1}{2}$ gr. (.03 Gm.); 2. *Tinctura Antiperiodica*, $\frac{4}{5}$ p. c.



FIG. 292.—*Angelica*—flowering stem and cross-section of cremocarp: *a*, the seed; *f*, the 2-ribbed wings (mericarps).

3. *Anethum* (*Peuced'anum*) *grave'olens*, *Anethi Fructus*, *Dill Fruit* (Br.).—S. Europe, Asia. Herb .6 M. (2°) high; leaves finely divided, glaucous; flowers yellow; fruit oblong, 4 Mm. ($\frac{1}{6}$ ') long, brown, smooth, mericarps 2, flat-faced, each having 5 ribs, 6 vittæ, of which 3 are filiform, 2 lateral ones broadly winged, light colored, odor, and taste spicy, caraway-like; contains volatile oil 3-4 p. c., fixed oil. Carminative, stimulant, stomachic, condiment, flavoring; as a substitute for anise and caraway in flatulent colic, hiccough, indigestion. Dose, gr. 10-30 (.6-2 Gm.); volatile oil (*Oleum Anethi*, Br.), ℥ij-5 (.13-.3 cc.); *Aqua Anethi* (Br.), 10 p. c., ℥ss-2 (15-60 cc.).

4. *Opop'anax* *Opopanax* (*Chiro'nium*).—S. Europe. Root and stem exude yellowish milk, hardening into reddish-brown tears, having a waxy luster, and a bitter, balsamic taste.

ASAFÆTIDA. ASAFETIDA, U.S.P.

Ferula { **Asafoetida**, *Linné*,
fœtida, *Regal*,
 and other species. } { The gum-resin obtained by incising the
 living rhizomes and roots, yielding not
 less than 50 p. c. alcohol-soluble extrac-
 tive, and not more than 15 p. c. acid-
 insoluble ash.

Habitat. Persia, Turkestan, Afghanistan; mountain slopes, barren desolate wastes, sandy deserts.

Syn. Asafoet., Gum Asafetida, Devil's Dung (*Stercus Diaboli*), Food of the Gods (*Cibus Deorum*), Gummi-resina Asafoetida; Fr. Asa Fœtida; Ger. Asa fœtida, Asant, Stinkasant, Teufelsdreck.

Fer'u-la. L. fr. *ferio*, *ferire*, to strike—*i. e.*, stems used as rods, with which, at one time, schoolboys were punished.

Fœt'i-da. L. *fatidus*, fetid, stinking—*i. e.*, the odor of the plant, and its secretion.

As'a-fœt'i-da. L. fr. Pers. *aza*, *asa*, mastic, + L. *fatida*, fetid, stinking—stinking mastic—*i. e.*, its odor, resemblance, and consistency.

PLANTS.—Large perennial herbs; stems 1.5–3 M. (5–10°) high, 2.5–7.5 Cm. (1–3') thick, greenish, erect, furrowed, smooth; leaves few, radical and cauline, mostly near stem's base, .3–.6 M. (1–2°) long and broad, on stout round petioles, 22.5 Cm. (9') long, expanding below into inflated sheath surrounding one-half the stem, imparipinnate, ternately divided, each bipinnate with few pinnæ, leaflets few; flowers small, monœcious, yellow; roots conical, 45 Cm. (18') long, 10–15 Cm. (4–6') thick, branched, dark brown, internally whitish. **GUM-RESIN** (asafetida), in soft mass, semi-liquid, irregular pliable masses composed of agglutinated tears of variable size imbedded in yellowish-brown matrix, or in loose ovoid tears, 1–4 Cm. ($\frac{2}{3}$ –1 $\frac{3}{4}$ ') broad, surface often with streaks of violet, yellowish-red, brownish, few vegetable fragments; soft or tough (fresh), hard even brittle (dry); fresh fractured surface of tears milky-white and opaque, changing gradually on exposure to pinkish, reddish-purple; tears moistened with water—milky-white; odor persistent, alliaceous; taste bitter, alliaceous, acrid. **POWDER**, light brown. *Tests:* 1. Triturate with water (3)—milk-white emulsion, yellowish with alkalies. 2. Heat tear with sulphuric acid—reddish-brown solution, which diluted with water, filtered, + excess of alkali—blue fluorescent solution, more pronounced with excess of ammonia water. 3. Alcohol filtrate (from assay) 10 cc., + few drops of phloroglucinol T. S. + few drops of hydrochloric acid—cherry-red. 4. Incinerate—ash 15 (gum-resin)–30 (powder) p. c. 5. Alcoholic filtrate 5 cc., + a few drop of ferric chloride T. S.—olive green (abs. of most foreign resins); alcoholic filtrate 10 cc., + hydrochloric acid until faint turbidity—bluish-green, fading on standing (abs. of galbanum). 6. Emulsion 2 cc. + water 5, + sodium hypobromite T. S. (5) to form separate layer—no red color (abs. of ammoniac). *Impurities:* Foreign resins, ammoniac, galbanum, rosin, etc. *Solvent:* alcohol. Dose, gr. 3–10 (.2–.6 Gm.).

ADULTERATIONS.—Divisible into 4 groups: 1, plant's tissues (insoluble in alcohol); 2, local associated gums; 3, earthy substances (ash, alcohol-insoluble residue); 4, turpentine products. Although some of these are added after reaching Europe, most of the adulterating occurs in its native country at Herat, before being conveyed to Bombay, where are used red clay (tawah), sand, stones, wheat or barley flour, gypsum, calcium carbonate, calcium sulphate, cloth, bristles, wood, rosin, resins, translucent gums—all amounting sometimes to 60–80 p. c., and yielding an ash of 15–20–40 p. c.; at present rigorously inspected with us so as to comply with official requirements.

Commercial.—Asafetida has been known in the East from early times and much studied since 1687; plants endure many years, producing each spring simply a crop of radical leaves but finally a scape with flowers and then die; the oldest are most productive, none being cut until the 5th year. In April, when leaves begin to wither, collection is started by pulling off the leafy stem, laying bare the upper portion of root-stock, 5–7.5 Cm. (2–3') deep, and cutting a slice from

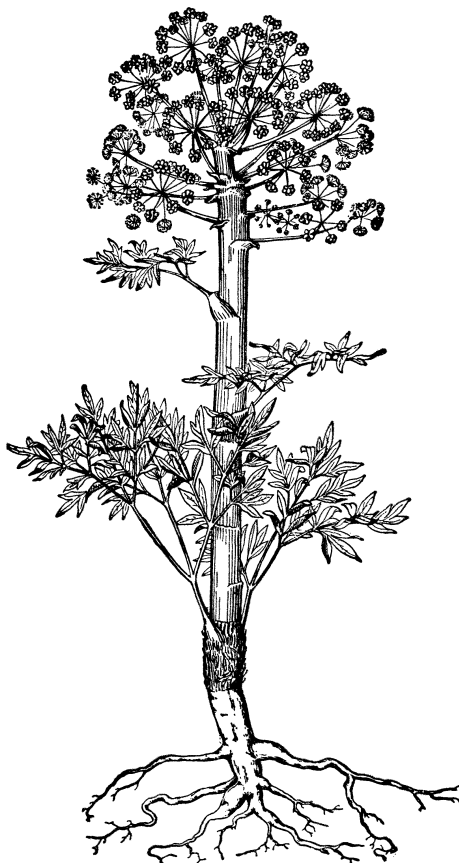


FIG. 293.—*Ferula fætida*.

the top, whereupon milky juice exudes but is not collected; the fresh exposed surface is protected from the sun's heat by a covering (*khora*), a crude domed structure several inches high of herbage and twigs, surmounted by clay and stones, save an opening on the north. On returning in about 40 days (May) the cut surface is found covered with a thick, gummy, reddish substance, not milky but in more or

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less irregular lumps resembling ordinary asafetida, which is scraped off into cups or leather (kid, goat) bags, and a thin slice of the root removed for fresh exudation—a process repeated at 10-day intervals until the root perishes or is exhausted (2 months); each subsequent cutting yields a thicker, better juice provided the root be screened properly all the time from the sun. The product from many plants is mixed, further hardened in the sun and forwarded to Herat, whence it enters commerce via Bombay, in skins, mats (80–90 pounds; 36–40.5 Kg.), boxes (200–400 pounds; 91–182 Kg.), and casks. Each root yields $\frac{1}{2}$ –32 ounces (.015–1 Kg.); the purest, called natively *hing* (usually soft, transparent, and considered a stem product) is consumed in India, while the mixed, called *hingra*, alone is exported. It may be powdered when excessively cold, or by drying over freshly burnt lime or exposure to currents of warm air, then reducing at low temperature; starch or magnesium carbonate as a diluent will maintain powdered form. There are four varieties: 1, *Amygdaloid (Lump)*, official kind, considered most reliable; 2, *Tears*, inferior, consisting of various-sized tears (pea, walnut), yellowish, roundish, flattened, oval, irregular-shaped, distinct or adhesive and agglutinated; 3, *Stony*, various-sized, angular or rounded pieces of gypsum and other earthy matters agglutinated or merely coated with the milky juice, and should not be used in medicine; 4, *Liquid*, white, opaque, syrupy, or semi-fluid mass turning brown with age, possibly the first exudate or due to moist season.

CONSTITUENTS.—Gum 20–30 p. c., Resin 60–70 p. c., Volatile oil 6–9 p. c., vanillin .06 p. c., free ferulic (ferulaic) acid 1.3 p. c., free asaresino-tannol 1 p. c., formic, acetic, valeric and malic acids, ash (pure) 3–4 p. c.

Gum.—Partly soluble in water, the residue (bassorin) dissolves in alkalies, being reprecipitated by acids.

Resin.—Reddish-brown, amorphous, soluble in ether except 3–4 p. c. It is the ferulic acid ester of asaresino-tannol, and contains ferulic acid, $C_{10}H_{10}O_4$, and resino-tannol, $C_{24}H_{35}O_5$; upon dry distillation yields umbelliferon, $C_9H_6O_3$, and blue-colored oils; when fused with potassium hydroxide gives resorcin and protocatechuic acid.

Volatile Oil.—This, to which the odor and stimulating property are due, is obtained by distilling with water or alcohol; sp. gr. 0.980; it is a mixture of several sulphides of ferulyl, ($C_7H_{14}S_2$ and $C_{11}H_{20}S_2$), two terpenes, ($C_{10}H_{16}$ and $C_{10}H_{16}O$), the latter yielding a sesquiterpene, $C_{15}H_{24}$, and a blue-colored oil in the higher boiling portions.

PREPARATIONS.—1. *Emulsum Asafetidæ*. Emulsion of Asafetida. (Syn., Emuls. Asafœt., Milk of Asafetida, Mistura (Lac) Asafœtidæ; Fr. Mixture (Lait) d'Asafœtida; Ger. Asafœtidaemulsion, Stinkasantmilch.)

Manufacture: 4 p. c. Rub asafetida (tears, selected masses) 4 Gm. in a mortar with water 90 cc., gradually added until uniform emulsion results, strain, rinse mortar and strainer with water q. s. 100 cc., mix thoroughly. Dose, \mathfrak{z} ss–1 (15–30 cc.).

2. *Pilulæ Asafætidiæ*. Pills of Asafetida. (Syn., Pil. Asafæt.; Fr. Pilules d'Asafétide; Ger. Asafætidapillen.)

Manufacture: Incorporate intimately asafetida 20 Gm., soap 6 Gm., using water q. s. 100 pills. Dose, 2–5 pills.

3. *Tinctura Asafætidiæ*. Tincture of Asafetida. (Syn., Tr. Asafæt.; Fr. Teinture d'Asafétide; Ger. Tinctura Asæ-fætidiæ, Stinkasant-tinktur.)

Manufacture: 20 p. c. Similar to *Tinctura Cardamomi Composita*, page 137; menstruum: alcohol. Dose, ʒss–1 (2–4 cc.).

Prep.: 1. *Mistura Magnesiæ, Asafætidiæ et Opii*, Dewees' Carminative, N.F., 7.5 p.c. Dose, ʒss–4 (2–15 cc.).

4. *Pilulæ Aloes et Asafætidiæ*, N.F., 1.5 gr. (.09 Gm.).

Unoff. Preps.: *Asafetida Præparata*—exhaust with alcohol, thereby eliminating gum, evaporate or pour solution into slightly acidulated water, getting resin and volatile oil. *Fetid Spirit of Ammonia* (Br.), asafetida 7.5 p. c., stronger ammonia water 10, alcohol q. s. 100. *Compound Galbanum Pill*. *Enema* (1 in 64 water). *Plaster*. *Suppositories*.

PROPERTIES.—Similar to other drugs with volatile oils; stimulant, antispasmodic, expectorant, laxative, (emmenagogue, anthelmintic, condiment).

USES.—Hysteria, hypochondriasis, convulsions, spasms, whooping-cough, measles, asthma, coughs, catarrhs, flatulent constipation, chorea, nervous apoplexy, consumption. Used in India, Persia, etc., as a condiment, for flavoring food, etc., like garlic and onions; acts here as a stimulant to the bowels and digestion. The natives value it highly, not only for its agreeable effect, but also for the odor and taste; a tolerance of this latter in most cases is acquired gradually by usage, as at first it is often nauseous and positively disgusting.

Incompatibles: Cerebral and arterial depressants, cold, acids, neutral salts; water with alcoholic liquid preparations.

Synergists: Cerebral excitants, alcohol, ether, gum-resins, balsams, aromatics, volatile oils containing sulphur and phosphorus. *F. Narthex* (*Narthex Asafætida*), U.S.P. 1820–1870, is a plant almost identical with *F. fætida*, and from it much gum-resin is collected and sent in with the official, as it is nearly impossible to recognize plant origin by the product.

Allied Plants:

1. *Ferula Sum'bul*, *Sumbul*, *Musk-root*, N.F.—The dried rhizome and roots of this, or other closely related species possessing a characteristic musk-like odor, with not more than 2 p. c. of foreign organic matter; C. and N. W. Asia, Turkestan, Russia—mountains. Perennial herb, dying after flowering, 2–3 M. (6–10°) high, 4 Cm. (1½') thick at base, solid, purplish, exuding milk juice when injured; leaves radical and cauline, tripinnate; leaflets ovate, dentate, bright green; flowers polygamous; fruit 12 Mm. (½') long, 6 Mm. (¼') broad, mericarps with 3 dorsal ridges, no dorsal vittæ. Rhizome, fusiform, vertical, in transverse segments, 2.5–10 Cm. (1–4') long, 2.5–7 Cm. (1–2½') thick,

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extremely light in weight, light brown, wrinkled, heavily annulate; fracture short, fibrous, spongy, yellowish, brownish resinous patches; odor peculiar, musk-like; taste bitter, aromatic. Powder, grayish-brown—tracheæ, few epidermal cells, sieve tissue, occasional parenchyma fragments, few starch grains; solvent: alcohol (67–80 p. c.); contains volatile oil (bluish, peppermint taste) .33–1 p. c., resin (soft,

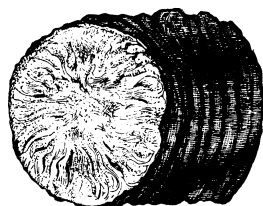


FIG. 294.—Sumbul root: section.

musk odor) 9 p. c., fixed oil 17 p. c., angelic (sumbulic) acid, valeric acid, bitter extractive, sugar, starch, ash 5–6 p. c. Stimulant, carminative, tonic, nervine (resembles musk and valerian), antispasmodic; hysteria, female nervousness, epilepsy, chlorosis, amenorrhea, hypochondriasis, often combined with asafetida in nervous troubles, with iron and arsenic in chlorosis. Dose, gr. 10–30 (.6–2 Gm.); 1. *Extractum Sumbul* (80 p. c. alcohol—yield 15 p. c.), dose, gr. 2–5 (.13–.3 Gm.); 2. *Tinctura*

Sumbul, 10 p. c. (67 p. c. alcohol), dose, ʒss–2 (2–8 cc.). Fluidextract. Resin.

2. *F. galbaniflua*, *Galbanum*.—The gum-resin, U.S.P. 1820–1880; N. Persia. Plant 1.3–1.6 M. (4–5°) high, 2.5 Cm. (1') thick, solid, striate, leaves radical and cauline; flowers yellow; fruit 12 Mm. ($\frac{1}{2}$ ') long, winged near face of mericarps. Gum-resin in tears size of pin-head to that of a pea, brownish-yellow, inside milk-white, waxy, odor peculiar, balsamic, taste bitter, acrid, with water gives milky emulsion. Obtained from incisions; contains gum 15–20 p. c., resin 60–66 p. c., volatile oil 10–20 p. c., free umbelliferon .25 p. c., umbelliferon combined with galbano-resino-tannol 20 p. c., ash 8–10 p. c. Stimulant, expectorant, antispasmodic; hysteria, chlorosis, catarrh, amenorrhea, rheumatism, bronchitis, for church incense, tumors, boils, in pill (*Pilula Galbani Composita*), emulsion, plasters, tincture. Dose, gr. 5–20 (.3–1.3 Gm.). It is intermediate between asafetida and ammoniac.

3. *Dore'ma Ammoni'acum*, *Ammoniacum*, *Ammoniac*.—The gum-resin, U.S.P. 1820–1890; E. Persia, Turkestan. Plant of striking appearance, dying after flowering; stem 1.6–2 M. (5–7°) high, greenish, joints greenish-purple; flowers small, white; leaves—radical and cauline. Gum-resin (ammoniac) exudes from stem and root, through fissures (due to varying temperature) or animal and insect punctures. It is in *tears* or *cakes*, the former preferred when 1.5–6 Mm. ($\frac{1}{16}$ – $\frac{1}{4}$ ') thick, yellowish, fracture conchoidal, waxy, milk-white; odor peculiar: taste acrid, bitter, nauseous; contains gum 18–28 p. c., resin 70 p. c., volatile oil 1–4 p. c., ash 1–4 p. c. Stimulant, expectorant, rubefacient, similar to but less powerful than asafetida; bronchitis, chronic catarrh, asthma, pleurisy; externally resolvent in white swelling, tumors, glandular enlargements. Dose, gr. 10–30 (.6–2 Gm.); emulsion (water—milky), 4 p. c., ʒss–1 (15–30 cc.). The root, under the name

of Bombay Sumbul or Boi, although of closer texture, firmer, denser, and more reddish is used largely to adulterate the "false sumbul" so prevalent with us in the past, but it in reality resembles more closely our present *Ferula Sumbul* root of the *N.F.* *D. Au'cheri*, W. Persia, yields also a similar product (ammoniac), while *D. robu'stum* gives a dissimilar gum-resin. *Ferula tingita'na*, African Ammoniac, is believed

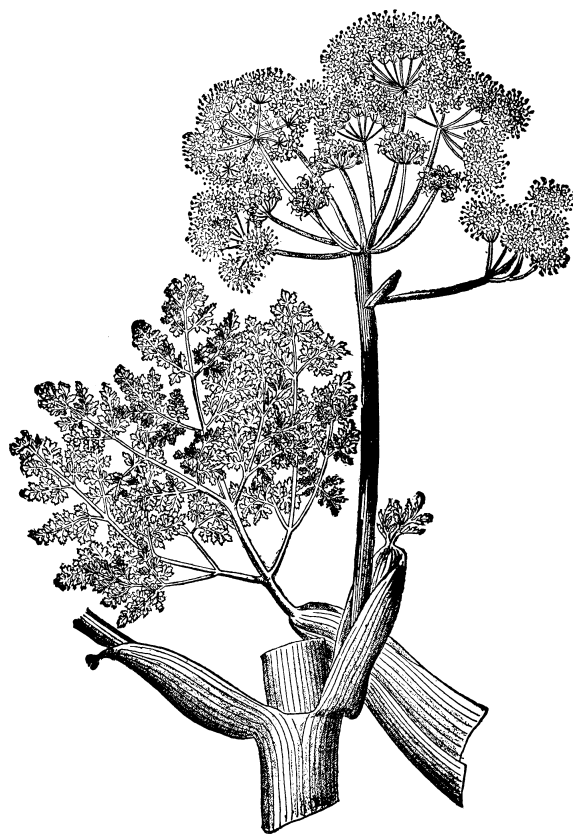


FIG. 295.—*Ferula galbaniflua*.

to be the "Ammoniacum" of the ancients; it is darker than our ammoniac, with agreeable odor like benzoin, but bitter, acrid taste; contains gum 9 p. c., resin 68 p. c., and yields umbelliferon.

4. *Heracle'um lana'tum*, Cow-parsnip, Masterwort.—The root, U.S.P. 1820-1850; United States. Plant 1.5-3 M. (5-10°) high, 2.5-4 Cm. (1-1½') thick, pubescent, hollow; root resembles parsley, disagreeable

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odor, acrid taste, fruit has each mericarp with 5 ribs and 6 vittæ; contains volatile oil, resin. Stimulant, carminative; epilepsy, dyspepsia, warts, escharotic; in infusion, juice. Dose, ʒss-1 (2-4 Gm.).

5. *Daucus Carota*, Carrot (Seed).—The fruit, U.S.P. 1820-1870; N. Asia, Europe; biennial herb, .6-1 M. (2-3°) high, hispid; flowers July-Sept., white; root fleshy, fusiform, aromatic, edible; fruit 4 Mm. ($\frac{1}{8}$ ') long, oval, flat, grayish-brown, each mericarp with 9 ribs, 6 vittæ; odor aromatic; taste pungent; contains volatile oil, fixed oil. Stimulant, diuretic, excitant; dropsy, strangury, nephritic affections, amenorrhea, ulcers, eczema, itching; in infusion, fluidextract. Dose, gr. 10-30 (.6-2 Gm.).

6. *Cornus flor'ida*, Cornus, Dogwood Bark, N.F., Cornaceæ.—The dried root-bark with not more than 5 p. c. of adhering wood nor 2 p. c. of other foreign organic matter; N. America. Small tree, 4.5-10.5 M. (15-35°) high, 12.5-25 Cm. (5-10') thick, flowers greenish with 4 large white involucral leaves, petaloid; fruit bright red. Bark, in irregular, chip-like pieces, portions of quills less than 5 Cm. (2') long, bark 1-4 Mm. ($\frac{1}{25}$ - $\frac{1}{6}$ ') thick, scaly, dingy brown, reddish where corky layers removed, heavy cork patches wanting (abs. of trunk bark); inner surface reddish-brown, short striæ; fracture short, roughened from stone cells; odor slight; taste bitter, astringent. Powder, reddish-



FIG. 296.—*Dorema Ammoniacum*.

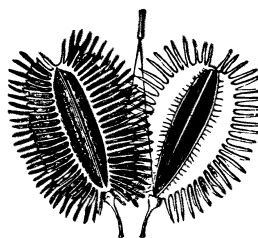


FIG. 297.—*Daucus Carota*: magnified 5 diam.

brown—parenchyma cells with amorphous substance, stone cells, numerous calcium oxalate rosette crystals, starch grains, cork with brownish pigment; lignified fibers and tracheæ very few or wanting (abs. of trunk bark and wood); solvent: diluted alcohol; contains

cornin (cornic acid), tannin 3 p. c., resin, ash 10 p. c. Astringent, tonic, febrifuge, stimulant; when fresh—emetic; formerly in large doses as an antiperiodic, given between the paroxysms, instead of cinchona, but owing to inferiority now seldom employed. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Corni* (glycerin 15, diluted alcohol 85). Decoction, 5 p. c., \mathfrak{z} j–2 (30–60 cc.).

7. *C. circinalis*, *Round-leaved Dogwood*.—The bark, U.S.P. 1820–1860; N. America. Shrub 1.6–3 M. (5–10°) high, branches greenish, warty; leaves round, 10–12.5 Cm. (4–5') wide, woolly beneath; flowers white cymes; fruit, blue drupe. Bark quilled, curved, greenish, brownish-gray, with suberous warts or longitudinal lines, inside cinnamon-brown; used like *C. florida*, but is more bitter and less astringent.

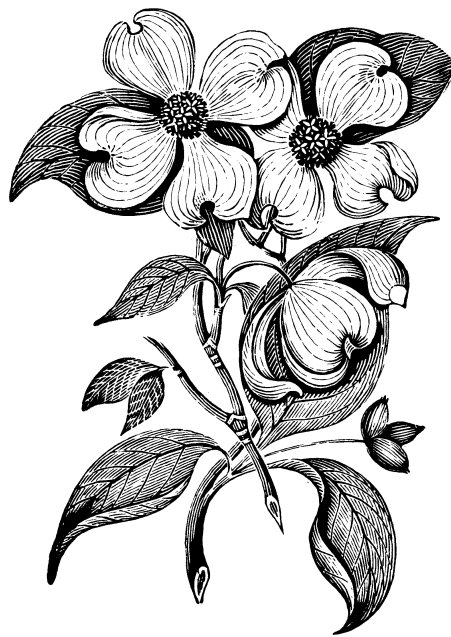


FIG. 298.—*Cornus florida*.

8. *C. Amo'mum* (*seric'ea*), *Silky Cornel*, *Swamp Dogwood*.—The bark, U.S.P. 1820–1870; N. America. Shrub 1.6–3 M. (5–10°) high, branches purple; leaves elliptical, silky beneath; flowers yellowish, woolly cymes; fruit pale blue. Bark quilled, thin, outside purplish-brown, less warty than preceding, otherwise resembles it; used like *C. florida*, but is less bitter and astringent.

[Note: Pages 458-459 are missing from the original text. DM]

ERICACEÆ

SERIES 2: **GAMOPETALÆ**. Petals more or less united, rarely separate or wanting.

52. ERICACEÆ. Heath Family.

Er-i-ka'se-e. L. *Eric-a* + aceæ, Gr. *ἐρείκη*, heath, fr. *ἐρείκω*, to break—*i. e.*, because some species break or dissolve stone in the bladder. Shrubs, small trees. Distinguished by astringent properties; leaves evergreen, exstipulate; calyx 4-5-cleft, inferior, corolla regular, hypogynous, 4-5-cleft; stamens as many or twice corolla-lobes, free from but inserted with corolla; anthers 2-celled; ovary 2-5-celled, style 1; fruit, capsule, or berry, edible; universal; astringent, tonic, diuretic, narcotic, poisonous.

Genera: 1. **Gaultheria**. 2. **Arctostaphylos**.

GAULTHERIA. GAULTHERIA.

Methylis Salicylas. Methyl Salicylate, *U.S.P.*

<p>Gaultheria procumbens, Linné, or Betula lenta, Linné.</p>	{	<p>An ester (compound ether) obtained by distilling leaves of the former, or bark of the latter, and produced synthetically.</p>
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Habitat. N. America, Newfoundland to Georgia, Minnesota; cold damp woods (shade of evergreens); forests.

Syn. Wintergreen, Spring (Creeping, Spicy, Aromatic) Wintergreen, Checker (Partridge) berry, Tea (Spice) berry, Mountain Tea; Black (Cherry, Mahogany, Sweet, Spice) Birch, Mountain Mahogany; Methyl, Salicyl., Oleum Gaultheriæ, U.S.P. 1900, Oil of Wintergreen; Oleum Betulæ, U.S.P. 1900, Oil of Sweet Birch, Oil of Teaberry; Fr. Salicylate de Méthyle; Ger. Künstliches Wintergrünöl.

Gaul-the'ri-a. L. dedicated by Kalm to Dr. Gaulther, of Quebec.

Pro-cum'bens. L. *pro*, forward, + *cumbere*, to lie, lying down—*i. e.*, the reclining habit of the stem.

Bet'u-la. L. fr. Celtic *betu*, the birch—*i. e.*, its original name.

Len'ta. L. *lentus*, soft, pliant, flexible—*i. e.*, its stems and branches.

PLANTS.—*Gaultheria procumbens*, stems slender, creeping on or below the surface, branches ascending, leafy at summit, 5-15 Cm. (2-6') high; leaves obovate, alternate, evergreen, spicy, mucronate, serrate; flowers, June-Sept., few, white, nodding, mostly single in the axils; fruit (formed of calyx) bright red berries (capsules), 5-celled, spicy, aromatic; *Betula lenta*—Betulaceæ, tree 12-24 M. (40-80°) high, .6-1 M. (2-3°) thick; bark dark brown, close, smooth, sweet, aromatic; leaves 7.5-10 Cm. (3-4') long, 2.5-5 Cm. (1-2') broad, ovate, acuminate, serrate, petiolate; flowers, staminate (catkins) and pistillate; bark not separable into layers, cambium when wounded in the spring, exudes sweet, acid, edible juice; wood reddish, strong, compact.

CONSTITUENTS.—Methyl Salicylate (Volatile oil), resin, tannin 3-6 p. c., gaultherin, betulin.

Methylis Salicylas. **Methyl Salicylate**, $C_6H_4(OH)CO_2CH_3$ or $CH_3C_7H_5O_3$.—While this constitutes 98 p. c. of the commercial oils of gaultheria and betula, it is obtained largely synthetically by distilling salicylic acid, or a salicylate, with methyl alcohol and sulphuric acid (abstracting water as eliminated), the methyl salicylate distilling over and floating on the surface— $HC_7H_5O_3 + CH_3OH + H_2SO_4 = CH_3C_7H_5O_3 + H_2O + H_2SO_4$. It is a colorless, yellowish, reddish liquid, characteristic odor and taste of gaultheria, soluble in 70 p. c. alcohol (7), with not more than slight cloudiness, slightly in water, miscible with alcohol and glacial acetic acid; alcoholic solution neutral, slightly acid, sp. gr. 1.183 (synthetic), 1.177 (from gaultheria or betula); boils at $221^\circ C.$ ($430^\circ F.$); optically inactive (synthetic and

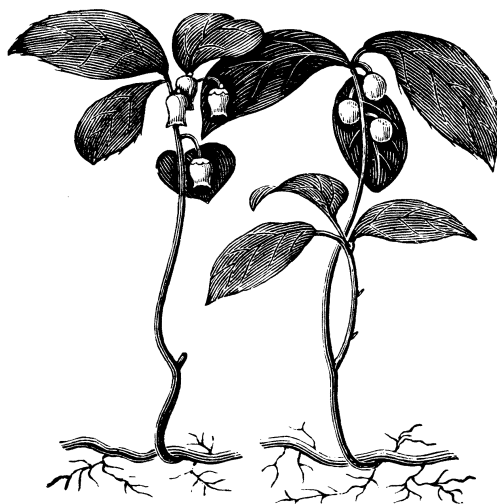


FIG. 299.—*Gaultheria procumbens*.

betula), slightly levorotatory (gaultheria); contains 98 p. c. of methyl salicylate. *Tests*: 1. Shake a drop with 5 cc. of distilled water, + a drop of ferric chloride T. S.—deep violet color. 2. Agitated 1 cc. with potassium hydroxide T. S. 10 cc.—clear, slightly cloudy, colorless or faintly yellowish, without separation of oily drops (abs. of other volatile oils, petroleum products). *Impurities*: Heavy metals, volatile oils, petroleum products. The label must indicate definitely its specific source. Should be kept cool, in well-stoppered, amber-colored bottles. Dose, m̄j-10 (.06–.6 cc.).

PREPARATIONS.—1. *Emulsum Olei Morrhuæ*, $\frac{2}{5}$ p. c. 2. *Fluidextractum Cascaræ Sagradæ Aromaticum*, $\frac{1}{50}$ p. c. 3. *Syrupus Sarsaparillæ Compositus*, $\frac{1}{50}$ p. c. 4. *Cataplasma Kaolini*, N.F., $\frac{1}{5}$ p. c. 5. *Denti-*

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fricium, N.F., $\frac{8.75}{1000}$ p. c. 6. *Inunctum Mentholis Compositum*, N.F., 10 p. c. 7. *Liquor Antisepticus*, N.F., $\frac{12}{100}$ p. c. 8. *Liquor Antisepticus Alkalinus*, N.F., $\frac{1}{20}$ p. c. 9. *Liquor Ferri Salicylatis*, N.F., $\frac{1}{5}$ p. c. 10. *Liquor Pepsini Antisepticus*, N.F., $\frac{1}{20}$ p. c. 11. *Nebula Aromatica*, N.F., $\frac{1}{2}$ p. c. 12. *Nebula Mentholis Composita*, N.F., $\frac{1}{2}$ p. c. 13. *Odontalgicum*, N.F., 45 p. c. 14. *Petroxolinum Methylis Salicylatis*, N.F., 20 cc. in 100 cc. product. 15. *Syrupus Trifolii Compositus*, N.F., $\frac{1}{50}$ p. c. 16. *Trochisci Ulmi*, N.F., $\frac{1}{33}$ p. c.
Unoff. Preps.: Oil of *Gaultheria* (Br.), m̄j–10 (.06–.6 cc.). Spirit, 5 p. c., ʒj–2 (4–8 cc.).



FIG. 300.—*Chimaphila umbellata*: upper part of flowering stem.

PROPERTIES AND USES.—Similar to salicylic acid: Antiseptic, analgesic, stimulant, carminative, flavoring; muscular rheumatism, lumbago, sciatica; locally applied upon lint over swollen joints, acute articular rheumatism, tic douloureux, etc. Amount may be increased, if no impairment of digestion, until full effect produced.

Poisoning: Large quantities produce drowsiness, cerebral congestion, delirium, gastric irritability, vomiting, purging, intestinal pain, rapid pulse, hot dry skin, difficult breathing; give diffusible stimulants—ether, alcohol, ammonia, etc.

Gaultheria (Leaves), U.S.P. 1820–1880; *Oleum Gaultheriæ*, U.S.P. 1820–1900; *Oleum Betulæ* (*Volatile*), U.S.P. 1890–1900.

Allied Plants:

1. *Chimaph'ila umbella'ta*, *Chimaphila*, *Pipsissewa*, *Princes' Pine*.—Pyrolaceæ, *N.F.*—The dried leaves with not more than 5 p. c. of stems or other foreign organic matter; N. America, Europe, Asia—dry woods. Perennial evergreen herb, 10–25 Cm. (4–10') high; rhizome creeping, yellowish; flowers terminal umbel, corymb, white tinged with red, fragrant. Leaves, oblanceolate, 2.5–7 Cm. (1–3') long, 8–20 Mm. ($\frac{1}{3}$ – $\frac{1}{2}$ ') broad, upper portion coarsely, sharply serrate, obtuse, lower cuneiform, nearly entire, coriaceous, dark green, paler beneath; odor slight; taste astringent, bitter. Powder, greenish-brown—epidermal tissue, stomata, palisade and spongy parenchyma with chloroplastids, tracheæ, reddish amorphous substance, calcium oxalate rosettes, starch grains, few stem and root-stock fragments; solvents: diluted alcohol, boiling water; contains chimaphilin, tannin, arbutin, ericolin, urson, volatile oil, resin. Astringent, tonic, diuretic (similar to buchu, uva ursi, pareira, scoparius), rubefacient; scrofula, rheumatism, dropsy, scanty urine, gravel, hematuria, gonorrhea, skin affections, diarrhea, gout, ulcers, tumors. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Chimaphilæ* (diluted alcohol), dose, ʒss–1 (2–4 cc.); 2. *Fluidextractum Stillingiæ Compositum*, 12.5 p. c.: Prep.: 1. *Syrupus Stillingiæ Compositus*, 25 p. c. Decoction, Extract.

2. *C. macula'ta*, *Spotted Wintergreen* (*Pipsissewa*).—The leaves, U.S.P. 1830; N. America. Herb, 7.5–15 Cm. (3–6') high, leaves 2.5–5 Cm. (1–2') long, 12 Mm. ($\frac{1}{2}$ ') wide, ovate-lanceolate, obtuse at base, toothed, upper surface variegated (spotted) with white along midrib and veins; flowers purplish-white.

3. *Pyr'ola rotundifo'lia*, *Round-leaved Wintergreen*; *P. ellip'tica*. *Shin-leaf*, and *P. chloran'tha*, *Greenish-flowered Wintergreen*.—These three have racemes of nodding wax-like flowers; leaves resembling and containing same as *Chimaphila umbellata*, and used similarly.

UVA URSI. UVA URSI, *U.S.P.*

Arctostaphylos Uva-ursi, { The dried leaf with not more than 5 p. c.
(*Linné*) *Sprengel*. { stems or other foreign organic matter.

Habitat. Europe, Asia, N. America, United States, south of New Jersey, westward to California, New Mexico; rocky or sandy soil—pine woods.

Syn. Bearberry, Red Bearberry, Upland (Mountain, Wild) Cranberry, Universe Vine, Mountain Box, Bear's Grape (Bilberry, Whortleberry), Barren Myrtle, Kinnikinnick, Fox (Meal) berry; Br. *Uvæ Ursi Folia*; Fr. *Busserole*, *Raisin d'Ours*; Ger. *Bärentraubenblätter*.

Arc-to-staph'y-los. L. fr. Gr. *ἄρκτος*, a bear, + *σταφυλή*, a bunch of grapes—*i. e.*, the roughness of the fruit and these berries occurring in clusters like grapes.

U'va-ur'si. L. *uva*, a grape, + *ursus, ursi*, a bear, of a bear—bear-berry—*i. e.*, berries are rough or bearish.

PLANT.—Low evergreen shrub; stem creeping, young branches rising obliquely upward several inches; flowers May, 3–15 together, pinkish-white, racemes, calyx reddish, corolla urceolate, reddish-white or white

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with red lips; fruit autumn, 6 Mm. ($\frac{1}{4}$ ') broad, fleshy, bright red berry, pericarp thick, 5-seeded, resembles currants in appearance and clusters. LEAVES (LEAF), obovate, oblong-spatulate, 12–30 Mm. ($\frac{1}{2}$ – $1\frac{1}{5}$ ') long, 5–13 Mm. ($\frac{1}{5}$ – $\frac{1}{2}$ ') broad, entire, slightly revolute, apex obtuse, rounded, base cuneate, tapering into short, stout petiole; dark green, glaucous, shiny, finely reticulate; under surface yellowish-green, slightly pubescent, especially on midrib, coriaceous; fracture short; odor aromatic, tea-like; taste astringent, somewhat bitter. POWDER, olive-green—irregular fragments, epidermal cells polygonal, elliptical stomata surrounded by 5–18 neighboring cells, mesophyll with chloroplastids, irregular masses of carbohydrates, fibro-vascular bundles, spiral tracheæ, sclerenchymatous fibers, crystal-fibers, cells

FIG. 301.—*Arctostaphylos Uva-ursi*.

with yellowish-brown content, bluish-black with ferric chloride T. S. Tests: 1. Cover over .1 Gm. (powder) on watch-crystal with another watch-crystal, heat gently—crystalline sublimate (hydroquinone) forms in long rods, feather-like aggregates, polarizing light with brilliant colors. 2. Macerate 1 Gm. with boiling water 10 cc., shake occasionally until cold, filtrate with a few drops of ferrous sulphate T. S.—grayish-purple precipitate; collect in autumn. Solvents: diluted alcohol; boiling water. Dose, gr. 15–60 (1–4 Gm.).

ADULTERATIONS. — *Vaccin'ium Vit'is-Idæ'a*, Wineberry, Cowberry, Red Whortleberry—leaves resemble uva ursi, but blackish, bristly points on under surface, and *V.*

uligino'sum, Bog Whortleberry, Great Bilberry—leaves crenate, much thinner, under surface pubescent; *Den'drium (Leiophyl'lum) buxifo'lium*, Sand Myrtle, N. J., southward; small shrub, leaves oval, shining, margin revolute, reticulate; *Bux'us semper'virens*, Box, Bush-tree Dudgeon, cultivated in gardens, leaves ovate, narrower toward apex than near the base; contain buxine and parabuxine (both giving bitterness), tannin, volatile oil, bitter extractive; *Epigæ'a re'pens*, Trailing Arbutus (Mayflower, Ground Laurel, Gravel Plant), and *Chimaphila umbellata*, Pipsissewa; leaves resemble and both contain the three active constituents of uva ursi; used in lithic acid gravel. Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Arbutin. $C_{12}H_{16}O_7$, Ericolin, $C_{34}H_{56}O_{22}$, Urson, $C_{10}H_{16}O$, Tannin 6–7 p. c., ericicol, $C_{10}H_{16}O$, gallic acid, ellagic acid, coloring matter, ash 3 p. c.

Arbutin.—A glucoside obtained by precipitating the decoction with lead subacetate, treating filtrate with hydrogen sulphide, and evaporating to crystallize. It is in needles, bitter, soluble in alcohol or hot water, insoluble in ether, blue with diluted ferric chloride; with sulphuric acid yields glucose, arctuin (hydroquinone), $C_6H_6O_2$, and methyl-hydroquinone, $C_7H_8O_2$. Dose, gr. 3–5 (.2–.3 Gm.).

Ericolin.—This is left in the mother-liquor from arbutin; it is a bitter glucoside, yellow, soluble in water, alcohol; yields glucose and ericinol (volatile oil).

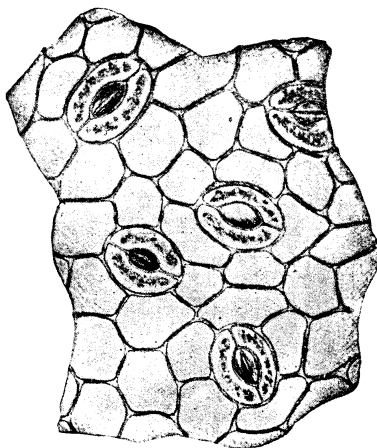


FIG. 302.—*Arctostaphylos Uva-ursi*: Section of leaf epidermis (lower surface) showing large stomata.

Urson.—Crystalline principle, resinous, obtained by exhausting with ether, evaporating, recrystallizing from alcohol; occurs in tasteless needles, insoluble in water, sparingly in alcohol, ether.

PREPARATIONS.—1. *Fluidextractum Uvæ Ursi*. Fluidextract of Uva Ursi. (Syn., Fldext. Uvæ Ursi, Fluid Extract of Uvæ Ursi; Fr. Extrait fluide de Busserole; Ger. Bärentraubenblätterfluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st menstruum: water 50 cc., alcohol 30, glycerin 10; 2d menstruum: 33 p. c. alcohol; reserve first 80 cc. Dose, $\mathfrak{m}\text{xv}$ –60 (1–4 cc.).

Unoff. Preps.: *Decoction*, dose, $\mathfrak{z}\text{j}$ –2 (30–60 cc.). *Extractum Uvæ Ursi* (alcohol 30 p. c.), dose, gr. 5–15 (.3–1 Gm.). *Infusum Uvæ Ursi* (Br.), 5 p. c., dose, $\mathfrak{z}\text{ss}$ –2 (15–60 cc.).

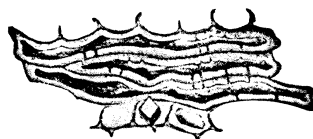


FIG. 303. — *Arctostaphylos Uva-ursi*: Bast-fibers and parenchyma from part of leaf without chlorophyll, containing a single crystal.

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PROPERTIES.—Astringent, diuretic, nephritic, tonic, disinfectant (due to the hydroquinone formed); large doses vomit, purge, oxytocic.

USES.—Cystitis, gravel, chronic nephritis, urethritis, incontinence of urine, dysuria, strangury, uterine hemorrhage, gleet, leucorrhea, menorrhagia, urinary calculi, bronchitis, diarrhea, cardiac dropsy.

Allied Plants:

1. *Arctostaphylos glauca*, *Manzanita*.—California mountains, small tree; leaves 5 Cm. (2') long; contains arbutin, tannin 10 p. c., ash 6 p. c. *A. polyloia* and *A. mucronifera*, Mexico; both used like *uva ursi*.

2. *Kalmia latifolia*, *Mountain Laurel*, *Calico-bush*.—About 1.8–9 M. (6–30°) high; flowers inodorous, May–June; leaves evergreen, elliptical; contains tannin, arbutin, resin, andromedotoxin, $C_{31}H_{51}O_{10}$. Astringent; large doses poisonous.

3. *Limonium carolinianum* (*Statice Limonium* var. *caroliniana*), *Marsh Rosemary*.—Plumbaginaceæ. The root, U.S.P. 1830–1870; N. America. Plant a maritime perennial, acaulescent; leaves 2.5–4 Cm. (1–1½') long, obovate, cuneiform, entire, mucronate, scape .3–.6 M. (1–2°) high, terete, corymbose panicles; flowers lavender color; root .3–.6 M. (1–2°) long, 2.5 Cm. (1') thick, annulate, wrinkled, purplish-brown, astringent, bitter; contains tannin 14–18 p. c., volatile oil, resin. Astringent like catechu or kino; aphthous and ulcerative affections of the mouth, fauces, hemorrhages, dysentery; in decoction, infusion, tincture. Dose, gr. 5–30 (.3–2 Gm.).



FIG. 304.—*Palaquium Gutta*.

4. *Palaquium Gutta*, and *P. oblongifolium*, *Gutta-percha*.—Sapotaceæ. The purified, coagulated, milky exudation, U.S.P. 1860–1880; Malayan Peninsula and Islands, Singapore, Borneo. Tree, 18–21 M. (60–70°) high, .6–1 M. (2–3°) thick; bark reddish-gray; leaves 10–12.5 Cm. (4–5') long, tomentose, silky beneath; flowers yellowish. Gutta-percha is obtained by incisions, or by felling trees, removing bark, and catching juice in plantain-leaf stalks, palm leaves, or cocoanut shells; it soon coagulates and occurs in yellowish, grayish masses, hard, heavier than water, flexible, plastic at 50° C. (122° F.), decomposes on melting; inodorous; tasteless; soluble in ether, chloroform, oil of turpentine, carbon disulphide; contains gutta, $C_{20}H_{32}$, 80 p. c., fine white powder; fluavil, $C_{20}H_{32}O$, yellow resin; albane, $C_{20}H_{32}O_2$, white resin. Used in surgery for splints, catheters, bougies, specula, pessaries, syringes, etc. *Liquor Guttae Perchæ*, U.S.P. 1860–1880, 15 p. c., + lead carbonate 17, chloroform q. s. 100; employed as an adhesive and protective agent for wounds, abrasions, skin affections, sore nipples, erysipelas, smallpox, etc.

5. *Dios'pyros virginia'na*, *Persimmon*.—Ebenaceæ. The unripe fruit dried, U.S.P. 1820–1870; United States. Tree, 6–21 M. (20–70°) high, much smaller northward; wood hard, blackish; leaves 7.5–12.5 Cm. (3–5') long, entire, glaucous beneath, elliptical; flowers yellowish; fruit plum-like, 2.5 Cm. (1') thick, green, 4-lobed calyx at base; short style at apex, 6-celled, 6-seeded; taste astringent, when ripe orange-red, by frost sweet, edible; contains tannin, malic acid. Astringent for diarrhea, chronic dysentery, uterine hemorrhage, leucorrhea, sore throat; in infusion, tincture, syrup. Dose, gr. 15–60 (1–4 Gm.). Persimmon beer, made by fermenting ripe fruit with hop, as a beverage, and the bark as tonic and astringent, are popular to some extent.

53. STYRACEÆ. *Storax* Family.

Sti-ra'se-e. L. *Styr-ax(ac)* + aceæ, Gr. *στίραξ*, a tree yielding gum, an alteration of native Ar. name *Assthirak*. Trees, shrubs. Distinguished by yielding stimulant balsamic resins; calyx 4–8-cleft, inferior; corolla 4–8-lobed; stamens equal or twice the petals, united at base; ovary 2–5-celled, each 1-seeded, style 1; fruit, berry or drupe, fleshy; tropics, temperate climates; stimulant; resins, dyes.

Genus: 1. **Styrax**.

BENZOINUM. BENZOIN, U.S.P.

Styrax Benzoin, *Dryander*, or other species. { The balsamic resin with not more than 1 p. c. foreign organic matter (Siam), yielding 75 (Sumatra)–90 (Siam) p. c. alcohol-soluble extractive and 1 (Sumatra)–.5 (Siam) p. c. acid-insoluble ash.

Habitat. East Indies—Sumatra, Siam, Java, Borneo, Malay Peninsula, Laos; cultivated; grown upon interior hills and sea coast plantations.

Syn. Gum Benjamin, Benzoin Laurel, Benjamin tree, Resina Benzoe, Asa Dulcis; Fr. Benjoin (de Sumatra); Ger. Benzoe, Benzoe.

Styrax. L. see etymology, above, of Styraceæ.

Ben-zo-i-num. L. fr. Ar. *luban*, *jawa*,—*lu* + *ban* + *join*, contracted, lit. “incense of Java,” in universal use.

Ben-zo'in. The original word and mostly used.

PLANT.—Handsome tree, medium height, with dense spreading crown; bark grayish, tomentose; leaves oblong, downy, 7.5–12.5 Cm. (3–5') long, acuminate, dentate; flowers inside reddish, outside white, hairy, anthers 2-celled. BALSAMIC RESIN: *Sumatra Benzoin*, in blocks, lumps of variable size made up of tears compacted together with reddish-brown resinous mass; tears yellowish-brown, fresh fracture milky-white; hard, brittle, softened by heat; odor aromatic, when boiled with water suggesting cinnamic acid or storax; taste aromatic, slightly acrid—gritty on chewing; *Siam Benzoin*, in pebble-like tears of variable size, compressed, yellowish-brown, separate or slightly

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agglutinated, fracture milky-white, hard, brittle, softened by heat; odor agreeable, balsamic, vanilla-like; taste aromatic, slightly acid—plastic on chewing. *Tests*: 1. Alcohol dissolves 75 (Sumatra)—90 (Siam) p. c., the solution being acid, and milky with water. 2. Heat fragments in test-tube—sublimate formed just above melted mass, in plates, small rod-like crystals strongly polarizing light (Sumatra), or in long rod-shaped crystals slightly polarizing light (Siam). 3. Ethereal solution added to small quantity of sulphuric acid—brownish-red (Sumatra), purplish-red (Siam). 4. Heat .5 Gm. with potassium permanganate T. S. 10 cc.—Sumatra only develops odor of benzaldehyde. 5. Treat 1 Gm. with warm carbon disulphide 15, + 5 cc. filtrate spontaneously evaporated—residue not over 12.5 p. c., and responds to tests of benzoic acid. *Impurities*: Rosin, foreign resins, etc. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—Wood, bark, splinters, earthy matter, stones, resinous matrix (in cake benzoin—remaining behind when treated with alcohol or sublimed), 10–40 p. c.

Commercial.—Trees contain no resin-receptacles and only the unhealthy afford resin—a pathological product (tannate transformation resulting from wounding)—which is obtained, July–Nov., from both wild and cultivated plants over 6 years old having a trunk 15–20 Cm. (6–8') thick, by making between the ground and the first branches longitudinal or oblique incisions, or a circle of notches through the bark into which the white liquid resin slowly exudes; after 3 months, when dry and hard (concreted), it is picked out, cut or scraped off with knives or sharp sticks, placed into baskets, and assorted according to size, cleanness, and quality, the larger tears (marbles, almonds) commanding the higher price. Each tree yields annually about 3 pounds (1.5 Kg.) for 12 years, when they are cut down; the first 3 years' product, called natively *head benzoin*, is best, being more fragrant and filled with white tears; the next 7–8 years' yield, *belly benzoin*, is browner, with less white tears, while by felling the trees and splitting the stems an inferior quality, *foot benzoin*, "*foots*," is scraped off, being dark and mixed with wood, bark, etc. These names correspond to our *superior*, *medium*, *inferior*—both having the same relative values, 105, 45, 18. It is received at the Sumatra ports in cakes wrapped in matting, there softened by heat, packed into chests, and sent to Penang and Singapore, thence into commerce; in Siam it is conveyed on bullocks' backs to Menam River, thence via Bangkok to market in cubical blocks. There are five varieties—the first two being recognized by U.S.P.: 1, *Sumatra*, grayish-brown, with many white tears mixed with resinous matrix of unknown origin, reddish-brown with age; 75 p. c. soluble in alcohol, odor weak, storax-like; inferior kinds with few or no tears, but many chips of wood, bark, etc., especially in the center—"drossy" or "false packed;" 2, *Siam*, best, reddish-brown, in small or large tears; 90 p. c. soluble in alcohol, odor strongest, most agreeable, vanilla-like, taste bitter; occurs in two forms:

(a) tears—almond-shaped lumps, often 2.5 Cm. (1') long, more or less flattened; (b) amygdaloid—tears agglutinated with reddish-brown matrix; 3, *Penang*, similar to Sumatra, but odor even more storax-like, and possibly from other species of *Styrax*; 4, *Palembang*, free from tears, pale reddish-brown, opalescent luster (due to moisture, becoming moldy), little odor; contains benzoic acid, no cinnamic acid nor vanillin; tincture gives flocculent precipitate, not milkiness, in water; seldom reaches our market; 5, *False* (*Catappa*—*Bu'ceras* (*Termin'lia*) *angustifolius*—*Combretaceæ*); whitish-brown aromatic exudate obtained by incisions; resembles benzoin slightly; used as incense in E. India. While the quality of all varieties depend upon the amount of tears, yet the Sumatra is the great article of commerce, although the Siam is purest, least variable, and best flavored.



FIG. 305.—*Styrax Benzoïn*: 1, flowering twig; 2, vertical section of flower; 3, diagram of the flower; 4, fruit, with upper portion laid bare, showing channeled surface; 5, anther; 6, seed, longitudinal section.

CONSTITUENTS.—Sumatra: Benzoic acid 10–20 p. c., Cinnamic acid, small amount or wanting, Resins, Vanillin .1–1 p. c., volatile oil (benzoic acid ester—aromatic, neutral) .3 p. c., styracin 2–3 p. c., styrol, benzaldehyde, phenyl-propyl cinnamate, 2 esters 75 p. c. (of which 92.6 p. c. is resinotannol, 7.4 p. c. benzoeresinol)—yielding cinnamic acid 33 p. c.; Siam: less benzoic acid, little or no cinnamic acid, more vanillin, 1–1.5 p. c., benzoeresinol benzoate, $C_{16}H_{26}O$, 5 p. c. (long white prisms), resinotannol benzoate, $C_{12}H_{14}O_3$, 57 p. c., ash 2 (Sumatra) –2.5 (Siam) p. c.

Acidum Benzoicum. **Benzoic Acid**, C_6H_5COOH , U.S.P.—(Syn., Acid Benz., Acidum Benzoicum Sublimatum, Flores Benzoës, Flowers of Benzoin; Fr. Acide benzoïque, Fleurs de Banjoin; Ger. Benzoessäure,

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Benzoebumen.) This organic acid—*English* variety, is obtained (*wet process*) by boiling benzoin several hours with milk of lime, filtering while hot, supersaturating filtrate with hydrochloric acid, allowing to crystallize, purifying; or more frequently (*dry process*) by the sublimation of benzoin (sometimes having an equal weight of sand added) between the temperatures 140–180° C. (284–366° F.). It is made also from hippuric acid (horse and cattle urine, furnishing the *German benzoic acid*), as well as synthetically from phthalic acid (naphthalene), but chiefly for commercial purposes, artificially from toluene (toluol), $C_6H_5CH_3$, by passing chlorine into it (boiling) until ceasing to gain weight, thereby converting it first into benzo-trichloride, and then treating this with water under pressure— $C_6H_5CCl_3 + 2H_2O = C_6H_5COOH + 3HCl$; it is in lustrous scales, friable needles; natural—white, yellowish, darker on exposure to light, slight odor of benzoin; synthetic—white, odorless, slight odor of benzaldehyde; pungent acid taste, somewhat volatile at moderate temperature, freely with steam; soluble in water (275), boiling water (18), alcohol (2.3), boiling alcohol (1.5), chloroform (4.5), ether (3), benzene (10), carbon disulphide or tetrachloride (30), oil of turpentine (23), solutions of alkali hydroxides, fixed and volatile oils, sparingly in petroleum benzin; melts at 120° C. (248° F.); saturated solution acid; contains not less than 99.3 p. c. of C_6H_5COOH ; the sublimed is most soluble in water and contains volatile oil imparting odor; melts at 121° C. (250° F.); ash—.05 p. c. *Tests*: 1. Warm for 5 minutes .1 Gm. synthetic acid + sulphuric acid 2 cc.—not darker than light yellow, acid from benzoin—light brown (abs. of readily carbonizable substances). 2. Dissolve .3 Gm. in hot water 15 cc., + $\frac{N}{10}$ potassium permanganate—no odor of benzaldehyde (dif. from cinnamic acid). *Impurities*: Chlorinated compounds, cinnamic acid, readily carbonizable substances. Should be kept cool, dark, in well-closed containers. Dose, gr. 5–15 (.3–1 Gm.).

Cinnamic Acid, $C_9H_8O_2$.—Obtained by agitating filtered ethereal solution with weak sodium hydroxide solution (to remove benzoic acid and vanillin), distilling off ether, saponifying pure esters by boiling with sodium hydroxide solution several hours, acidifying, boiling, filtering, cooling, when crystals appear. The two acids may be separated by their different degree of volatility, benzoic acid melting at 121.4° C. (250.5° F.) and the two mixed (1 cinnamic, 2 benzoic) at 25.5° C. (78° F.).

Resins.—One is extracted along with benzoic acid by boiling solution of potassium carbonate in excess; another is dissolved from the residue by ether, while the third is affected by neither solvent, hence left as a residue. With melted potassium hydroxide get paroxybenzoic acid, $C_7H_6O_3$, protocatechuic acid, $C_7H_5O_4$, and pyrocatechin, $C_6H_6O_2$.

Vanillin, $C_8H_8O_3$.—Is obtained by treating Siam benzoin with caustic lime, precipitating benzoic acid with hydrochloric acid and shaking liquid with ether.

PREPARATIONS.—I. BENZOIN: 1. *Adeps Benzoinatus*. Benzoinated Lard. (Syn., Adeps Benz., Benzoated Lard, Unguentum Benzoini, Axungia Balsamica—Benzoinata or Benzoata; Br. Adeps Benzoatus; Fr. Axonge benzonée; Ger. Adeps Suillus Benzoinatus, Benzoe (Benzoinirtes)-schmalz.)

Manufacture: 1 p. c. Melt lard 100 Gm. on water-bath, add Siam benzoin, in coarse powder, 1 Gm., mix thoroughly, heat gently, 60° C. (140° F.), for 2 hours, covering the vessel, strain, stir occasionally while cooling; when for hot-weather use, may replace 5 p. c. (or more) of the lard by white wax. Should be kept cool, in well-closed containers impervious to fat.

Preps.: 1. *Ceratum*, 70 p. c. 2. *Ceratum Cantharidis*, 20 p. c. 3. *Unguentum*, 80 p. c. 4. *Unguentum Hydrargyri Fortius*, 25 p. c. 5. *Unguentum Sulphuris*, 85 p. c. 6. *Ceratum Camphoræ N.F.*, 40 p. c. 7. *Mulla Acidi Salicylici*, *N.F.*, 10 p. c. 8. *Mulla Hydrargyri Chloridi Corrosivi*, *N.F.*, 5 p. c. 9. *Mulla Zinci*, *N.F.*, 20 p. c. 10. *Pasta Zinci Sulphurata*, *N.F.*, 70 p. c. 11. *Unguentum Plumbi Iodidi*, *N.F.*, 90 p. c. 12. *Unguentum Potassii Iodidi*, *N.F.*, 80 p. c. 13. *Unguentum Stramonii*, *N.F.*, 65 p. c. 14. *Unguentum Sulphuris Alkalinum*, *N.F.*, 65 p. c. 15. *Unguentum Veratrinæ*, *N.F.*, 90 p. c.

2. *Tinctura Benzoini*. Tincture of Benzoin. (Syn., Tr. Benz.; Fr. Teinture de Benjoin; Ger. Tr. Benzoes, Benzoetinktur.)

Manufacture: 20 p. c. Similar to *Tinctura Cardamomi Composita*, page 137; menstruum: alcohol. Dose, ʒss–1 (2–4 cc.); largely externally.

Prep.: 1. *Unguentum Picis Compositum*, *N.F.*, 2 p. c.

3. *Tinctura Benzoini Composita*. Compound Tincture of Benzoin. (Syn., Tr. Benz. Co., Friar's or Turlington's Balsam, *Tinctura Balsamica*, *Balsamum Commendatoris*, *Elixir Traumaticum*; Fr. Teinture balsamique, Baume du Commandeur de Permes; Ger. Persischer Wundbalsam.)

Manufacture: 10 p. c. Similar to *Tinctura Cardamomi Composita*, page 137—using benzoin 10 Gm., aloe 2, storax 8, tolu 4; menstruum: alcohol. Dose, ʒss–1 (2–4 cc.); mostly externally.

4. *Serum Benzoinatum*, *N.F.*, 3 p. c.

Preps.: 1. *Mulla Acidi Salicylici*, *N.F.*, 80 p. c. 2. *Mulla Creosoti Salicylata*, *N.F.*, 65 p. c. 3. *Mulla Hydrargyri Chloridi Corrosivi*, *N.F.*, 90 p. c. 4. *Mulla Zinci*, *N.F.*, 70 p. c.

II. BENZOIC ACID: 1. *Tinctura Opii Camphorata*, $\frac{2}{3}$ p. c.

Unoff. Prep.: *Benzoic Acid Lozenge* (Br.), each $\frac{1}{2}$ gr. (.03 Gm.).

PROPERTIES.—Stimulant, expectorant, antiseptic, diuretic, antipyretic. It is eliminated slightly by the skin, salivary glands, and broncho-pulmonary mucous membrane, but mostly by the kidneys, where it is converted into hippuric acid, which renders alkaline urine acid, increases the flow, disinfects and stimulates the genito-urinary tract.

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USES.—Chronic laryngitis, diarrhea, dysentery. Locally the tincture as a stimulant and protective to wounds, to arrest coryza. Benzoic acid—for bronchitis, uric acid deposits, cystitis, acute gonorrhea, phosphatic gravel, incontinence of urine, rheumatism. Bright's disease, albuminuria, dressing to wounds, ulcers.

Incompatibles: The tinctures with all aqueous preparations.

54. OLEACEÆ. Olive Family.

O-le-a'se-e. L. *Ole-a* + aceæ, Gr. *ἐλαία*, olive tree, *ἐλαιον*, *oleum*, oil—*i. e.*, referring to the oleaginous fruit. Trees, shrubs. Distinguished by stamens 2–4, inserted on corolla; ovary 2-celled, superior; ovules 2 in each cell; calyx and corolla 4–8 cleft, regular; fruit capsule, samara, berry or drupe, often 1-seeded; temperate climates, tropics; tonic, febrifuge, purgative, perfumery (vol. oil), fragrant flowers; hardwood, dye.

Genera: 1. **Fraxinus**. 2. **Olea**.

MANNA. MANNA, *U.S.P.*

Fraxinus Ornus, *Linne.* { The dried exudation yielding not less than 75 p. c. of anhydrous alcohol-soluble extractive, when extracted with boiling 90 p. c. alcohol.

Habitat. Mediterranean Basin, Asia Minor to Spain; Sicily, France, Italy.

Syn. Manna (Flowering) Ash, European Manna Tree; Fr. Manne en Larmes; Ger. Manna.

Frax'i-nus. L. for ash tree, fr. Gr. *φράσσω*—*ξω*, to fence in, enclose—*i. e.*, the wood used for making hedges or fences, thus protecting things and places.

Or'nus. L. Wild Ash, fr. Heb. *oren*, Gr. *ορείνος*—*i. e.*, the classic name for wild mountain ash.

Man'na. L. fr. Gr. *μάννα*, Heb. *man*, Ar. *mann*, gift (of heaven)—divinely supplied food—*i. e.*, to the Israelites in their journey through the wilderness of Arabia.

PLANT.—Small tree, 4.5–7.5 M. (15–25°) high; stem slender, bark gray, with leaf-scars on young twigs; leaves imparipinnate, 15–20 Cm. (6–8') long; leaflets 4 pairs, 2.5–5 Cm. (1–2') long, oval, acuminate, serrate, bright green, petiolate; flowers May–June, small, numerous, white, panicles, petals, 4 Mm. ($\frac{1}{6}$ ') long; fruit samara, 2.5 Cm. (1') long, 4 Mm. ($\frac{1}{6}$ ') broad. EXUDATION (manna), in irregular, more or less elongated, flattened, 3-sided pieces, yellowish-white, friable; internally nearly white, porous and crystalline in appearance; odor slight, characteristic; taste sweet, slightly bitter, faintly acrid; also in irregular masses, partly brittle or soft fragments, yellowish-white, yellowish-gray—the latter at least, to the extent of 40 p. c. *Test:* 1. Heat to boiling 5 Gm. with alcohol 100 cc.—filtrate on cooling rapidly deposits crystals of mannite. *Solvents:* hot or cold water; alcohol. Dose, ʒj–8 (4–30 Gm.).

ADULTERATIONS.—Products of allied species, bread crumbs, starch, glucose, wood, bark, etc.

Commercial.—The manna ash was introduced into Europe, 1710, and is so graceful as to be planted often in gardens for ornament. In Sicily whole plantations are cultivated for the juice, which is obtained from trees, at least 8 years old and stem 7.5–10 Cm. (3–4') thick, by cutting through the bark to the wood with a curved knife



FIG. 306.—*Fraxinus Ornus*: branch showing leaves and flowers.

transverse incisions, 2.5–5 Cm. (1–2') long, and 2.5 Cm. (1') apart, the first cut being nearest the ground, and another made directly above it every day during warm weather, July–August. The next year another portion of the stem is used, so continuing 10–12 seasons, when the trees, being spent, are felled and shoots allowed to spring from the stump. Manna exudes from these incisions as a clear liquid, soon concretes on the stem, or on sticks and straws placed in the incisions for the purpose, is dried upon shelves, and packed for market

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in tin-lined deal boxes having partitions. There are three varieties: 1, *Large Flake* (*Manna Cannellata*, *Electa*), obtained when juice abundant from upper incisions, giving a product less fatty, in consequence of which it dries easily in tubes or flat pieces—the very best, *Manna a cannola*, on sticks, straws inserted in the cuts, being unknown in our market; 2, *Small Flake* (*Manna in tears*, *lachrymis*), same as preceding, only smaller and often of darker shade; 3, *Sorts* (*Tolfa*, *Manna Communis*), in tears from lower incisions, into which leaves, etc., are placed for it to congeal upon; it is inferior, more gummy, sticky, brownish, internally whitish, less crystalline, some being scraped from trees; 4, *Fat* (*Manna Pinguis*), flows down the trunk, Oct.-Nov., fragments united by brown viscid matter, without flakes; rarely seen in market or used in medicine.

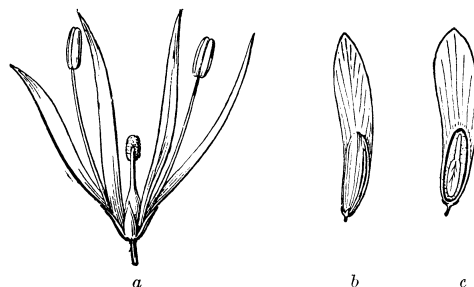


FIG. 307.—*Fraxinus Ornus*: a, flower opened; b, single-winged fruit; c, longitudinal section of same.

CONSTITUENTS.—Mannite 60–90 p. c., Glucose, sucrose, mucilage, fraxin, resin.

Mannite, $C_6H_8(OH)_6$.—Obtained with boiling alcohol and recrystallizing from the same several times; occurs in white prisms, soluble in water (6), slightly in absolute alcohol, insoluble in ether, sublimes at $200^\circ C.$ ($392^\circ F.$) mostly into mannitan, $C_6H_{12}O_5$, a sweetish, syrupy liquid, by oxidation gives fermentable mannitose and various acids.

Glucose.—Sometimes 16 p. c. **Mucilage** and **Fraxin**, $C_{22}H_{36}O_{20}$, are mostly in inferior grades; to this latter are due the fluorescence of the aqueous solution and the green color seen in some manna.

PREPARATIONS.—1. *Syrupus Mannæ*, *N.F.*, 12.5 p. c. + sucrose 77.5, alcohol 6.5, hot water q. s. 100. Dose, $\mathfrak{z}\text{j}$ –2 (4–8 cc.). 2. *Infusum Sennæ Compositum*, *N.F.*, 12 p. c.

PROPERTIES.—Laxative, demulcent, expectorant, cholagogue, may cause flatulence and colic; action slow and constringes secondarily.

USES.—Usually given with other medicines, as senna, rhubarb, magnesium oxide, neutral salts, etc., to which it adds purgative properties, and by its sweetness disguises disagreeable taste of its associate. Useful in piles, genito-urinary irritation, constipation of pregnancy; mostly given to children and delicate persons, to whom its sweetness appeals.

Allied Products:

1. *Fraxinus excel'sior*, *European Ash*.—S. Europe. Produces manna identical with the official.

2. *La'rix Larix (europæa)*, *Briançon Manna* (Pinaceæ); *Quercus Vallo'nea*, *Armenian Manna* (Fagaceæ); *Alha'gi camelo'rum*, *Persian Manna* (Papilionaceæ); *Eucalyptus gonioca'lyx*, *E. Gun'ni* and *E. vimina'lis* (Myrtaceæ); *Tam'arix mannif'era*, *Tamarisk Manna* (Tamaricaceæ). All these produce sweet exudations or mannas (not met in commerce), containing melezitose, $C_{12}H_{22}O_{11} \cdot 3H_2O$, or melitose, $C_{12}H_{22}O_{14}$, or some such saccharine principle. The saccharine products of some insects as *Trehala*, cocoon of *Lavi'nus mellif'icus* (Syria) and *Lerp*, upon *Eucalyptus dumosa* (Australia) contain trehalose, a sugar, and are used as manna.

Allied Plants:

1. *Fraxinus america'na*, *Fraxinus*, *White Ash Bark*.—United States; tree 18–24 M. (60–80°) high, durable, tough wood, 5–9 ovate, acuminate leaflets, terete fruit, 2.5–5 Cm. (1–2') long, abruptly dilated into wedge-linear wing. Dried bark, deprived of corky layer—in flat pieces of varying length, 3–6 Mm. ($\frac{1}{8}$ – $\frac{1}{4}$ ') thick, yellowish, warty, inside pale brown, striate, fracture uneven, fibrous; odor faintly aromatic, taste bitter, acrid; contains volatile oil, resin, tannin, alkaloid (?), ash 10 p. c. Diuretic, diaphoretic, purgative; gout, rheumatism, intermittents. Dose, gr. 30–60 (2–4 Gm.); infusion, 5 p. c., \mathfrak{z} ss–1 (15–30 cc.).

2. *Chionan'thus virgin'ica*, *Chionanthus*, *Fringe Tree Bark*, *N.F.*—The dried root-bark with not more than 5 p. c. of wood and other foreign organic matter, yielding to 70 p. c. alcohol not less than 25 p. c. of non-volatile extractive; S. United States, river banks. Low tree or shrub, very ornamental in cultivation; leaves 5–6, oblong; fruit, purple ovoid drupe, 1–2 Cm. ($\frac{2}{5}$ – $\frac{4}{5}$ ') long. Bark, usually in transversely curved pieces, occasionally single quills, 1–10 Cm. ($\frac{2}{5}$ –4') long, 2–10 Mm. ($\frac{1}{12}$ – $\frac{2}{5}$ ') thick, heavy, some pieces sink in water, reddish-brown, transverse wrinkles, scaly, pits and ridges, whitish cork patches, root-scars, inner surface yellowish-brown, striate, undulate; fracture short, hard, coarsely granular (stone cells); odor characteristic; taste bitter. Powder, light brown—starch grains, numerous stone cells in groups or isolated, few short fibers, numerous resin masses, brownish cork cells, parenchyma tissue, prismatic crystals; solvent: water; contains bitter principle, tannin, ash 5 p. c. Alterative, blood purifier; liver trouble, syphilis; popular with Eclectics, Homeopaths. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum Chionanthi* (75 p. c. alcohol). Decoction, Infusion, 5 p. c., \mathfrak{z} ss–1 (15–30 cc.).

OLEA. OLIVE.

Oleum Olivæ. Olive Oil, *U.S.P.*

Olea europæa, } A fixed oil obtained from the ripe fruit.
Linné.

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Habitat. Asia, S. Europe (Spain, Portugal, Asia Minor, Syria, Italy, S. France); Algeria; cultivated in S. United States (Fla., Cal.), S. America.

Syn. Olive Gum, Lucca Gum, Olive (Bark) Leaves; Ol. Oliv., Sweet Oil; Fr. Huile d'Olive; Ger. Oleum Olivarum, Olivenöl.

O'le-a. L. olive, fr. Gr. ἔλαια, olive tree, *oliva*, the fruit, *oleum*, the juice or oil from the fruit.

Eu-ro-pæ'a. L. European—*i. e.*, its habitat.

PLANT.—When wild a branched, thorny shrub; under cultivation a tree 3–9 M. (10–30°) high, resembling white willow; bark grayish-white; leaves 5–6 Cm. (2–2½') long, lanceolate, acute, entire, coriaceous, glabrous, upper side glaucous-green, the lower silvery-white; flowers many, small, creamy-white, diandrous, racemes; fruit drupe, 12–25 Mm. (½–1') long, ovoid, pointed, olive-green then deep purple, sarcocarp firm, fleshy, internally greenish and filled with oil; stone (putamen) thick, bony, ovoid, 1-seeded.

CONSTITUENTS.—**FRUIT (SARCOCARP):** Fixed oil 70 p. c., water 25 p. c.

Oleum Olivæ. Olive Oil.—It is a pale yellow, light greenish-yellow, oily liquid, slight peculiar odor and taste, faintly acrid after-taste; slightly soluble in alcohol, miscible with ether, chloroform, carbon disulphide; sp. gr. 0.915; cooled from 10–8° C. (50–46° F.) somewhat cloudy from separation of crystalline particles, at 0° C. (32° F.) forms whitish, granular mass; contains olein 70 p. c., linolein 6 p. c., palmitin and arachin 28 p. c., phytosterin (unsaponifiable matter, once thought to be cholesterol), chlorophyll (from fruit, imparting greenish color). *Tests:* 1. Mix in test-tube 5 cc. with 5 cc. of equal vols. of amyl alcohol and carbon disulphide, containing 1 p. c. of precipitated sulphur in solution, immerse to one-third its depth in boiling, saturated aqueous sodium chloride solution—no reddish color in 15 minutes (abs. of cottonseed oil). 2. Mix 2 cc. with 1 cc. of hydrochloric acid containing 1 p. c. of sucrose, shake half a minute, let stand 5 minutes, add 3 cc. of distilled water, shake—acid layer shows no pink color (abs. of sesame oil). Should be kept cool, in well-closed containers. Dose, adult, ʒss–1 (15–30 cc.), when for gall-stones ʒviii–16 (240–480 cc.); infant, ʒj–2 (4–8 cc.), in emulsion.



FIG. 308.—*Olea europæa*.

ADULTERATIONS.—Chiefly cottonseed oil, also peanut, poppy, rape, and sesame oils, etc., rarely less than 25 p. c.; all of these congeal at much lower temperature, and do not solidify when shaken with mercuric nitrate (12), as does pure olive oil.

Commercial.—Tree is grown successfully in California, but our supply of oil comes solely from Europe, it being obtained by crushing

ripe fruit short of the putamen, subjecting marc, in coarse bags, to strong pressure, and running oil into vessels containing water, from which, after a few days subsidence, it is skimmed, thus constituting the first grade, *huile vierge—virgin oil*; the press-cakes are taken from the bags, finely broken up with hot water, and subjected to greater pressure, thereby removing both water and oil, the latter being drawn off from the surface, constituting *second-grade oil*; the remaining marc contains 9–12 p. c. of oil, which may be extracted by carbon disulphide, or by mixing with hot water in cisterns (*enfer*), and allowing partial fermentation, yielding on the surface a disagreeably smelling oil, *huile d'enfer*; sometimes inferior fruit is allowed to ferment in heaps or vats, giving by expression also an inferior oil, *huile fermentée*. In order to combine perfume, fineness, and sweetness the oil must be from fruit slightly ripe, and then stored 6–8 months, until the strong flavor has disappeared; it enters commerce in bottles, jugs, and barrels, under the brands: Provence, Florence, Gallipoli, Spanish, Sicily—the best from S. France, the most from Italy (one-half), and Spain (one-fifth).

PREPARATIONS.—1. *Sapo*. Soap. (Syn., Olive Oil Castile Soap, Sodium Oleate; Br. Sapo Durus, Hard Soap; Fr. Savon Médicinæ, Savon blanc d'Espagne; Ger. Sapo medicatus—(*hispanicus*), Medizinische Seife, Seife, Spanische Seife.)

Manufacture: Olive oil and sodium hydroxide are boiled together until saponified— $\text{C}_3\text{H}_5(\text{C}_{18}\text{H}_{33}\text{O}_2)_3 + 3\text{NaOH} = 3\text{NaC}_{18}\text{H}_{33}\text{O}_2$ (hard soap) + $\text{C}_3\text{H}_5(\text{OH})_3$. It is a white, whitish solid (in bars), hard, yet easily cut when fresh, or a fine, yellowish-white powder, faint, characteristic odor, free from rancidity, disagreeable, alkaline taste; soluble in water, alcohol, more readily with heat; aqueous solution alkaline. *Impurities*: Water, soap from animal fats, sodium hydroxide, sodium chloride, sodium carbonate, silica, metallic and other alcohol-insoluble substances.

Preps.: 1. *Linimentum Saponis*. Soap Liniment. (Syn., Lin. Sapon., Liquid Opodeldoc, Tinctura Saponis Camphorata, Spiritus Nervinus Camphoratus; Fr. Liniment savonneux camphré; Ger. Linimentum saponato-camphoratum, Opodeldok.)

Manufacture: 6 p. c. Dissolve camphor 4.5 Gm., oil of rosemary 1 cc. in alcohol 70 cc., add soap 6 Gm., water q. s. 100 cc.; agitate until soap dissolved, set in cool place for 24 hours, filter; used externally.

Preps.: 1. *Linimentum Chloroformi*, 70 p. c. 2. *Linimentum Aconiti et Chloroformi*, N.F., 75 p. c.

2. *Extractum Colocynthis Compositum*, 15 p. c. 3. *Pilulæ Aloes*, 2 gr. (.13 Gm.). 4. *Pilulæ Asafætidæ*, 1 gr. (.06 Gm.). 5. *Dentifricium*, N.F., 5 p. c. 5. *Emplastrum Saponis*, N.F., 10 p. c. 7. *Lavatio Ori*, N.F., 6 p. c., + gluside $\frac{1}{5}$ p. c., fuchsin $\frac{1}{500}$, ol. cinnam., ol. menth. pip., āā, $\frac{1}{2}$, ol. caryoph. 1, alcohol 75, water q. s. 100. 8. *Linimentum Saponato-Camphoratum*, Solid Opodeldoc, N.F., sod. carb. monohyd. 1 Gm., acid. stear.

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- 5, camphor 2.5, water 10 cc., ol. thymi .3, ol. rosmar. .6, aq. ammon. 5, alcohol q. s. 100. 9. *Pilulæ Aloes et Asafætidæ*, N.F., 1½ gr. (.09 Gm.). 10 *Pilulæ Rhei*, N.F., 1 gr. (.06 Gm.).
 2. *Emplastrum Plumbi Oleatis*, q. s. 3. *Curatio Paraffini*, N.F., 3 p. c. 4. *Emplastrum Fuscum Camphoratum*, N.F., 60 p. c. 5. *Lini-mentum Calaminæ*, N.F., 50 p. c. 6. *Oleum Phenolatum*, N.F., 95 p. c. 7. *Unguentum Fuscum*, N.F., 25 p. c.

Unoff. Preps.: *Compound Pill of Soap* (Br.), 60 p. c., + opium 20, syrup of glucose 20, dose, gr. 2-4 (.13-.26 Gm.). *Curd Soap* (Br.).

PROPERTIES.—Nutritious, demulcent, emollient, laxative, protection to mucous membrane against acrid or poisonous substances; it increases secretion of bile, peristalsis, and dissolves cholesterin, the chief constituent of gall-stones. Like other oils, it is partly emulsified and saponified in the intestines, its glycerin being set free, and fatty acid combining with free alkalis to form soap, which with the emulsion forms molecular basis of the chyle; it enters the blood through the lacteals, being finally oxidized into carbon dioxide and water. Soap has same properties.

USES.—Gall-stones, cantharides and other poisoning, infantile constipation in enema. Externally—burns, skin inflammations, to protect from air, insect-bites, stings, bruises, sprains, wounds, engorged mammae, rectal ascarides; facilitates removal of crusts, scales, etc., and introduction of bougies, catheters, pessaries, sounds, specula; to lubricate machinery, in making liniments, plasters, cerates, ointments, etc.

Allied Products:

1. *Olive Gum, Lecca Gum*.—Resinous substance which exudes spontaneously from the trees. 2. *Leaves and young bark*; used externally as astringents, antiseptics; internally as tonics in intermittents. 3. *Olive Wood*; has beautiful veins, pleasant odor, capable of fine polish, highly esteemed for backs of brushes, boxes, and in cabinet-work. 4. *Olive Fruit*; as a dessert—for this the unripe fruit is steeped repeatedly in water containing lime and ashes, or solutions of NaOH and NaCl, then bottled in a slightly aromatic, concentrated salt solution; the small French or Provence and the large Spanish olives, “Queen olive,” are used for this purpose. Ripe olive, Cal.—purplish-black; oil 50 p. c.; aperient.

55. LOGANIACEÆ. *Logania* Family.

Lo-ga-ni-a'se-e. L. *Logani-a* + aceæ, after J. Logan, a noted botanist. Shrubs, herbs, trees. Distinguished by poisonous properties; leaves entire, stipulate or raised stipular line; calyx 4-5-cleft, inferior; corolla 4-, 5-, 10-cleft, regular; stamens epipetalous, 4, 5, 10; ovary 2-, 3-, 4-celled, superior; fruit capsule or drupe. Connects Gentianaceæ, Apocynaceæ, Scrophulariaceæ (from which differentiated by having stipules), and Rubiaceæ (which has no free ovary); tropics; nervine, tonic, anthelmintic, poisonous.

Genus: 1. **Strychnos**.

NUX VOMICA. NUX VOMICA, *U.S.P.*

Strychnos Nux-vomica, { The dried, ripe seed, yielding not less than
Linné. 2.5 p. c. of alkaloids.

Habitat. India, Hindustan, E. India islands, Malabar, Ceylon, Java, N. Australia.

Syn. Nux Vom., Dog (Quaker, Bachelor's) Buttons, Vomit (Poison) Nut, Dog Poison, Crow-fig, Ratsbane, False Angustura, Columbrina, Ordeal-root, Nux Metella, Semen Nuces Vomicae; Fr. Noix vomique; Ger. Semen Strychni, Brechnuss, Krähenaugen.

Strych'nos. L. fr. Gr. *στρίχνος*, night shade, equivalent to *L. solanum*, used anciently for several poisonous plants, but not for the present one.

Nux' Vom'i-ca. L. *nux*, a nut, + *vomere*, to vomit—*i. e.*, excessive doses may vomit, or require vomiting to save life, small doses may allay it.

PLANT.—Small tree, 4.5–9 M. (15–30°) high, trunk short, thick, crooked, branches irregular, bark yellowish-gray, nearly smooth; leaves exstipulate, 5–10 Cm. (2–4') long, roundish, oval, 3–5-nerved, apex acute, entire, shining; flowers in winter, whitish, funnel-shaped, 8 Mm. ($\frac{1}{3}$ ') long, paniculate cymes; fruit shining, globular, 4–5 Cm.

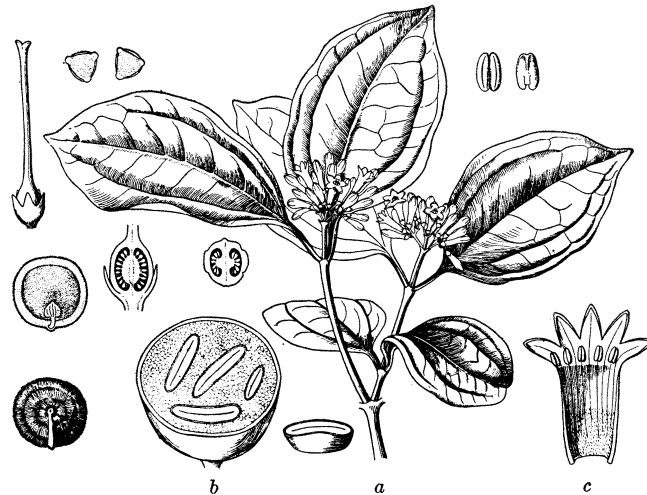


FIG. 309.—*Strychnos Nux-vomica*: a, flowering branch ($\frac{1}{4}$ natural size); b, cross-section of fruit; c, corolla; also anther, pollen, pistil, ovary, seed, enlarged.

($1\frac{2}{5}$ –2') thick, rind thin, tough, orange-yellow when ripe, filled with poisonous white gelatinous pulp in which 1–5 seed are immersed irregularly. **SEED**, orbicular, nearly flat, occasionally irregularly bent, 10–30 Mm. ($\frac{2}{3}$ –1 $\frac{1}{2}$ ') broad, 4–5 Mm. ($\frac{1}{8}$ – $\frac{1}{5}$ ') thick, very hard when dry; grayish, greenish-gray, covered with appressed hairs giving a silky

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luster; hilum—a circular scar at the center of one of the flattened sides and connected with micropyle at the edge by a ridge; internally showing a thin, hairy seed-coat and large grayish-white endosperm, at one end of which is embedded a small embryo with 2 ovate 5-7-nerved cotyledons; inodorous; taste intensely, persistently bitter. POWDER, light gray—chiefly thick-walled endosperm cells containing fixed oil globules, few aleurone grains, lignified non-glandular hairs with walls having large pores, few spherical starch grains in tissues of adhering pulp. *Solvents*: 75 p. c. alcohol; boiling water partially. Dose, gr. $\frac{1}{2}$ –5 (.03–3 Gm.).

ADULTERATIONS.—SEED: Rare—as nothing resembles them closely; POWDER: Common—various inert substances (increasing amount of hairs) and olive stones, often 50 p. c. RASPED: “Vegetable ivory” (coroso, negrito), seeds of *Phytel'ephas macrocar'pa* (Australia, used natively for making buttons) and of *Metrox'ylon vitie'se* (so-called Australian “coroso,” Fiji Islands, imported into Hamburg for the purpose; odorless, tasteless, bony, revealing decided structural differences under the microscope).

Commercial.—Plant resembles our dogwood and its fruit a small orange. Seed are washed free of pulp and dried in the sun, the best being recognized by light color, ample breadth, thin edge, excessive silkiness, and prominent hilum; they may readily be powdered by breaking into small pieces and drying several days with hot air or carefully applied direct heat; powder should be uniform so as not to retard or prevent thorough exhaustion by menstruum. There are four varieties valued in the order named: 1, *Bombay*; 2, *Cochin* (*Calcutta*); 3, *Ceylon*; 4, *Madras*.

CONSTITUENTS.—Alkaloids 2.5–4–5.3 p. c.: Strychnine .25–2 p. c., Brucine .5–2 p. c., Igasurine (probably impure brucine), all combined with igasuric (strychnic, tannic, caffeo-tannic) acid; Loganin, fixed oil, proteins 11 p. c., yellow coloring matter, gum, sugar 6 p. c., ash 1–3.5 p. c. Dunstan and Short found total alkaloids to vary from 2.74 p. c. in small Madras to 3.9 p. c. in large, silky Bombay seed, of which 30–50 p. c. was strychnine.

Strychnina, Strychnine, $C_{21}H_{22}O_2N_2$, *N.F.*—This alkaloid is found not only in *nux vomica*, but also in other loganiaceous plants (seeds); it was discovered by Pelletier, 1818, and may be obtained by boiling powdered seed with acidulated (HCl or H_2SO_4) water, thus liberating tannic (igasuric) acid, mucilage, coloring matter, etc., and forming chlorides or sulphates of the alkaloids; concentrate and add milk of lime to decompose alkaloidal salts (forming $CaCl_2$ or $CaSO_4$) and to precipitate strychnine and brucine; wash precipitate, treat it with diluted alcohol to dissolve brucine, or with alcohol or benzene to take out strychnine, thus leaving brucine in the mother-liquor. If diluted alcohol be used for brucine, then by boiling residue with alcohol strychnine is obtained; can purify with animal charcoal and reprecipitate with ammonia. It is in colorless, transparent, prismatic

crystals, white crystalline powder, odorless (must use great caution in tasting, and then only in very dilute solutions, which are exceedingly bitter—1 in 700,000), permanent, soluble in water (6420), boiling water (3100), alcohol (136), boiling alcohol (34), chloroform (5), benzene (180), very slightly in ether; saturated solutions alkaline, levorotatory; forms numerous salts (hydrochloride, nitrate, phosphate, sulphate, etc.). With sulphuric acid containing 1 p. c. of ammonium vanadate—deep violet-blue, changing to deep purple, cherry-red; incinerate 1 Gm.—ash .1 p. c.; solution of .1 Gm. in sulphuric acid 2 cc.—only pale yellow (abs. of readily carbonizable organic substances) until a fragment of potassium dichromate is added—deep blue color, changing to deep violet, purplish-red, cherry-red, orange, yellow. Add .1 Gm. to mixture of equal vols. nitric acid and distilled water—may produce yellow color, but no red or reddish (abs. of brucine). *Impurities*: Brucine, readily carbonizable organic substances; commercial strychnine contains some homo-strychnine, $C_{22}H_{24}O_2N_2$. Dose, gr. $\frac{1}{60}$ — $\frac{1}{20}$ (.001–.003 Gm.).

Strychninæ Nitras, Strychnine Nitrate, $C_{21}H_{22}O_2N_2.HNO_3$, *U.S.P.*—(Syn., Strych. Nit; Fr. Azotate (Nitrate) de Strychnine; Ger. Strychninum nitricum, Strychninnitrat, Salpetersaures Strychnin.) Obtained by dissolving strychnine (1) in diluted nitric acid (1,886), or strychnine (5), hot dist. water (50), dilute nitric acid q. s., when neutral evaporate, crystallize. It is in colorless, glistening needles, white, crystalline powder, odorless (must use great caution in tasting, and then only in very dilute solutions, which are exceedingly bitter—1 in 700,000), permanent, soluble in water (45), boiling water (10), alcohol (150), hot alcohol (80), glycerin (50), chloroform (105), insoluble in ether; saturated aqueous solution neutral, slightly acid, levorotatory; contains 84.13 p. c. of the alkaloid. *Tests*: 1. Superimpose in a test-tube an aqueous solution of the salt upon diphenylamine T. S.—a blue color at zone of contact; heated with hydrochloric acid—bright red. 2. Aqueous solution (1 in 100) 20 cc. acidulated with 2 drops diluted nitric acid, + 5 drops of silver nitrate T. S.—no opalescence at once (abs. of chloride); similar solution 20 cc. + 5 drops of barium nitrate T. S.—no immediate turbidity (abs. of sulphate). Should be kept dark in well-closed containers. Dose, gr. $\frac{1}{60}$ — $\frac{1}{20}$ (.001–.003 Gm.).

Strychninæ Sulphas, Strychnine Sulphate, $(C_{21}H_{22}O_2N_2)_2.H_2SO_4.5H_2O$, *U.S.P.*—(Syn., Strych. Sulph.; Fr. Sulfate de Strychnine; Ger. Strychninum sulfuricum, Strychninsulfat, Schwefelsaures Strychnin.) Obtained by dissolving strychnine in diluted sulphuric acid, avoiding excess, evaporating filtrate, crystallizing. It is in colorless, white, crystals, white, crystalline powder, odorless, efflorescent (must use great caution in tasting, and then only in very dilute solutions, which are exceedingly bitter—1 in 700,000), soluble in water 35, boiling water (7), alcohol (81), hot alcohol (26), chloroform (220), glycerin, insoluble in ether; saturated aqueous solution (1 in 50) neutral, slightly acid, levorotatory; contains 78.03 p. c. of the alkaloid. *Tests*: 1. Aqueous

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solution with barium chloride T. S.—white precipitate, insoluble in hydrochloric acid. 2. Dried to constant weight at 100° C. (212° F.)—loses 11 p. c. (all water of crystallization); ash .1 p. c. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{60}$ – $\frac{1}{20}$ (.001–.003 Gm.).

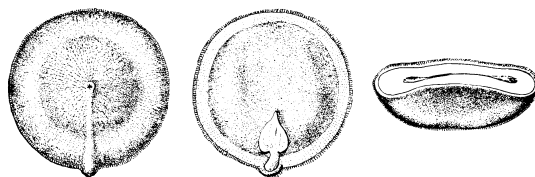


FIG. 310.—*Nux vomica*: whole seed, cut longitudinally, and cut transversely.

Brucine (Brucina), $C_{23}H_{25}O_4N_2$.—Named after James Bruce (1730–1794), a Scotch traveler, and obtained in extracting strychnine; occurs in rectangular, octahedral crystals, containing $4H_2O$, soluble in water (850), readily in chloroform, alcohol, ammonia, creosote; forms numerous salts, less bitter than strychnine, 12 times weaker, 3 times slower physiologically; by some considered to be strychnine + resin, as it has same action. *Test*: 1. With nitric acid—blood-red color, changing to orange-yellow; now add stannous chloride, sulphurous acid, or any deoxidizing agent—violet-red (this completely bleaches morphine-red). Dose, gr. $\frac{1}{12}$ – $\frac{1}{2}$ (.005–.03 Gm.).

Igasurine (Igasuria), fr. Malay, *igasura*, the *nux vomica*.—Obtained from mother-waters of strychnine and brucine after their precipitation with lime; occurs in white crystals; by some claimed to be a mixture of 9 alkaloids, mostly brucine; others doubt its existence.

Igasuric Acid.—Identical with tannic or caffeo-tannic acid, amorphous, dark green with ferric salts, by hydrolysis yields glucose and caffeic acid.

Loganin, $C_{25}H_{34}O_{14}$.—Bitter glucoside, in white prisms, soluble in water, alcohol; with sulphuric acid—red, then purple, and splits into dextrose and loganetin.

PREPARATIONS.—SEED: 1. *Extractum Nucis Vomicae*. Extract of *Nux Vomica*. (Syn., Ext. Nuc. Vom., Powdered Extract of *Nux Vomica*; Fr. Extrait de Noix vomique; Ger. Extractum Strychni, Brechnussextrakt.)

Manufacture: Macerate, percolate 100 Gm. with 75 p. c. alcohol containing acetic acid 1 p. c. until exhausted, reclaim alcohol, concentrate to 20 cc., transfer to flask or separator, add water 15 cc. + purified petroleum benzin 20 cc., shake thoroughly several minutes, decant benzin layer, shake residue again with purified petroleum benzin 10 cc., decant benzin layer, reject benzin solutions. Evaporate fat-free residue on water-bath to dryness, stirring frequently; assay and add q. s. dried starch for extract to contain 15.2–16.8–16 p. c. of the alkaloids. Pulverize, mix thoroughly, pass through fine sieve. Should be

kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.): Preps.: 1. *Pilulæ Aloes et Podophylli Compositæ*, N.F., $\frac{1}{4}$ gr. (.016 Gm.). 2. *Pilulæ Ferri, Quininæ, Aloes et Nucis Vomicae*, N.F., $\frac{1}{4}$ gr. (.016 Gm.).

2. *Tinctura Nucis Vomicae*. Tincture of Nux Vomica. (Syn., Tr. Nuc. Vom.; Fr. Teinture de Noix-vomique; Ger. Tinctura Strychni, Brechnusstinktur, Krähenaugentinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page, 104, 1st menstruum: 75 p. c. alcohol containing 1 p. c. of acetic acid, 2d menstruum: 75 p. c. alcohol; contains .237–.263—.25 Gm. of alkaloids in each 100 cc. Dose, \mathfrak{m} v–20 (.3–1.3 cc.).

3. *Fluidextractum Nucis Vomicae*, N.F., (75 p. c. alcohol), 2.5 Gm. alkaloids in each 100 cc. Dose, \mathfrak{m} j–5 (.06–.3 cc.). STRYCHNINE: 1. *Elixir Ferri Pyrophosphatis, Quininæ et Strychninæ*, N.F., $\frac{1}{125}$ gr. in each \mathfrak{z} j. 2. *Elixir Pepsini, Bismuthi et Strychninæ*, N.F., $\frac{1}{100}$ gr. in each \mathfrak{z} j. 3. *Liquor Hypophosphitum Compositus*, N.F., $\frac{1}{250}$ gr. in each \mathfrak{z} j. 4. *Pilulæ Aloini, Strychninæ et Belladonnæ*, N.F., $\frac{1}{125}$ gr. in each. 5. *Pilulæ Aloini, Strychninæ et Belladonnæ Compositæ*, N.F., $\frac{1}{125}$ gr. in each. 6. *Pilulæ Ferri, Quininæ, Strychninæ et Arseni Fortiores*, N.F., $\frac{1}{20}$ gr. in each. 7. *Pilulæ Ferri, Quininæ, Strychninæ et Arseni Mites*, N.F., $\frac{1}{50}$ gr. in each. 8. *Pilulæ Laxativæ Compositæ*, N.F., $\frac{1}{125}$ gr. in each. 9. *Syrupus Ferri Quininæ et Strychninæ Phosphatum*, N.F., $\frac{1}{80}$ gr. in each \mathfrak{z} j. 10. *Syrupus Hypophosphitum Compositus*, N.F., $\frac{1}{80}$ gr. in each \mathfrak{z} j. STRYCHNINE NITRATE: 1. *Elixir Glycerophosphatum Compositum*, N.F., $\frac{1}{60}$ gr. in each \mathfrak{z} j. 2. *Syrupus Phosphatum cum Quinina et Strychnina*, N.F., $\frac{1}{125}$ gr. in each \mathfrak{z} j. STRYCHNINE SULPHATE: 1. *Elixir Cinchonæ Alkaloidorum, Ferri, Bismuthi et Strychninæ*, N.F., $\frac{1}{100}$ gr. in each \mathfrak{z} j. 2. *Elixir Cinchonæ Alkaloidorum, Ferri et Strychninæ*, N.F., $\frac{1}{100}$ gr. in each \mathfrak{z} j. 3. *Elixir Ferri, Quininæ et Strychninæ*, N.F., $\frac{1}{100}$ gr. in each \mathfrak{z} j.

Unoff. Preps.: Abstract (seed), gr. $\frac{1}{4}$ –2 (.016–.13 Gm.). Decoction (leaves)—externally in rheumatism. Elixirs, Solutions, Syrups of various salts of strychnine.

PROPERTIES.—Motor excitant, spinant, tonic, stomachic, respiratory, cardiac, muscular, and nervous stimulant, antiseptic, poisonous. Strychnine and nux vomica are identical, increasing the vascularity of gastric mucous membrane, secretion of gastric juice, and peristalsis by stimulating the intestinal muscular coat (purgative), stimulates direct the cardiac muscles or the motor ganglia and nerves of special sense; strychnine, full dose, gr. $\frac{1}{100}$ (.006 Gm.), gives dilated pupils, jerky limbs, spasmodic respirations, stiff lower jaw, cerebral tension, shuddering, depression, facial smile or grin. Thebaine (opium) acts similarly. The spasms of tetanus are constant, of strychnine intermittent, with meaningless smile, the modified lockjaw, absence of wound, and rapidly developed symptoms differentiate the two. Strychnine is absorbed rapidly, but eliminated slowly by urinary, salivary, and cutaneous channels.

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USES.—Strychnine was used first in paralysis, and now in atonic dyspepsia, gastric catarrh, bowel atony, pregnancy and phthisis vomiting, nervous cough, bronchitis, anemia, paralytic condition, lead palsy, inebriate and diphtherial paralysis, amaurosis from lead, tobacco, alcohol, paralysis of bladder, incontinence of urine, sexual impotence, tetanus, chorea, epilepsy, delirium tremens, spermatorrhea, neuralgia, dysmenorrhea, diarrhea, dysentery, cholera, antidote to chloral hydrate, morphine, physostigmine. A tolerance for it is established quickly, but gr. $\frac{1}{12}$ (.005 Gm.) has killed, while gr. $\frac{1}{2}$ –2 (.03–.13 Gm.) as a rule is considered fatal; extract, gr. 3 (.2 Gm.) also have killed.

Poisoning: Strychnine, gr. $\frac{1}{2}$ (.03 Gm.), or more, produces within half an hour difficult breathing, sense of suffocation and impending death, muscular rigidity, stiffness of neck, tonic or persistent convulsions of all extensor muscles, coming on at intervals 3–30 minutes, lasting a few seconds to one or more minutes, these quickly recurring at every noise, touch or peripheral irritation, between convulsions complete relaxation, face dusky and with ghastly grin, angles of mouth drawn back and upward, body curved so as to rest on head and heels, eyeballs prominent, pupils dilated during paroxysm, eyes fixed and open, lips livid, great thirst but unable to drink owing to spasms of jaws, respiration suspended during convulsions, pulse feeble and rapid, involuntary defecation and urination, lockjaw, death in 2–3 hours from asphyxia; mind clear until near the end, when carbon dioxide narcosis (cyanosis), exhaustion and nervous storm set in. Place in horizontal position, in dark room remote from all noise, use evacuants, (stomach-pump, emetics, purgatives), follow with antidotes: tannin dissolved in water, charcoal, potassium permanganate; if ingested relax (convulsions) with chloroform or ether, and give by rectum potassium bromide gr. 60 (4 Gm.) and chloral hydrate, gr. 40 (2.6 Gm.) in starch water; amyl nitrite, (soluble iodides, tobacco, opium, physostigmine, atropine, conium, cannabis). Empty bladder often (catheter), practise artificial respiration.

Incompatibles: Chloral hydrate, potassium bromide, tobacco, chloroform, ether, tannin, bromides, iodides, chlorides.

Synergists: Motor excitants, ergot, ustilago, electricity, cold.

Allied Product:

1. The bark was once (1806–1837) upon the market in England and Holland, being mixed usually with *Angustura*, and since then has been known as *False Angustura Bark*; it is poisonous, gray, cork patches rust-color, warty, inside brown, fracture smooth, no white striae (calcium oxalate); contains strychnine, brucine, etc. The wood is used in domestic practice; all portions are medicinal.

Allied Plants:

1. *Strychnos Igna'tii*, *Ignatia*, *Saint Ignatius Bean*, *Ignatia Amara*, *N.F.*—The dried ripe seed, yielding not less than 2 p. c. of alkaloids nor more than 1 p. c. of foreign organic matter; Philippine Islands. Large climbing shrub; leaves ovate, acute, smooth, flowers white,

tubular, racemes; fruit resembles a pear, pericarp brittle. Seed, 24 imbedded in bitter pulp, 20–30 Mm. ($\frac{4}{5}$ – $1\frac{1}{5}$ ') long, 15 Mm. ($\frac{3}{5}$ ') broad and thick, heavy, hard, horny, angularly ovate, with obtuse angles, several sided, grayish-black, nearly smooth, few hairs; fracture granular and translucent in small fragments, small irregular cavity in center with embryo; nearly inodorous, intensely bitter. Powder, grayish-brown—cells of epidermis and seed-coat, polygonal cells with granular contents from endosperm, few hairs in spreading clusters, embryo tissue of small thin-walled cells; solvent: alcohol; contains more strychnine, but less total alkaloids than nux vomica—strychnine .5–1.5 p. c., brucine .5–1.4 p. c., proteins 10 p. c., ash 4 p. c. Properties, uses and poisoning similar to nux vomica. Dose, gr. $\frac{1}{2}$ –3 (.03–.2 Gm.); 1. *Extractum Ignatiæ*, *Powdered Extract of Ignatia*, 6 p. c. alkaloids, (75 p. c. alcohol), dose, gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.); 2. *Tinctura Ignatiæ*, 10 p. c., $\frac{1}{5}$ p. c. alkaloids (88 p. c. alcohol), dose, ℥v–20 (.3–1.3 cc.). *S. Tieu'te*.—Java; seed resemble nux vomica but smaller, whiter; contain strychnine, brucine; extract used natively for arrow poison. *S. potato'rum*, India; seed subglobular, 12 Mm. ($\frac{1}{2}$ ') wide, brownish-gray, not bitter, no strychnine; used natively for clearing muddy water. *S. Colubrina*, India; yields true *Lignum Colubrinum*, for which nux vomica branches often are substituted. All parts bitter and contain strychnine and brucine; once used as antidote to snake-bites, hence the name. *S. toxifera* (*Castelnæ'na*), *Curara*, *Curare*, *Woorara*, *Urari*.—Brazil, Guiana. Extract of bark (South American arrow poison), blackish, hygroscopic, bitter, friable, 75 p. c. soluble in water; contains curarine, $C_{18}H_{35}N$ (yellowish-brown, bitter alkaloid), resin, fat. Diaphoretic, sedative, irritant; best drug in tetanus. Dose, gr. $\frac{1}{10}$ – $\frac{1}{3}$ (.006–.02 Gm.); curarine gr. $\frac{1}{1000}$ (.0006 Gm.)—resembles digitalis in action.

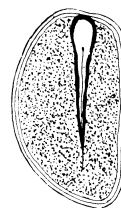


FIG. 311.—*Ignatia*: vertical section.

2. *Gelsemium semper'virens*, *Gelsemium*, *Yellow Jasmine (Root)*, *N.F.*—The dried rhizome and roots with not more than 2 p. c. of foreign organic matter; United States, Va. to Fla. Beautiful woody climber; leaves persistent, evergreen, lanceolate, entire, flowers large, yellow, fragrant, poisonous, corolla funnel-shaped; fruit brown, capsule. Rhizome, cylindrical, in pieces 3–20 Cm. ($1\frac{1}{5}$ –8') long, 3–30 Mm. ($\frac{1}{8}$ – $1\frac{1}{5}$ ') thick, yellowish-brown, wrinkled, transverse fissures, few stem-scars above, numerous roots beneath; fracture tough, splintery; bark thin; wood radiate, excentric; odor slight; taste bitter. Powder, yellowish—tracheæ, few bast-fibers, lignified tracheids, starch grains, few calcium oxalate monoclinic prisms, groups of stone cells; solvent: diluted alcohol; contains gelsemine, gelseminine, gelsemic acid (beta-methyl-æsculetin) .3–.4 p. c., volatile oil .5 p. c., 2 resins 4 p. c., starch, gum, pectin. Nervine, sedative, mydriatic, antispasmodic, antiperiodic; closely resembles hemlock in action, and somewhat digitalis, aconite, veratrum viride, antimony; rheumatism, neuralgia, intermittent and

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yellow fevers, headache, migraine, asthma, chorea, epilepsy, nervous cough, mania. *Poisoning*: Dim vision, projected eyeballs, dropping of



FIG. 312.—*Gelsemium sempervirens*: a, rhizome; b, flowering branch; c, fruiting branch ($\frac{1}{4}$ natural size); also flower, ovary, fruit, seed, floral diagram, enlarged.

upper eyelid and lower jaw, difficult enunciation, labored breathing, convulsions (strychnine-like), death—evacuants, tannin, cardiac stimulants: ammonia, strychnine, atropine, digitalis; external heat and friction. Dose, gr. 2–10 (.13–.6 Gm.); 1. *Fluidextractum Gelsemii* (80 p. c. alcohol), dose, \mathfrak{m} j–10 (.13–.6 cc.): Preps.: 1. *Elixir Sodii Salicylatis Compositum*, 1.6 p. c.; 2. *Tinctura Gelsemii*, 10 p. c. (65 p. c. alcohol). Dose, \mathfrak{m} x–60 (.6–4 cc.).

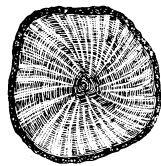


FIG. 313.—*Gelsemium sempervirens*: rhizome, transverse section.

3. *Spigelia marylandica*, *Spigelia*, *Pinkroot*. —The dried rhizome and roots with not more than 10 p. c. of stems or other foreign matter, U.S.P. 1820–1910; United States, Maryland, southward. Perennial herb, .3–.6 M. (1–2°) high, purplish; leaves sessile, entire, ovate-lanceolate; flowers large, scarlet red, on one side of stem above the leaves; fruit 2-seeded. Rhizome, horizontal, 1.5–5 Cm.

($\frac{3}{5}$ –2') long, 2–5 Mm. ($\frac{1}{12}$ – $\frac{1}{5}$ ') thick, dark brown, cup-shaped scars above, numerous roots beneath; fracture short, brittle, 3 zones—pith, wood, bark; odor slightly aromatic; taste bitter, pungent. Powder, grayish-brown—starch grains, lignified tracheæ, tracheids, bast-fibers, reddish-brown epidermal cells; solvents: diluted alcohol, boiling water; contains bitter principle (?), spigeline, volatile oil, resins, tannin, wax, fat, gum, ash 8–10 p. c. Anthelmintic, toxic, mydriatic; large doses narcotic poison; to destroy round worms, usually associated with senna or calomel, or followed by Epsom salt. *Poisoning*: Vertigo, dilated pupils, dry throat, convulsions, delirium—diffusible stimulants: ammonia, brandy, amyl nitrite, atropine, digitalis, Dose, \mathfrak{ss} –2 (2–8 Gm.); children gr. 10–20 (.6–1.3 Gm.); Fluidextract (diluted alcohol); Compound Infusion (Worm Tea), 15 Gm. + senna 10, fennel 10, manna 30, water q. s. 500 cc., \mathfrak{z} ij–5 (60–150 cc.). *S. anthelmia*, *Demerara Pink Root*, *Worm Grass*.—W. Indies. Used for a long time by the native Indians as a vermifuge and narcotic; fresh root has nauseous odor, is bitter, acrid, and kills cattle. *Phlox' caroliniana*, *Carolina* or *Georgia Pink*.—This has a knotty and lighter colored rhizome with a central pith; it is also an anthelmintic, as is *P. glaberrima*.



FIG. 314.—*Spigelia marylandica*.

56. GENTIANACEÆ. Gentian Family.

Jen-shia-na'se-e. L. *Gentian-a* + aceæ, fr. Gr. γέντιανή—*i. e.*, after Gentius, King of Illyria, who first discovered and experienced its virtues. Herbs, shrubs. Distinguished by being smooth, with bitter principles; leaves exstipulate, entire, glabrous, sessile; flowers regular, 5's, sometimes 4, 6, 8, 10; ovary 1-celled; fruit capsule, 1–2-celled, 2-valved; seeds many; universal; tonic, febrifuge, stomachic.

Genus: 1. *Gentiana*.

GENTIANA. GENTIAN, U.S.P.

Gentiana lutea, { The dried rhizome and roots, yielding not less than
Linné. { 30 p. c. of water-soluble extractive.

Habitat. C. and S. Europe (France, Austria, Germany, Switzerland, Portugal, England); mountainous districts.

Syn. Yellow Gentian Root, Pale Gentian, Bitter Root, Bitterwort, Felwort, Radix Gentianæ Rubræ, Luteæ or Majoris; Br. Gentiane Radix; Fr. Gentiane, Racine de Gentiane (de Gentiane jaune); Ger. Radix Gentianæ, Enzianwurzel, Bitterwurzel, Rother (Gelber) Enzian.

Gen-ti-a'na. L. see etymology, page 487, of Gentianaceæ.

Lu'te-a. L. *luteus*, golden-yellow—*i. e.*, the flowers.

PLANT.—Large perennial herb; stem thick, hollow above, .6–1.3 M. (2–4°) high, yellowish-green, underground portion .6–1 M. (2–3°)



FIG. 315.—*Gentiana lutea*.

long, branched; leaves entire, 5–7-nerved, 15–30 Cm. (6–12') long, ovate, glabrous, yellowish-green; flowers June–Aug., numerous, cymes of 20 or more; corolla 5 Cm. (2') long, orange-yellow, spotted, 6 segments; fruit 1-celled, ovate capsule, 3 Cm. (1½') long, many winged-seed. **RHIZOME** (root), in subcylindrical, sometimes branching pieces, of variable length, 5–40 Mm. (½–1½') thick, yellowish-brown, rhizome annulate, roots longitudinally wrinkled; fracture short and uneven when dry, tough and flexible when damp; internally yellowish-brown, bark .5–2 Mm. (⅓–⅓½') thick, separated from a spongy wood by a dark brown cambium zone; odor strong, characteristic; taste slightly sweetish, strongly and persistently bitter. **POWDER**, yellowish-brown — parenchymatous cells with fragments of scalariform or reticulate tracheæ, few or no starch grains and calcium oxalate crystals; no stone cells, bast- or wood-fibers. *Solvents*: water; diluted alcohol. Dose, gr. 5–30 (.3–2 Gm.).

ADULTERATIONS.—**RHIZOME**: Through carelessness—rhizomes, roots of allied species, especially *G. asclepiadea* (stone cells and prosenchymatous tissue); aconite, belladonna, white hellebore, orris (none yellow internally), *Rumex alpinus* (odor and taste distinct—bitter, astringent without gentian aroma); **POWDER**: Ground pine-wood, almond shells, olive stones, sack and rope fibers, etc.

Commercial.—Plant, remarkable for beauty and size, was used by the Greeks and Arabians, and grows in the Alps, Apennines, Pyrenees, Jura, Vosges, 900–1200 M. (3000–4000°) elevation, along with vera-

trum album, the leaves of both closely resembling. Rhizome and roots are collected usually when in flower, washed, dried, and exported from Germany, France (Marseilles)—our chief supply. Austria imposes a fine for collecting any less than 2 Cm. ($\frac{4}{5}$ ') thick at the crown—product of plants 3 years old, which insures propagation through having produced seed.

CONSTITUENTS.—Gentiopicroin, Gentiin, gentiogenin, $C_{10}H_{10}O_4$, gentienin, $C_{14}H_{10}O_5$, gentianose, $C_{16}H_{66}O_{31}$ (uncrystallizable sugar) 14 p. c., resin, gum, pectin, fixed oil 6 p. c., yellow coloring matter, identical with quercitrin, ash 6 p. c.

Gentiopicroin, $C_{16}H_{20}O_9$.—Bitter glucoside, upon which activity depends, obtained by diluting alcoholic extract with alcohol, extracting with equal weight of warm hydrous ether, evaporating to get crystals that contain 1 p. c. gentiin, which can be removed by recrystallizing from acetic ether + 2 p. c. of water; by hydrolysis yields glucose and gentiogenin (white crystals).

Gentiin, $C_{25}H_{28}O_{14}$.—Crystallizes from 60 p. c. hot alcohol in yellow needles, insoluble in water, blackish-green with ferric chloride, heated with 4 p. c. of sulphuric acid splits into glucose, xylose and gentienin.



FIG. 316.—Gentian rhizome, longitudinally sliced, about one-half natural size.

PREPARATIONS.—1. *Tinctura Gentianæ Composita*. Compound Tincture of Gentian. (Syn., Tr. Gentian Co.; Fr. Teinture de Gentiane composée; Ger. Zusammengesetzte Enziantinktur.)

Manufacture: 10 p. c. Similar to *Tinctura Veratri Viridis*, page 104—using gentian 10 Gm., bitter orange peel 4 Gm., cardamom seed 1 Gm., packing moderately; 1st menstruum: glycerin 10 cc., alcohol 50, water 40, finishing with diluted alcohol q. s. 100 cc. Dose, ʒj–2 (4–8 cc.).

2. *Extractum Gentianæ, N.F.*—yield 30 p. c. (water). Dose, gr. 2–10 (.13–.6 Gm.).

Preps.: 1. *Pilulæ Antiperiodicæ, N.F.*, q. s. 2. *Pilulæ Ferri, Quinina, Aloes et Nucis Vomica, N.F.*, q. s.

3. *Fluidextractum Gentianæ, N.F.* (diluted alcohol). Dose, m̄v–50 (.3–2 cc.).

Preps.: 1. *Elixir Gentianæ, N.F.*, 3.5 p. c. Dose, ʒj–2 (4–8 cc.).

Preps.: 1. *Elixir Gentianæ et Ferri, N.F.*, 90 p. c. 2. *Elixir Gentianæ et Ferri Phosphatis, N.F.*, 95 p. c. Dose, each, ʒj–2 (4–8 cc.).

2. *Elixir Gentianæ Glycerinatum, N.F.*, 1 p. c. Dose, ʒj–2 (4–8 cc.).

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4. *Infusum Gentianæ Compositum*, N.F., 3 p. c. Dose, ʒij–4 (8–15 cc.). 5. *Tinctura Rhei et Gentianæ*, N.F., 1 $\frac{3}{4}$ p. c. 6. *Tinctura Amara*, Bitter Stomach Drops, N.F., 6 p. c. + centaury 6, bitter orange peel 6, zedoary 2 (67 p. c. alcohol q. s.). Dose, ʒss–1 (2–4 cc.). 7. *Tinctura Antiperiodica*, N.F., $\frac{1}{2}$ p. c.

PROPERTIES.—Tonic, bitter, increases appetite, digestion (action local); large doses oppress stomach, irritate bowels, nauseate, and cause vomiting.

USES.—Dyspepsia, atonic gout, amenorrhea, hysteria, scrofula, intermittents. *G. Elliot'tii* (*Catesbæ'i*), *Elliott's Gentian*.—The root, U.S.P. 1820–1870; United States, grassy swamps. Perennial herb, 20–60 Cm. (8–24') high, rough; leaves 2.5–5 Cm. (1–2') long, lanceolate, serrate; flowers Oct., blue, 4 Cm. (1 $\frac{3}{8}$ ') long; corolla 10 segments, 5 inner fringed; root resembles the official; constituents and uses similar; in infusion, wine, tincture. *G. purpurea* (purplish flowers), *G. pannon'ica* (dark purple flowers), and *G. puncta'ta* (yellow, purple-dotted flowers); all grow along with official, and collected for it.

Allied Plants:

1. *Erythræ'a Centau'rium*, *Centaurium*, *Centaury*, N.F.—The dried flowering herb with not more than 3 p. c. of foreign organic matter; C. and S. Europe. Plant glabrous, 15–50 Cm. (6–20') high, branched, leaves opposite, entire, sessile, ovate, obovate; flowers, cyme, rose-colored, calyx 5-parted, stamens 5, bright yellow, pistil 2, carpelled; odor faint, characteristic; taste persistently bitter. Powder, brownish-yellow—wood-fibers, wood parenchyma and tracheæ, calcium oxalate rosettes or prisms, non-glandular hairs, few stomata, chlorophyll, tissue of petals and calyx with papillated cells, abundant pollen grains, small stone cells of seed-coat, pith and cortical parenchyma; solvent: diluted alcohol; contains erythrocentaurin (bitter glucoside), erytaurin, waxy and saline substances. Tonic, bitter; dyspepsia, similar to gentian and chirata. Dose, ʒss–1 (2–4 Gm.); 1. *Tinctura Amara*, 6 p. c.

2. *Swer'tia Chiray'ita*, *Chirata*, N.F.—The dried plant with not more than 3 p. c. of foreign organic matter; N. India—mountains. Annual plant, 1 M. (3°) high, cylindrical above, quadrangular below, smooth, yellowish-brown, branched; wood yellowish—thin, enclosing large yellowish, easily separable pith; root simple, 7 Mm. ($\frac{1}{4}$ ') thick near the crown; leaves opposite, sessile, ovate-lanceolate, entire; flowers small, paniced, 4-lobed calyx and corolla; fruit capsule, ovoid, many-seeded; odor slight; taste intensely bitter. Powder, yellowish-brown—numerous tracheæ, lignified fibers, abundant pith parenchyma cells with lignified walls, epidermis with stomata, seed, fragments of seed-coat, pollen grains, cells with brown resin and tannin masses; solvents: diluted alcohol, water partially; contains ophelic acid, chiratin, ash 6 p. c. (K, Ca, Mg, carbonates and phosphates). Tonic, febrifuge, stomachic, laxative, antispasmodic, hepatic, stimulant, large doses nauseate; indigestion, constipation, chronic bronchitis, similar to gentian and calumbo. Dose, gr. 15–30 (1–2 Gm.); 1. *Fluidextractum*

Chiratae (diluted alcohol), dose, ℥xv–30 (1–2 cc.); Tincture 10 p. c. (67 p. c. alcohol), ʒss–1 (2–4 cc.). *S. angustifolia* and *S. pulchella* have entire square stems, pith thin or wanting; less bitter but used to adulterate the preceding.

3. *Sabba'tia angul'aris*, *American Centaury*.—The herb, U.S.P. 1820–1870; United States. Plant .3–.6 M. (1–2°) high, stem branched above, square, smooth; leaves ovate, 2.5 Cm. (1') long, heart-shaped; flowers deep rose, central star greenish, wheel-shaped, 5-parted, bitter; contains bitter principle, fat, erythrocentaurin. Used as tonic, febrifuge, diaphoretic, rheumatism, sore throat, fevers. Dose, gr. 15–60 (1–4 Gm.). *S. Elliot'tii*, *Quinine Flower*; *S. campe'stris*, and *Erythræ'a Centau'rium*, *European Centaury*; all may be used similarly.

4. *Frase'ra carolinen'sis* (Walt'e'ri), *American Colombo*.—The root, U.S.P. 1820–1870; United States. Perennial herb, 1–2.5 M. (3–8°) high, dark purple stem 2.5–5 Cm. (1–2') thick; leaves in whorls 4–6, entire, spatulate; flowers July, yellow, purple-dotted, large; root fusiform, fleshy, yellow. Usually in segments 2.5 Cm. (1') thick, annulate, orange-brown; odor gentian-like; taste sweet, bitter; constituents and uses like gentian. Dose, gr. 15–30 (1–2 Gm.).



FIG. 317.—*Menyanthes trifoliata*.

5. *Menyan'thes trifolia'ta*, *Buckbean*, *Bogbean*, *Water Shamrock*.—The root (rhizome), U.S.P. 1820–1830; dried leaves; United States. Perennial herb, 2.5–3.7 M. (8–12°) high; rhizome 1–2.5 Cm. ($\frac{2}{5}$ –1') thick, slightly longer, branching, black; leaves on petioles, 10–15 Cm. (4–6') long, ternate, leaflets sessile, 5–8 Cm. (2–3') long, obtuse, obovate, entire or crenate, smooth, pale green, inodorous, bitter; contains menyanthin (glucoside, yields menyanthol), mucilage, albumin, sucrose, fat, ash 10 p. c. Tonic, febrifuge, emmenagogue, antiscorbutic, vermifuge; large doses emetic, purgative; rheumatism, scrofula, scurvy, dropsy, intermittents, jaundice, dyspepsia, worms. Dose, gr. 15–30 (1–2 Gm.).

57. APOCYNACEÆ. Dogbane Family.

A-pos-i-na'se-e. L. *Apocyn-um* + aceæ, fr. Gr. ἀπό, from, away, + κύων, a dog—i. e., drives away or kills dogs, hence dogbane. Trees, shrubs. Distinguished by being milky, acrid, poisonous; leaves exstipulate, entire; calyx and corolla 5-lobed; from Asclepiadaceæ by stamens being free from style and stigma (insertion on the corolla), granular pollen, filaments distinct; ovary 2, usually separate; fruit 2 follicles or drupes; tropics; purgative, tonic, febrifuge, poisonous.

Genus: 1. **Strophanthus**.

festoons and coils upon the ground. Fruit is collected by the natives who peel off husks (epicarp, mesocarp), preserve, and dry the smooth, yellowish-brown, more leathery inner covering (endocarp) enclosing the seed, and as such consists of seed 37 p. c., endocarp (pod) 37 p. c., hairs 25 p. c.; the lighter in color the pappus, the higher in grade the contained seed; occurs on the market in pods and as clean seed.

CONSTITUENTS.—Strophanthin 1–3 p. c., choline, trigonelline, fixed oil 25–30 p. c., starch, proteins, pseudo-strophanthinin (?), strophanthic acid (?), ash 4–5 p. c.

Strophanthinum, Strophanthin, $C_{40}H_{66}O_{19}$, *U.S.P.*—(Syn., Fr. Strophantine, Inéine; Ger. Strophanthin.) This glucoside or mixture of



FIG. 319.—*Strophanthus Kombé*: capsule, one-half natural size.

glucosides is obtained by exhausting seed with ether or petroleum benzin (removing fat), then extracting with 70 p. c. alcohol, reclaiming latter, dissolving residue in water, filtering; add tannin, wash precipitate, mix with litharge, dry, exhaust with alcohol, precipitate with ether; heated with diluted hydrochloric acid becomes hydrolyzed, yielding strophanthidin, $C_{27}H_{38}O_7 + 2H_2O$, which precipitates, and strophanthobiose-methyl-ether, $C_{12}H_{21}O_{10}CH_3$, remaining in solution. It is a white, yellowish powder, containing varying amounts of water, which it does not lose entirely without decomposition, permanent (must use great caution in tasting and then only in very dilute solutions), soluble in water, diluted alcohol, less so in dehydrated alcohol, nearly

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insoluble in chloroform, ether, benzene; solutions neutral, dextro-rotatory. *Tests*: 1. With sulphuric acid—emerald-green color, changing to brown; incinerate .1 Gm.—ash negligible. 2. Aqueous solution (1 in 50) with trace of ferric chloride T. S., and a few cc. of sulphuric acid—red-brown precipitate, turning dark green in 1–2 hours. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{300}$ – $\frac{1}{120}$ (.0002–.0005 Gm.).

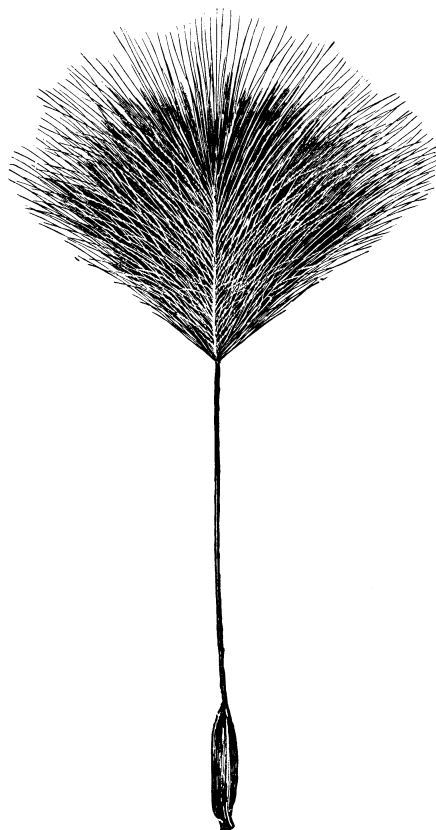


FIG. 320.—*Strophanthus* seed with comose awn.

Fixed Oil.—Brownish-green, non-drying, heavy odor, sp. gr. 0.925, contains volatile oil, phytosterin, formic acid, oleates, stearates, arachinates; may be the irritating ingredient.

PREPARATIONS.—1. *Tinctura Strophanthi*. Tincture of *Strophanthus*. (Syn., Tr. *Strophanth.*; Fr. Teinture (de Semences) de *Strophanthus*; Ger. *Strophanthus* (samen) tinktur.)

Manufacture: 10 p. c. Percolate slowly 10 Gm. with purified petroleum benzin until no greasy stain left; unpack and expose contents to air until dry and benzin odor disappeared, then proceed similar to Tinctura Veratri Viridis, page 104; menstruum: alcohol—moistening and macerating for 48 hours (instead of 24 hours) before starting percolation. Adjust the volume of finished tincture to conform to its biological standard. Dose, Mj-10 (.06-.6 cc.).

Unoff. Preps.: Decoction, 1 p. c., Mx-60 (.6-4 cc.). Extract (Br.), 50 p. c., gr. $\frac{1}{4}$ -1 (.016-.06 Gm.). *Test:* 1. The tincture or extract + ferric chloride T. S. + sulphuric acid, gives brown precipitate changing to green after 1 hour, and so remains 3-4 hours.

PROPERTIES.—Similar to digitalis; heart stimulant, diuretic. Acts directly on muscular tissue of the heart, increasing the contractile power; small doses stimulate contractions, strengthen the force and lower the rate of heart-beats, thus prolonging diastole without altering the duration of the systole, making regular an irregular heart; large doses paralyze the heart, leaving cardiac muscle rigid. It is a better diuretic and a more powerful cardiac stimulant than digitalis, the effect coming on much more quickly, yet being less permanent; reduces pulse and temperature, but is not cumulative, nor does it occasion any gastro-intestinal derangement other than increased peristalsis (sometimes diarrhea); the increased cardiac action stimulates renal circulation, thereby causing the diuretic action.

USES.—Cardiac dyspnea, chronic Bright's, valvular heart lesions, palpitation, weak heart, pulmonary edema from pneumonia, cardiac dropsy, endocarditis, hysteria, chlorosis, renal calculi, asthma, exophthalmic goiter. The effect is felt within half an hour, lasting 4-8 hours, reducing pulse 10-30 beats, at the same time increasing force and volume. The natives make of it an arrow poison (*kombé*), which is an extract, to be applied as a coating over several inches of the pointed end. Game, when wounded, soon becomes exhausted, but flesh is not injured by the poison.

Poisoning, Incompatibles, Synergists: Same as for digitalis. *S. dichotomus*, *False Strophanthus Seed*; these are chestnut-brown and less densely covered with hair, otherwise resemble the official.

Allied Plants:

1. *Apo'cynum cannabinum*, *Apocynum*, *Canadian Hemp*, *Dogbane*, *N.F.*—The dried rhizome and roots with not more than 5 p. c. of stems or other foreign organic matter; United States, Canada to Florida. Perennial milky-juiced herb, 1-2 M. (3-6°) high, glabrous, branched; leaves opposite, entire, mucronate; flowers, cymes, greenish-white; fruit acute follicle, 20 Cm. (8') long, 4 Mm. ($\frac{1}{8}$ ') thick. Rhizome, cylindrical, branched, varying length, 3-10 Mm. ($\frac{1}{8}$ - $\frac{2}{3}$ ') thick, grayish-brown, wrinkled, occasional transverse fissures with vertical sides through bark; fracture short; bark (50-65 p. c. of root) brownish, 1.5-3 Mm. ($\frac{1}{8}$ - $\frac{1}{4}$ ') thick—containing laticiferous ducts and bitterness; wood radiate with large tracheæ; pith small, in rhizome pieces only; almost

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inodorous; taste starchy, bitter, acrid. Powder, light brown—numerous starch grains, some altered, swollen and with central cleft, lignified

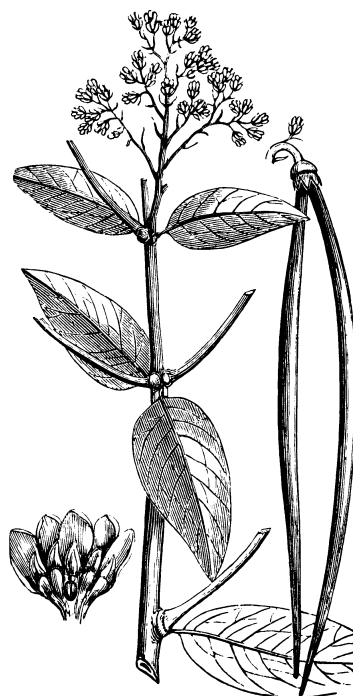


FIG. 321.—*Apocynum cannabinum*.

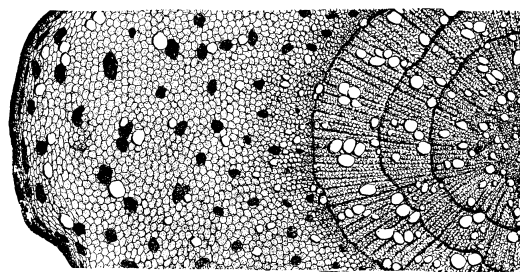


FIG. 322.—*Apocynum cannabinum*: root, transverse section, magnified 25 diam.

wood-fibers, tracheæ, few cork cells with reddish-brown walls, few latex cells, few or no stone cells; solvents: 60 p. c. alcohol, boiling water

partially; contains cynotoxin, tannin, resin, starch, ash 5 p. c. Diuretic, diaphoretic, expectorant, antiperiodic, alterative, cardiac stimulant (similar to digitalis); emetic; cardiac and renal dropsy, intermittents, dyspepsia. Dose, gr. 2-5 (.13-.3 Gm.); emetic, gr. 15-30 (1-2 Gm.); 1. *Fluidextractum Apocyni* (60 p. c. alcohol), dose, mij-5-30 (.13-.3-2 cc.). Extract (aqueous), Infusion, 5 p. c., Tincture, 10 p. c. *A. androsæmifo'lium*, *Spreading Dogbane*.—The rhizome (root), U.S.P. 1830-1870; N. America. Grows associated with the preceding, having stem more spreading, leaves broader, rhizome thinner, tougher, with central pith; bark thinner with layer of stone cells; flowers pinkish; contains (supposedly) about the same as *A. cannabinum*, causing it to be used for similar purposes, but, as a fact, it produces quite different effects.

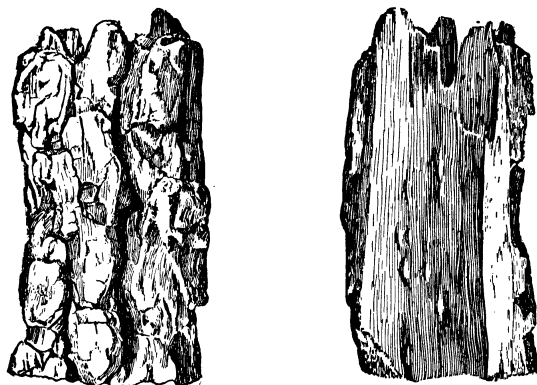


FIG. 323.—*Aspidosperma* (one-half natural size).

2. *Aspidosper'ma Quebra'cho-blan'co*, *Aspidosperma*, *Quebracho Bark*.—The dried bark with not more than 2 p. c. of wood or other foreign matter, U.S.P. 1890-1910; S. America, Argentine Republic, Chile. Evergreen tree, 25-30 M. (80-100°) high, drooping branches; wood brownish; leaves lanceolate, small, coriaceous, rigid, glaucous; flowers campanulate, yellowish, 5's; fruit dehiscent capsule, pericarp thick, woody. Bark, in irregular pieces, 5-14 Cm. (2-6') long, 10-35 Mm. ($\frac{2}{3}$ -1 $\frac{2}{3}$ ') thick, 2-layers—outer corky, 3-25 Mm. ($\frac{1}{8}$ -1') thick, reddish-brown, deeply furrowed, frequently reticulate with longitudinal and shallow transverse fissures; outer surface of bark (after removing cork) reddish-brown, rough, inner surface yellowish-brown, sometimes with adhering wood, striate, porous; fracture short, fibrous, revealing 2 well-defined strata of near equal thickness marked with dots, stone cells and striæ; nearly inodorous; taste bitter, slightly aromatic. Powder, reddish-brown—bast-fibers, crystal-fibers, stone cells, cork cells, starch grains; solvent: diluted alcohol; contains aspidospermine, aspidosper-

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matine, aspidosamine (amorphous), quebrachine, quebrachimine, hypoquebrachine (amorphous), quebrachit (sugar), tannin 3-4 p. c. Cardiac and respiratory stimulant, slows and deepens breathing, antispasmodic, antiperiodic—poisonous, death from asphyxia, solutions protective to wounds; cardiac and asthmatic dyspnea, phthisis, asthma from bronchitis or chronic pneumonia, shortness of breath. Dose, gr. 15-30 (1-2 Gm.); Fluidextract, Extract, Tincture, 20 p. c., Wine. *Quebracho Colorado* (*Loxopterygium Lorentzii*—Red *Quebracho*).—S. America, Bark checkered, wood red, light brown (Colorado); contains tannin 20 p. c., loxopterygine; resinous exudation of bark resembles kino; resembles aspidosperma but deeper color, largely used in tanning. *Quebracho flo'ja* (*Iodi'na rhombifo'lia*), S. America, and *Copalchi Bark* (*Croton ni'vens*), Mexico. All three collected and sold as aspidosperma.

3. *Ascle'pias tubero'sa*, *Asclepias*, *Pleurisy Root*, N.F.—Asclepiadaceæ. The dried root with not more than 5 p. c. of foreign organic matter; United States, Canada. Perennial plant with numerous stems .6-1 M. (2-3°) high, hairy, green or reddish, differing from other asclepiades in not emitting milky juice; flowers beautiful orange-red. Root, irregularly fusiform, 10-20 Cm. (4-8') long, .5-5 Cm. ($\frac{1}{8}$ -2') thick, occasionally branched, usually in pieces; orange-brown, annulate above, numerous intersecting grooves; bark thin; fracture tough, granular and white, yellowish wood bundles and medullary rays; odor slight; taste bitterish, disagreeable, acrid. Powder, yellowish-brown—many starch grains, calcium oxalate rosettes, abundant parenchyma cells, many filled with starch grains; stone cells, tracheæ, bordered pores, few fibers; solvent: diluted alcohol; contains asclepiadin—the active glucoside, volatile oil, 2 resins, mucilage, starch, tannin, ash 9 p. c. Diaphoretic, expectorant, carminative, sudorific, anodyne, irritant, large doses emetic, cathartic; pleurisy (hence name), pneumonia, consumption, rheumatism of chest, colic, dyspepsia, asthma, scrofula, ulcers, wounds. Dose, gr. 15-30 (1-2 Gm.); 1. *Fluidextractum Asclepiadis* (diluted alcohol), dose, 3 ss-1 (2-4 cc.).

4. *A. incarna'ta*, *Flesh-colored Asclepias*, *Swamp Milkweed*.—The root (rhizome), U.S.P. 1820-1830, 1840-1850, 1870; Canada, United States. Perennial herb, smooth or pubescent, .6-1 M. (2-3°) high, with 2 downy lines above; very leafy; leaves lanceolate, cordate base, 10-17.5 Cm. (4-7') long, 2.5-5 Cm. (1-2') wide; flowers rose-purple, sweet-scented; root 2.5 Cm. (1') long, knotty, oblong, brownish, bark thin, central pith, sweet, then acrid bitter, emits milky juice when wounded; contains volatile oil, 2 acrid resins, asclepiadin. Alterative, emetic, cathartic, diuretic, like *Asclepias tuberosa*; decoction, infusion, tincture. Dose, gr. 15-40 (1-2.6 Gm.).

5. *A. syri'aca* (*Cornu'ti*), *Common Milkweed*, *Silkweed*.—The root (rhizome), U.S.P. 1820-1850, 1870; United States. Herb 1-1.5 M. (3-5°) high, stout, pubescent, finely soft; leaves oblong, 10-20 Cm. (4-8') long, downy beneath; flowers large, purplish-white, sweet-

scented, hoods ovate with a tooth each side of stout, claw-like horn; fruit prickly pods containing much silky seed-down; root 2.5–15 Cm. (1–6') long, 6–12 Mm. ($\frac{1}{4}$ – $\frac{1}{2}$ ') thick, in sections, wrinkled, knotty, brownish; bark tough, thick, with laticiferous vessels, wood-wedges yellow, bitter, nauseous; contains asclepion (tasteless), bitter, crystalline principle, caoutchouc (6 p. c. of milk-juice), resin, tannin, starch. Used like preceding, also to coat over wounds, ulcers, etc., to promote cicatrization. Dose, gr. 15–40 (1–2.6 Gm.). *A. curassav'ica*, *Bastard Ipecacuanha*, C. and S. America; flowers bright red; the glossy seed-hairs, called vegetable silk, firmer than the preceding; contains asclepiadin; used natively as we do *Asclepias tuberosa*.

6. *Marsde'nia* (*Gonolobus*) *Conduran'go*, *Condurango*, *N.F.*—The dried bark with not more than 2 p. c. of wood or other foreign organic matter; Ecuador. Climbing vine, 3–9 M. (10–30°) high. Bark (stem) in quills, curved pieces, 4–13.5 Cm. ($1\frac{3}{5}$ – $5\frac{2}{5}$ ') long, 1–6 Mm. ($\frac{1}{2}$ – $\frac{1}{4}$ ') thick, grayish-brown, nearly smooth, numerous lenticels, or scaly and rough, occasionally with whitish lichens; inner surface grayish-white, striate; fracture short-fibrous, granular; odor slightly aromatic (fresh); taste bitter, aromatic. Powder, yellowish-brown—stone cells, parenchyma with calcium oxalate crystals, rosettes, prisms and starch grains; bast-fibers non-lignified, latex tubes with a granular substance, grayish-yellow cork; solvent: diluted alcohol; contains conduragin (bitter glucoside), alkaloid (strychnine-like action), conduransterin, resin, starch, sugar, tannin 12.6 p. c., crystalline acid, wax, ash 12 p. c. Alterative, stomachic, tonic; cancer, syphilis, rheumatism; may occasion nausea, vomiting, convulsions, paralysis. Dose, 3 ss–1 (2–4 Gm.); 1. *Fluidextractum Condurango* (diluted alcohol), dose, 3 ss–1 (2–4 cc.). Infusion, Wine.

58. CONVULVACEÆ: Morning-glory Family.

Kon-vol-vu-la'se-e. L. *Convolvulus* + aceæ, fr. *convolvere*, to roll together, entwine—*i. e.*, referring to stem's twining habit. Herbs, shrubs. Distinguished by twining or trailing habit, roots, containing acrid, milky, purgative juice; leaves exstipulate, sometimes parasitic and leafless; calyx 5, imbricate, inferior; corolla regular, 5-plaited or -lobed; ovary 2–4-celled; ovules 2 in each cell; fruit capsule, 2–4-celled. Allied to Solanaceæ and Scrophulariaceæ, but differing in habit, alternate leaves, and large solitary seeds, with crumpled embryo; tropics, temperate climates; purgative (glucosides in juices); some roots edible (starch, sugar).

Genera: 1. **Exogonium**. 2. **Ipomœa**.

JALAPA. JALAP, *U.S.P.*

Exogonium Jalapa,
(*Nuttall et Coxe*) *Bail-*
lon. { The dried tuberous root, yielding not less than
7 p. c. of the total resins.

CONVOLVULACEÆ

Habitat. E. Mexico, in damp, rich, shady woods; cultivated in India.

Syn. True Jalap, Vera Crux Jalap, Radix Jalapæ; Fr. Jalap—tubéreux—officinal; Ger. Tubera Jalapæ, Jalapenwurzel, Jalapenknollen, Jalape.

Ex-o-go'ni-um. L. fr. Gr. ἔξω, outside, + γένος, offspring—i. e., parts of generation (stamens, pistil) exserted—extended above corolla.

Jal'a-pa. L. named after *Jalapa* or *Xalapa*, a city in Mexico, whence imported. *Jal'ap.* Formerly *jal'op*, English abbreviation from *Jalapa*.

PLANT.—Perennial twining herb; stems numerous, slender, twisted, furrowed, smooth, purplish, 3.6–6 M. (12–20°) long, twining around



FIG. 324.—*Exogonium Jalapa*.

neighboring objects; leaves exstipulate, 10–12.5 Cm. (4–5') long, cordate, entire, smooth, pointed, under side paler, prominently veined, or long petioles; flowers Sept.–Nov., purple, salver-shaped, tube 5 Cm (2') long, limb 5–7.5 Cm. (2–3') wide, in 3-flowered cymes, stamens exserted (*exogonium*). Root, fusiform, irregularly ovoid, pyriform

4–15 Cm. ($1\frac{3}{5}$ –6') long, 1–10 Cm. ($\frac{2}{5}$ –4') thick, often incised or cut into pieces; dark brown, longitudinally wrinkled or furrowed, numerous lenticels; hard, compact; not fibrous, internally grayish-brown, with distinct brown cambium line; odor slight, distinctive, smoky; taste somewhat sweet, acrid. POWDER, light brown—numerous starch grains, .003–.035 Mm. ($\frac{1}{8325}$ – $\frac{1}{725}$ ') broad, concentric or excentric lamellæ, calcium oxalate rosette aggregates, tracheæ, simple pores, secretory cells with yellowish-brown resinous contents. *Solvents*: diluted alcohol extracts virtues completely; water or alcohol alone only partially, each taking out a portion of purgative property, the alcoholic solution being more griping than the aqueous. Dose, gr. 5–20 (.3–1.3 Gm.).

ADULTERATIONS.—False Jalap roots (*Ipomæa simulans*, *I. orizabensis*), and roots of allied species; immature jalap roots, collected at improper times and containing very little resin; jalap roots deprived of resin by soaking in alcohol, becoming sticky to the touch, darker internally and thereby easily recognized; roots of other species of *Exogonium* and *Ipomæa* genera; mealy jalap, resembling the true root, but with mealy fracture and very few resin cells.

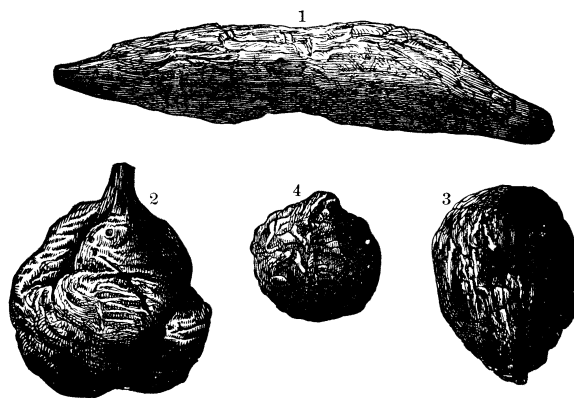


FIG. 325.—Jalap tubers, small sized: 1, fusiform; 2, pear-shaped; 3, date-shaped; 4, globular.

Commercial.—Plant resembles our Morning-glory, demands rich forest-loam and a climate suitable to Cinchona; grows on the eastern slope of the Mexican Andes, 1,500–2,400 M. (5,000–8,000') elevation, flourishes well in the Neilgherry, India, and is cultivated in Jamaica. It is trained upon trellises and various supports, and not disturbed until 3 years old and only thereafter every third year. Roots are dug in all seasons (hence varying appearance and strength), but chiefly in the spring, when young shoots appear, and in the autumn (best), after aerial stems have decayed, then washed, placed into nets and

CONVOLVULACEÆ

dried by holding over fire (there being no sunshine during the rainy season), which imparts a slight smoky odor and hydrates much of the starch; prior to desiccation the very large pieces are divided into halves, quarters, or transversely that tends to make it less desirable; after drying it is put into bags (100–200 pounds; 45–90 Kg.) and shipped from Vera Cruz.

CONSTITUENTS.—Resin 7–15–22 p. c., starch, gum 15 p. c., sugar 2 p. c., bassorin, coloring matter, ash 5–6.5 p. c.

Resin.—Consists of: 1. *Jalapin* (probably identical with scammonin), 4–10 p. c., soft, waxy, soluble in ether, alkalies, reprecipitated by acids, and medicinally inert. 2. *Jalapurgin*, *rhodeoretin*, *convolvulin*, $C_{62}H_{100}O_{32}$, 90–96 p. c., a white, odorless glucoside, hard, insoluble in ether, soluble in alkalies, more of an irritant than jalapin, and the chief active constituent; converted by alkalies into jalapurgic (convolvul(in)ic acid, which is soluble in water), $C_{23}H_{36}O_{14}$, by warming with diluted acids or emulsin into glucose, volatile methyl-ethyl-acetic acid, $C_5H_{10}O_2$, and convolvulic acid, and this latter by continued action into glucose and crystalline convolvulinolic acid, $C_{16}H_{30}O_3$; the name jalapin has unfortunately been assigned to both resins.



FIG. 326.—Jalap tuber: transverse section.

PREPARATIONS.—1. *Pulvis Jalapæ Compositus*. Compound Powder of Jalap. (Syn., Pulv. Jalap. Co., Pulvis Purgans—Catharticus or Jalapæ tartaratus; Fr. Poudre de Jalap composée; Ger. Jalapenpulver mit Weinstein.)

Manufacture: 35 p. c. Triturate together jalap 35 Gm., potassium bitartrate 65; mix thoroughly, pass through No. 60 sieve. It is light brown—numerous sharp, angular, colorless, rectangular fragments, straight-edged, slowly soluble in water or chloral hydrate T. S., strongly polarizing light with strong display of colors (fragments of potassium bitartrate crystals); other elements of identification—tissues of jalap. Dose, gr. 15–60 (1–4 Gm.).

2. *Resina Jalapæ*. Resin of Jalap. (Syn., Res. Jalap.; Br. Jalapæ Resina; Fr. Résine de Jalap; Ger. Jalapenharz.)

Manufacture: Macerate, percolate 100 Gm. with alcohol until the percolate when dropped into water only produces slight turbidity (250 cc.), reclaim alcohol until percolate reduced to 25 Gm., and add this, constantly stirring, to water 300 cc., let precipitate subside, decant supernatant liquid, wash precipitate twice by decantation, each time with hot water 100 cc., drain, dry on water-bath. It is in yellowish-brown masses, fragments, breaking with resinous, glassy fracture, translucent at edges, or yellowish-brown powder, slight, peculiar odor, somewhat acrid taste, permanent, soluble in alcohol, insoluble in carbon disulphide, benzene, fixed or volatile oils; alcoholic solution faintly acid. **Tests:** 1. Shake occasionally for an hour in a stoppered flask 1 Gm. with 20 cc. of chloroform, wash flask and filter with 3

successive 5 cc. portions of chloroform, evaporate combined filtrates, dry residue—should weigh .3 Gm. 2. Dissolve in ammonia water (5) —solution not gelatinous on standing; acidify with hydrochloric acid—only slight turbidity (abs. of rosin, guaiac, other resins). *Impurities*: Rosin, guaiac, aloin, acid resins, other resins, water, soluble substances. Dose, gr. 1–5 (.06–.3 Gm.).

Preps.: 1. *Pilulæ Hydrargyri Chloridi Mitis Compositæ*, $\frac{1}{3}$ gr. (.02 Gm.). 2. *Pilulæ Catharticæ Vegetabiles*, *N.F.*, $\frac{1}{3}$ gr. (.02 Gm.). 3. *Fluidextractum Jalapæ*, *N.F.*, 100 p. c. root (7 p. c. resin—alcohol). Dose, mij –10 (.3–.6 cc.).

4. *Tinctura Jalapæ*, *N.F.*, 20 p. c. root (1.4 p. c. resin—67 p. c. alcohol). Dose, ss –1 (2–4 cc.).

5. *Tinctura Jalapæ Composita*, *N.F.*, 12.5 p. c. (root) + resin of ipomœa 3 p. c. (67 p. c. alcohol.) Dose, ss –1 (2–4 cc.).

Unoff. Preps.: Abstract (alcohol), gr. 2–5 (.13–.3 Gm.). Extract (alcohol), gr. 2–10 (.13–.6 Gm.).

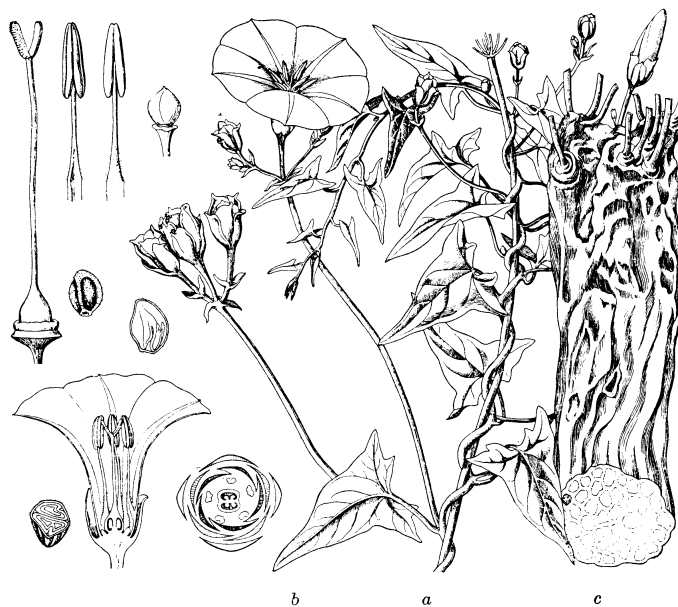


FIG. 327.—*Convolvulus Scammonia*: a, blooming plant, b, fruiting twig; c, root ($\frac{1}{3}$ natural size); also flower, anther, pistil, fruit, seed, diagram of flower, enlarged.

PROPERTIES.—Hydragogue cathartic, diuretic. Has no effect until the duodenum is reached, where with the bile it forms a purgative compound that stimulates vascularity, peristalsis, and profuse secretion from intestinal glands, with no action on biliary flow; usually acts in 4

CONVOLVULACEÆ

hours. It is less irritating than gamboge, podophyllum, or scammony, but occasionally gripes, nauseates and vomits. Often given to children for worms, as it has little taste and a safe action. Excessive doses produce dangerous hypercatharsis. Jalapurgin (convolvulin) in large doses is likewise an active irritant or poison.

USES.—Dropsy, constipation, in febrile and inflammatory affections, head troubles; was introduced into Europe early in the 17th century, and is even now quite popular, being combined usually with calomel, cream of tartar, etc.

Allied Plants:

1. *Convolvulus Scammo'nia*, *Scam'mony*, U.S.P. (resin) 1820–1900; (root) 1910; W. Asia, Syria, Greece. Perennial twining herb, 6–9 M. (20–30°) long; leaves sagittate, bright green; flowers yellow, funnel-shaped; fruit capsule, 4-seeded. Root, vertical, cylindrical, 10–25 Cm. (4–10') long, 1–4.5 Cm. ($\frac{2}{3}$ –1 $\frac{1}{2}$ ') thick, grayish-brown, twisted, furrowed, root-scars, hard, heavy; fracture tough with projecting wood-fibers; internally mottled, yellowish porous wood-wedges, separated by whitish parenchyma containing starch and resin; odor slight, jalap-like; taste slightly sweet; acrid. Powder, grayish-brown—starch grains, calcium oxalate prisms, resin cells, tracheæ, wood-fibers, stone and cork cells; solvents: alcohol, ether; contains resin 3–10 p. c., gum, tannin 3 p. c., sugar 15 p. c., starch, extractive. Hydragogue, cholagogue cathartic—acts locally on upper intestine like jalap, but being a greater irritant causes more griping—sometimes fatal purgation; should be combined with aromatics, potassium sulphate and other cathartics; dropsies, cerebral affections, torpid intestines with slimy mucus. Dose, gr. 5–20 (.3–1.3 Gm.); Resin, gr. 3–8 (.2–.5 Gm.).

2. *Convolvulus Mechoacan'na*, *Mechoacanna Root*.—Considered by some identical with *Ipomœa pandurata*; occurs in sections, light, whitish, mealy, contains little resin.

IPOMCEA. IPOMEA, U.S.P.

Ipomœa orizabensis, *Ledenois*. { The dried root, yielding not less than 15 p. c. total resins nor more than 3 p. c. acid-insoluble ash.

Habitat. Mexico—eastern slopes of Mexican Andes, rainy atmosphere.

Syn. Ipom., Orizaba Jalap Root, Mexican Scammony Root, Fusiform, Light, or Woody Jalap; Br. *Ipomœa Radix*.

Ip-o-mœ'a. L. fr. Gr. *ἴψ*, *ἰσός*, a worm, bindweed, + *ομοίος*, like, resembling—i. e., from the stems' twining habit, resembling the contortions of a worm.

O-ri-za-ben'sis. L. of or belonging to Oriza'ba, a Mexican city, around which it grows and is collected.

PLANT.—A climbing vine resembling closely our common "Morning glory," *I. purpurea*; stem cylindrical, villous; leaves large, petiolate, cordate, acuminate, villous on veins; corolla campanulate, reddish-

purple; fruit capsule, 2-locular, 1-seeded. Root, large, .3-.6 M. (1-2°) long, fusiform, branching, yellowish, internally whitish; usually in nearly flat transverse slices, 2-12 Cm. ($\frac{1}{8}$ -5') broad, 1-5.5 Cm. ($\frac{2}{3}$ -2 $\frac{1}{3}$ ') thick, brownish, deeply wrinkled, fracture tough, fibrous, cut surface light brown, showing concentric rings from which coarse fibers protrude; odor distinct, aromatic; taste slightly sweet, acrid. POWDER, light grayish-brown—starch grains, .003-.035 Mm. ($\frac{1}{8}$ $\frac{1}{3}$ $\frac{1}{5}$ - $\frac{1}{7}$ $\frac{1}{10}$ ') broad, numerous calcium oxalate crystals, mostly in rosette aggregates, occasionally rhombohedra; fragments of yellowish-brown resin cells, tracheæ, wood-fibers, *Solvent*: alcohol. Dose, gr. 10-30 (.6-2 Gm.).

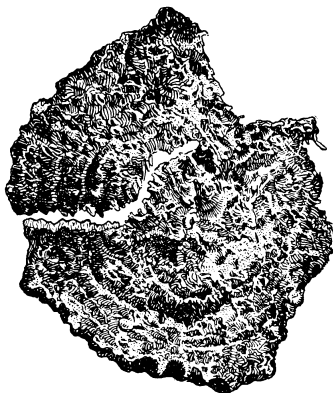


FIG. 328.—*Ipomœa orizabensis*: transverse section (disk), natural size.

Commercial.—*Ipomœa* root has been made official to replace the more acceptable Levant Scammony Root for some years unobtainable. The two roots differ strikingly in marketable form, *Ipomœa* being cut when fresh into disks, rapidly dried in the sun, and shipped from Mexico City; internally unlike scammony in not being mottled, in showing regular concentric wood-bundles, in having no stone cells, and calcium oxalate crystals in rosette aggregates rather than monoclinic prisms.

CONSTITUENTS.—Resin (jalapin, orizabin) 15-18.5 p. c. (75-90 p. c. ether-soluble), starch, gum, tannin, ash 9.89 p. c.

PREPARATIONS.—1. *Resina Ipomœæ*. Resin of *Ipomea*. (Syn., Res. *Ipom.*; Br. *Scammonia Resina*, Scammony Resin.)

Manufacture: Macerate, percolate 100 Gm. with alcohol until percolate when dropped into water produces only slight turbidity, reclaim alcohol until percolate reduced to a thin syrup, and pour this slowly, stirring constantly, into hot water 100 cc., let resin subside, decant supernatant liquid, wash resin twice by decantation, each time with hot water 100 cc., dry on water-bath. It is in translucent, brownish masses, fragments; fracture resinous, glossy; odor characteristic; soluble in alcohol, chloroform, ether (80-90 p. c.), petroleum benzin (less than 5 p. c.); ash—.5 p. c. *Tests*: 1. Dried to constant weight—

HYDROPHYLLACEÆ

loses not more than 1 p. c. (abs. of water). 2. Dissolves in ammonia T. S. (5) or potassium hydroxide T. S. (5) with turbidity—not gelatinous on standing; these solutions, + little hydrochloric acid—only slight turbidity (abs. of rosin, guaiac, other resins). 3. Triturated with distilled water—latter not colored, as it dissolves none of the resin (abs. of soluble impurities), nor does it acquire bitter taste (abs. of aloin). *Impurities*: Rosin, guaiac, aloin, water-soluble substances, other resins. Dose, gr. 1–5 (.06–.3 Gm.).

Preps.: 1. *Extractum Colocynthis Compositum*, 14 p. c. 2. *Tinctura Jalapæ Composita*, N.F., 3 p. c.

PROPERTIES.—Hydragogue, cholagogue cathartic: Root seldom employed internally; resin similar to that of scammony, but a greater irritant and nauseant which may be overcome by combination with other cathartics, and aromatics.

USES.—Dropsies, cerebral affections, torpid intestines with slimy mucus.

Poisoning: Same as for aloe, colocynth, jalap, etc.

Allied Plants:

1. *Ipomœa pandura'ta* (*Convolvulus pandura'tus*), *Wild Potato* or *Jalap*, *Man Root*, *Man of the Earth*.—The root, U.S.P. 1820–1850; United States. Plant recognized by its fiddle-shaped leaves, stem purplish, climbing 3.5–4.5 M. (12–15°) high; flowers campanulate, white, purplish; root conical, .6–1 M. (2–3°) long, 5–7.5 Cm. (2–3') thick, in slices, wrinkled, brownish-yellow, milky inside, bark thin with a zone of resin-cells, odor slight, taste sweetish, bitter, acrid; contains resin 1–2 p. c. (glucoside). Diuretic, cathartic in strangury, calculi. Dose, gr. 15–60 (1–4 Gm.).

2. *I. simulans*, *Tampico Jalap*.—Root irregularly globular or elongated, deeply wrinkled, no transverse ridges—as in the official; yields resin (*tampicin*) 10–15 p. c., nearly all being soluble in ether, and believed identical with resin of scammony.

59. HYDROPHYLLACEÆ. Waterleaf Family.

Hi-dro-fil-la'se-e. L. *Hydrophyllum* + aceæ, fr. Gr. ὕδωρ, water, + φύλλον, L. *folium*, a leaf—*i. e.*, each leaf has a cavity for holding water. Herbs, shrubs, small trees. Distinguished by being hairy, juicy, leaves hairy, toothed, lobed, pinnately compound; flowers regular, scorpioid, 5's; ovary 1–2-celled, 2 parietal placentas, styles and stigmas 2; ovules 2–many; fruit, capsule, 2-valved; temperate climates; stimulant, astringent.

Genus: **1. Eriodictyon.**

ERIODICTYON. ERIODICTYON, U.S.P.

Eriodictyon californicum, { The dried leaf with not more than 5 p. c.
(*Hooker et Arnott*) *Bentham et* stems nor 2 p. c. other foreign organic
Torrey. matter.

Habitat. California, Northern Mexico; dry hills, mountains.

Syn. Eriodict., Yerba Santa, Bear's-, Consumptive's- or Tar Weed, Mountain Balm, Gum Plant, Gum-bush.

Er-i-o-dic'ty-on. L. fr. Gr. *ἔριον*, wool, + *δικτυον*, a net *i. e.*, woolly, net-veined leaves.

Cal-i-for'ni-cum. L. *californicus*, California, of or belonging to California—*i. e.*, its habitat.

PLANT.—Evergreen shrub, 1–1.5 M. (3–5°) high; stem smooth, resinous; flowers 12 Mm. ($\frac{1}{2}$ ') long, bluish-purple, funnel-shaped; 5's,

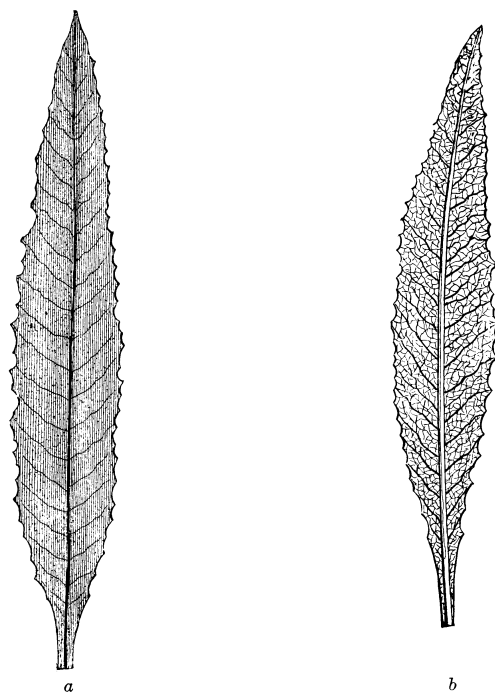


FIG. 329.—Eriodictyon leaves, natural size; *a*, upper surface; *b*, under surface.

racemes. **LEAVES (LEAF)**, lanceolate, 5–15 Cm. (2–6') long, 1–3 Cm. ($\frac{2}{3}$ –1 $\frac{1}{2}$ ') broad, acute, base slightly tapering into short broad petiole, irregularly serrate, crenate-dentate; upper surface yellowish-green, covered with a more or less glistening resin; under surface yellowish-white, conspicuously reticulate with greenish-yellow veins; minutely tomentose between the reticulations; thick, brittle; odor aromatic; taste balsamic, bitter, sweetish. **POWDER**, greenish—non-glandular hairs, glandular hairs, tracheæ, lignified fibers, few starch grains, numerous calcium oxalate crystals in rosette aggregates. *Solvent*: 80 p. c. alcohol. Dose, ʒss–1 (2–4 Gm.).

LABIATÆ

Commercial.—Plant grows among rocks and presents a striking appearance from its shining resinous coating on all green parts.

CONSTITUENTS.—Volatile oil .1 p. c., resin (complex, nearly soluble in ether) 30 p. c., triacontane, $C_{30}H_{62}$, pentatriacontane, $C_{35}H_{70}O_6$, .23 p. c., eriodictyol, phenol, glucose, phytosterol, tannin, gum.

PREPARATIONS.—1. *Fluidextractum Eriodictyi*. Fluidextract of Eriodictyon. (Syn., Fldext. Eriodict., Fluid Extract of Eriodictyon, Fluidextract of Yerba Santa; Fr. Extrait fluide d'Eriodictyon; Ger. Eriodictyonfluidextrakt.)

Manufacture: Similar to Fluidextractum Colchici, page 111; menstruum: 80 p. c. alcohol; reserve first 80 cc. Dose, $\mathfrak{M}\text{xv}$ –60 (1–4 cc.).

Preps.: 1. *Elixir Eriodictyi Aromaticum*, *N.F.*, 6 p. c., + syrup 50, elix. tarax. co. 44, mag. carb. 1, pumice 3. Dose, $\mathfrak{J}\text{j}$ –2 (4–8 cc.). 2. *Syrupus Eriodictyi Aromaticus*, *N.F.*, 3.2 p. c., + liq. pot. hydrox. 2.5, tr. cardam. co. 6.5, ol. sassaf., ol. limon. āā, $\frac{1}{2}\text{ö}$, ol. caryoph. $\frac{1}{10}$, alcohol 3.2, sucrose 80, mag. carb. $\frac{1}{2}$, water q. s. 100. Dose, $\mathfrak{J}\text{j}$ –2 (4–8 cc.).

Unoff. Preps.: Extract, gr. 2–10 (.13–.6 Gm.). Syrup—made like syrup of tolu (pineapple odor and taste).

PROPERTIES.—Stimulating expectorant, bitter tonic.

USES.—Bronchitis, asthma, to disguise bitterness of quinine. *E. tomentosum* grows along with the official plant, and differs in being larger and having a dense coat of short villous hairs, which become whitish or rust-colored by age; corolla salver-form; leaves oval, obtuse.

Allied Plant:

1. *Verbe'na hasta'ta*, *Verbena*, *Blue Vervain*.—Verbenaceæ. The dried overground portion, collected when flowering; N. America. Perennial roughish, pubescent, 1–2.5 M. (3–7°) high; in broken or cut pieces; stem stout, quadrangular, rough, pubescent; leaves opposite, 7–15 Cm. (3–6') long, lanceolate, acute, serrate, lobed, deep green, petiolate; flowers panicles, spikes; corolla salver-form, 5-lobed, bright blue, didynamous; fruit 4-seeded, 4 nutlets at maturity; odor heavy, taste bitter, astringent, disagreeable; contains bitter glucoside, tannin; solvent: water. Diaphoretic, expectorant, nauseant, antiperiodic, similar to eupatorium. Dose, gr. 15–30 (1–2 Gm.). Fluidextract (dil. alc.); Infusion, 5 p. c.

60. LABIATÆ. Labiate (Mint) Family.

La-bi-a'te. L. *Labi-um*(-a) + atæ, fem. pl. of *labiatus*, lip, lips, lipped—*i. e.*, referring to the irregular or lipped corolla. Herbs, shrubs. Distinguished by abounding in aromatic, stimulant, volatile oils, bitter extractive; stems square, calyx regular, 2-lipped, 5-toothed, corolla irregular, 2-lipped, 4–5-lobed, stamens 4, didynamous, or by abortion 2; leaves opposite, aromatic; ovary 4-lobed, becoming in fruit 4 seed-like monospermous nutlets or achenes, enclosed by persistent calyx;

temperate climates; aromatic, carminative, stimulant (vol. oil), tonic, stomachic (bitter extractive principle), flavoring, perfumery.

Genera: 1. **Rosmarinus**. 2. **Lavandula**. 3. **Thymus**. 4. **Mentha**.

ROSMARINUS. ROSEMARY.

Oleum Rosmarini. Oil of Rosemary, *U.S.P.*

Rosmarinus officinalis, *Linne.* { A volatile oil distilled from the fresh flowering tops, yielding not less than 2.5 p. c. esters (bornyl acetate) nor less than 10 p. c. total borneol free and as esters.

Habitat. Mediterranean Basin—Spain to Asia Minor, N. Africa, reaching to Madeira and the Canary Islands; cultivated in gardens.

Syn. Garden Rosemary, Old-man, Folia Rosmarini, Folia Roris Marini, Folia Anthos; Fr. Romarin; Ger. Rosmarin, Meerthau; Ol. Rosmar., Rosemary Oil, Oleum Anthos; Fr. Essence de Romarin; Ger. Rosmarinöl.

Ros-ma-ri-nus. L. *ros*, dew, mist, + *marinus*, *maris*, of the sea—sea foam—*i. e.*, from its maritime habitat and glaucous appearance. *Rosemary*—not Mary's rose.

Of-fi-ci-na'lis. L. see etymology of (*Smilax*) *officinalis*, page 122.

PLANT.—Small perennial shrub 1–1.3 M. (3–4°) high, bushy, much branched; bark pale brown, twigs tomentose; flowers April-May, bilabiate, upper lip 2-parted, lower 3-divided, middle one being the largest, pale blue; fruit achenes, subglobose, smooth; leaves evergreen, many, sessile, 2.5 Cm. (1') long, linear, both ends blunt, entire, margins revolute, dark green, shining above, woolly with white, stellate hairs beneath, like the flowers, with aromatic fragrance, camphor-like; taste bitter.

CONSTITUENTS.—Volatile oil 1 p. c., resin, tannin, bitter principle.

Oleum Rosmarini. Oil of Rosemary.—This volatile oil, obtained by distilling the fresh flowering tops with water or steam, is a colorless, pale yellow liquid, characteristic odor of rosemary, camphoraceous taste, soluble in 10 vols. of 80 p. c. alcohol, sp. gr. 0.903, dextrorotatory; contains pinene, $C_{10}H_{16}$, 80 p. c., camphene, cineol, $C_{10}H_{18}O$, camphor, $C_{10}H_{18}$, also at least 2.5 p. c. of esters, calculated as bornyl acetate, $C_{10}H_{17}C_2H_3O_2$, and 10 p. c. of total borneol, $C_{10}H_{17}OH$. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, m̄j–5 (.06–.3 cc.).

ADULTERATIONS.—**OIL:** Oil of turpentine, etc., recognized by odor and not being affected by an equal volume of alcohol, which dissolves out oil of rosemary.

Commercial.—The Dalmatian (Italian) oil of rosemary, distilled after the flowering season is over, and the French, distilled from the flowering tops and of finer odor, are the chief commercial varieties; the English, from cultivated plants, and the Spanish, being high priced are greatly esteemed by some, but little used.

LABIATÆ

PREPARATIONS.—1. *Linimentum Saponis*, 1 p. c. 2. *Tinctura Lavandulæ Composita*, $\frac{1}{5}$ p. c. 3. *Acetum Aromaticum*, N.F., $\frac{1}{20}$ p. c. 4. *Linimentum Saponato-Camphoratum*, N.F., $\frac{3}{5}$ p. c. 5. *Oleum Hyoscyami Compositum*, N.F., $\frac{1}{5}$ p. c. 6. *Spiritus Odoratus*, N.F., $\frac{7}{10}$ p. c.

Unoff. Preps.: Infusion, 5 p. c.; Spirit (Br.), 10 p. c., m_x-30 (.6-2 cc.).

PROPERTIES.—Carminative, stimulant, diuretic, diaphoretic, emmenagogue; excessive doses cause death.

USES.—Colic, nervous disorders, menstrual derangements; externally in rheumatism, sprains, bruises. Stimulates the hair in alopecia, reduces temperature, and imparts violet odor to urine; mainly used in liniments, lotions, ointments, perfumery.



FIG. 330.—*Rosmarinus officinalis*: branch and flowers.

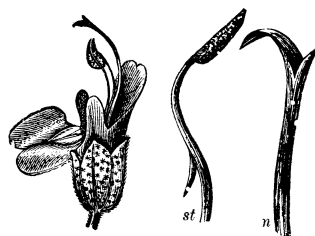


FIG. 331.—*Rosmarinus officinalis*: st, stamen with anther; n, style with stigma.

Tops or Leaves, U.S.P. 1820-1880.

Allied Plants:

1. *Scutellaria lateriflora*, *Scutellaria*, *Skullcap*, *Mad-dog*, N.F.—The dried underground portion, with not more than 3 p. c. of foreign organic matter; N. America, United States, damp thickets, ditch banks. Perennial herb .3-.6 M. (1-2°) high; stem branched, smooth, quadrangular; leaves opposite, 5 Cm. (2') long, ovate-lanceolate, acuminate, coarsely serrate, rounded at base, petiolate; flowers 6 Mm. ($\frac{1}{4}$ ') long, 1-sided axillary leafy racemes, pale blue corolla and bilabiate calyx, closed in fruit, upper lip helmet-shaped, including 4 didynamous stamens (upper pair shorter); odor slight; taste slightly bitter. Powder, dark green—numerous non-glandular hairs, glandular hairs, smooth pollen grains, chlorenchyma, epidermal cells and stomata, lignified fibers, narrow tracheæ, occasional epidermal cells of corolla, fragments pink in chloral hydrate T. S.; solvents: diluted alcohol, boiling water; contains scutellarin, volatile oil, tannin, sugar, ash 12 p. c. Tonic, nervine, antispasmodic; epilepsy, hysteria, nervous exhaustion, chorea, delirium tremens, tremors, spasms, muscular twitching, hyperesthesia, neuralgia, convulsions, intermittents, anuresis, hydrophobia. Dose, ʒss-1 (2-4 Gm.); 1. *Fluidextractum Scutellariæ*

(diluted alcohol), dose, $\overline{5}$ ss-1 (2-4 cc.); 2. *Tinctura Viburni Opuli Composita*, 1 p. c. Decoction, 5 p. c., $\overline{3}$ j-2 (30-60 cc.); Extract, gr. 5-10 (.3-.6 Gm.). *S. integrifolia*, hairy, terminal racemes, *S. pilo'sa*, hairy, terminal racemes, leaves in distinct pairs, *S. galericulata*, nearly smooth, flowers single, axillary—all used interchangeably.

2. *Nep'eta Cata'ria*, *Cataria*, *Catnep*, *Catmint*, *N.F.*—The dried leaves and flowering tops with not more than 5 p. c. of stems over 4 Mm. ($\frac{1}{8}$) thick, or other foreign organic matter; Asia, Europe, naturalized in United States. Perennial herb, .6-1 M. (2-3°) high: Top 10-20 Cm. (4-8') long, branched, crushed and broken; stems quadrangular, downy; leaves opposite, 2-7 Cm. ($\frac{4}{5}$ -3') long, ovate, cordate, acute, crenate, gray-green, hairy; flowers small, spikes, calyx tubular, 5-toothed, corolla whitish, purple-dotted, bilabiate, crenulate; odor faintly aromatic, mint-like; taste bitter, pungent, aromatic. Powder, grayish-green—parenchyma, palisade tissue with green plastids, numerous non-glandular hairs, glandular hairs, stomata, few collenchyma and lignified wood-fiber bundles; solvent: diluted alcohol; contains volatile oil, bitter principle, tannin, gum, fixed oil, ash 16 p. c. Carminative, stimulant, tonic, diaphoretic, emmenagogue, antispasmodic, aphrodisiac (cats); hysteria, chlorosis, colic, amenorrhea, toothache. Dose, gr. 15-60 (1-4 Gm.); 1. *Fluidextractum Catariae* (43 p. c. alcohol), dose, $\overline{5}$ ss-1 (2-4 cc.): Prep.: 1. *Elixir Catariae et Foeniculi*, 10 p. c., + ol. fœnic. $\frac{1}{5}$, ol. menth. vir., $\frac{1}{10}$, sod. bicarb. $1\frac{3}{4}$, alcohol 15, syrup 20, aq. dest. q. s. 100, dose (infant), \overline{m} x-30 (.6-2 cc.). *Prunel'la* (*Brunel'la*) *vulga'ris*, *Self-heal*, *Heal-all*. Plant .3 M. (1°) high, flowers purplish-blue, in dense spike, leaves hairy, bitter, astringent.

LAVANDULA. LAVENDER.

Oleum Lavandulæ. Oil of Lavender, U.S.P.

Lavandula spica, *Linné.* { A volatile oil distilled from the fresh flowering tops, yielding not less than 30 p. c. esters, calculated as linalyl acetate.

Habitat. S. Europe (France, Italy, Spain), N. W. Africa—sunny hills and mountains; cultivated.

Syn. True (Garden, Spike, Common) Lavender, Flores Lavandulæ; Fr. Lavande Vraie,—officinale; Ger. Lavendelblüten; Ol. Lavand., Oleum Lavandulæ Florum, U.S.P. 1900; Fr. Essence de Lavande; Ger. Lavendelöl.

La-van'du-la. L. fr. *lavo*, *lavare*, to wash—*i. e.*, medieval name, in allusion to the use made of its distilled water for bathing.

Spī'ca. L. *spica*, a point, spike—*i. e.*, flowers arranged in a spike: terminal cluster.

PLANT.—Shrub .3-1 M. (1-3°) high; stem crooked, branched, bark brownish-gray, much cleft when old; leaves linear, sessile, entire, revolute margins, with whitish down, crowded at bases of the quadrangular

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branches; flowers June-July, lilac-color, terminal spikes, 2-lipped, hairy, glandular; entire plant delightfully fragrant.

CONSTITUENTS.—Volatile oil 1–3 p. c., resin, tannin.

Oleum Lavandulæ. Oil of Lavender.—A colorless, yellow liquid, characteristic odor and taste of lavender flowers, soluble in 3 vols. of 70 p. c. alcohol, sp. gr. 0.881, levorotatory; contains a terpene, $C_{10}H_{16}$, 2 alcohols—geraniol, $C_{10}H_{18}O$, and (chiefly) linalool, $C_{10}H_{18}O$, also, its compound ester—linalyl acetate, $C_{10}H_{17}C_2H_3O_2$, 30–36 p. c.,

upon which the value depends, and a little cineol—a large quantity of this latter proving the presence of oil of spike (wild broad-leaved variety). When cold deposits stearoptene, and if distilled from leaves and stalks the odor is more rank. *Tests:* 1. Shake in a narrow glass cylinder with equal volume of distilled water—volume not diminished (abs. of alcohol). The *French* oil is from flowers, sometimes including leaves, of wild plants collected July–Sept., the late and high altitude products being best—chief

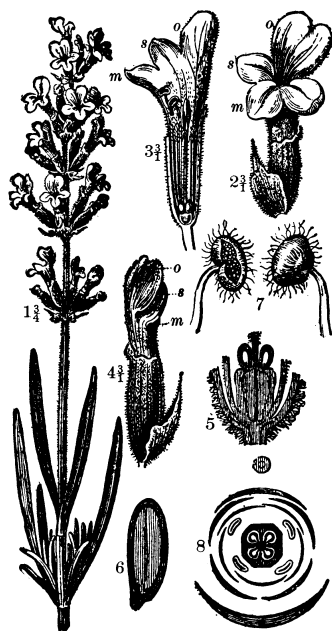


FIG. 332.—*Lavandula spica*: 1, flowering twig; 2, flower with sepal; 3, longitudinal section of flower; 4, flower bud; 5, vertical section of flower bud with ovary; 6, vertical section of little nut; 7, stamens; 8, diagram of flower.

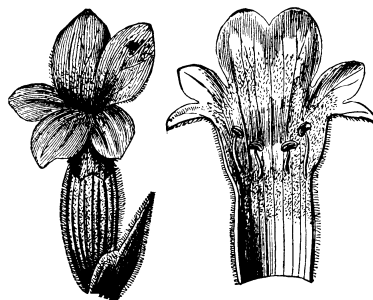


FIG. 333.—Lavender flower and corolla: magnified 4 diam.

commercial article; the *English* oil (oil of garden lavender) is solely from flowers of cultivated plants, the yield being small and price high. Should be kept cool, dark, in well-stoppered amber-colored bottles. Dose, $\mathfrak{m}\text{j}$ –5 (.06–.3 cc.).

ADULTERATIONS.—Oil of turpentine—less soluble in alcohol; oil of sweet basil (*Ocimum Basilicum*), Asia, Africa—plant cultivated in gardens for seasoning food and for its white or reddish flowers; oil balsamic, aromatic, possessing a cooling taste.

PREPARATIONS.—1. *Spiritus Lavandulæ*. Spirit of Lavender. (Syn., Sp. Lavand.; Fr. Alcoolat (Esprit, Eau) de Lavande; Ger. Lavendelspiritus.)

Manufacture: 5 p. c. Dissolve oil 5 cc. in alcohol q. s. 100 cc. Dose, ʒss–1 (2–4 cc.).

2. *Tinctura Lavandulæ Composita*. Compound Tincture of Lavender. (Syn., Tr. Lavand. Co., Compound Spirit of Lavender, Lavender Drops; Fr. Teinture de Lavande composée; Ger. Zusammengesetzte Lavendeltinktur.)

Manufacture: $\frac{4}{5}$ p. c. Similar to *Tinctura Cardamomi Composita*, page 137—using oil of lavender .8 cc., oil of rosemary .2, cinnamon 2 Gm., clove .5, myristica 1, red saunders 1, macerating powders in alcohol 75 cc., in which the oils have been dissolved, and water 25 cc., finishing with 75 p. c. alcohol. Dose, ʒss–1 (2–4 cc.).

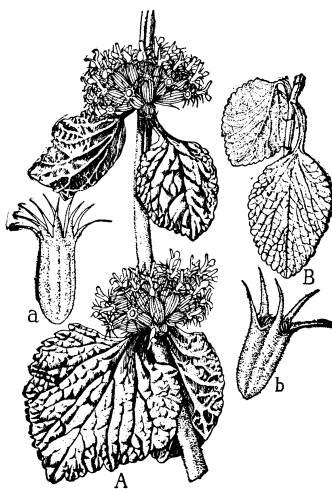


FIG. 334.—A, *Marrubium vulgare* (Nat.); a, calyx ($\times 3$). B, spurium marrubium (Nat.); b, calyx ($\times 3$).

Prep.: 1. *Liquor Potassii Arsenitis*, 3 p. c. (arsenic trioxide 1 p. c., potassium bicarbonate 2 p. c.).

3. *Linimentum Saponis Mollis*, 2 p. c. 4. *Spiritus Ammoniae Aromaticus*, $\frac{1}{10}$ p. c. 5. *Unguentum Plumbi Oleatis*, 1 p. c. 6. *Acetum Aromaticum*, N.F., $\frac{1}{20}$ p. c. 7. *Mistura Oleo-Balsamica*, N.F., $\frac{2}{5}$ p. c. 8. *Oleum Hyoscyami Compositum*, N.F., $\frac{1}{5}$ p. c. 9. *Petroxolinum Liquidum*, N.F., $\frac{1}{2}$ p. c. 10. *Petroxolinum Spissum*, N.F., 3 p. c. 11. *Spiritus Odoratus*, N.F., $\frac{2}{5}$ p. c.

Unoff. Preps.: Water, $\frac{1}{5}$ p. c. Infusion and Fomentation (flowers).

PROPERTIES.—Stimulant, carminative, nervine, errhine.

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USES.—Gastralgia, nausea, flatulence, to correct nauseating medicines, nervous headache; mostly in perfumery.

Flowers, U.S.P. 1840–1880. *Oil of Lavender Flowers*, U.S.P. 1880–1900, distilled from the fresh flowers. *L. Stæ'chas*, Arabian (French)



FIG. 335.—*Salvia officinalis*.

FIG. 336.—*Salvia officinalis*, flower: a, b, filaments; c, connective; d, fertile anthers; e, sterile anthers.

Lavender, has dark purple flowers, aromatic camphoraceous odor, and is used, with other varieties, for obtaining the oil.

Allied Plants:

1. *Marrubium vulga're*, (White, Common) *Horehound*.—The dried leaves and flowering tops, U.S.P. 1820–1900; Europe, C. Asia, N. America, cultivated in waste places, gardens, etc. Perennial herb .3–.6 M. (1–2°) high, with short rootstock; stems numerous, annual, branched below, quadrangular, tomentose, woolly; leaves 1.5–5 Cm. ($\frac{3}{5}$ –2') long, opposite, petiolate, roundish-ovate, obtuse, coarsely crenate, strongly rugose-veined, white-hairy; flowers whitish, in dense, axillary whorls, calyx 10-toothed, divisions slightly unequal, erect-spreading, pungent; corolla small, bilabiate, 4 included stamens; fruit of 4 ovoid, obtuse, nearly smooth nutlets, 1.5 Mm. ($\frac{1}{16}$ ') long; odor distinct, agreeable; taste aromatic, bitter; solvents: diluted alcohol, boiling water; contains volatile oil, marrubiin (bitter amaroid).

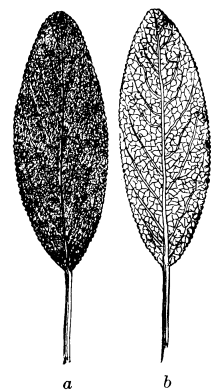


FIG. 337.—Sage leaf: a, upper surface; b, lower surface.

$C_{21}H_{28}O_4$, .02–4 p. c., resin, tannin, gum, albumin, salts. Stimulant, tonic, bitter stomachic, expectorant, resolvent, anthelmintic (large doses—diuretic, diaphoretic, laxative); dyspepsia, bronchitis, chronic hepatitis, jaundice, amenorrhea, phthisis, cachexia, catarrh, chronic

rheumatism, intermittents. Dose, \mathfrak{z} ss-1 (2-4 Gm.); extract, gr. 5-10 (.3-.6 Gm.); fluidextract, \mathfrak{z} ss-1 (2-4 cc.); infusion (sweetened and flavored to liking), 5 p. c., \mathfrak{z} j-2 (30-60 cc.); juice (Succus Marrubii), \mathfrak{z} j-2 (4-8 cc.), in honey or milk; owing to bitterness, the lozenge (cough drop) is the most popular form for administration.

2. *Salvia officinalis*, (Garden, Meadow) Sage.—The dried leaves, U.S.P. 1840-1900; S. Europe, warm stony places; cultivated universally. Perennial; stem semi-shrubby, .6 M. (2°) high, quadrangular,



FIG. 339.—*Hedecoma pulegioides*.



FIG. 338.—*Monarda punctata*: flower magnified.



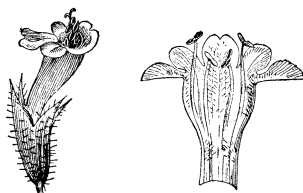
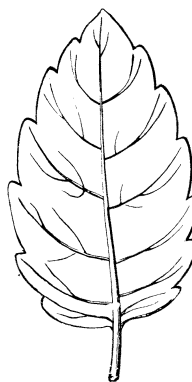
FIG. 340.—*Hedecoma pulegioides*: flower and corolla, magnified.

gray-pubescent, branched; flowers, cymes, blue with white and purple, on woolly stalks, calyx tubular, 2-lipped, upper with 3, lower with 2 acute teeth; corolla tubular, bilabiate, lower in 3 rounded lobes, central one largest; fruit 4 achenes; seed solitary. Leaves ovate-oblong, 3-7.5 Cm. (1½-3') long, apex subacute, base subcordate, crenulate, thick, grayish-green, reticulate-veined, pubescent, petiolate; odor aromatic; taste aromatic, bitter, astringent; should be collected when flowering and dried carefully; solvents: diluted alcohol, boiling water; contains volatile oil .5-2 p. c., resin, tannin, bitter principle (similar to

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amaroid marrubiin), gum. Stimulant, tonic, astringent, vulnerary, condiment; dyspepsia, colliquative sweats, seasoning fat fowl, pork; infusion (externally)—ulcers of mouth, throat, indurated sores, nasal catarrh, suppression of mammary secretion; gargle may be sweetened (sugar, honey) and have added vinegar, alum, borax, potassium chlorate, etc.; ancients valued it highly. Dose, gr. 15–60 (1–4 Gm.); fluidextract, ℥xv–60 (1–4 cc.); infusion, 5 p. c., ʒj–2 (30–60 cc.); water (Aqua Salviæ), distil 1 part with water 10; gargle. *S. pratensis*, S. Europe; *S. lyrata*, N. America, slightly aromatic, and *S. polystachya*, Chia-seed, Mexico, are aromatic and bitter, all being used interchangeably; infusions of either produce (hot) or check (cold) excessive sweating.

3. *Monarda punctata*, Horse-mint.—The leaves and tops, U.S.P. 1820–1870; United States. Perennial, .6–1 M. (2–3°) high, stem branched, downy, leaves 5–7.5 Cm. (2–3') long, lanceolate, serrate, punctate, flowers yellow, spotted red with pinkish bracts, downy, calyx 5-toothed, aromatic, pungent, bitter; contains volatile oil. Carminative, stimulant, emmenagogue, nervine, diaphoretic, diuretic; flatulent colic, nausea, rheumatism, neuralgia, diarrhea; in infusion. Dose, gr. 15–60 (1–4 Gm.). *Oleum*

FIG. 341.—*Melissa officinalis*: flower and corolla, magnified.FIG. 342.—*Melissa officinalis*: leaf.

Monarda (volatile oil), U.S.P. 1820–1870, is yellowish or reddish, sp. gr. 0.930; contains terpene, $C_{10}H_{16}$, 50 p. c., thymol (monardin), $C_{10}H_{14}O$, 25–61 p. c., also alcohol, $C_{10}H_{18}O$, and its acetic, butyric, and formic esters.

4. *Hedeoma pulegioides*, (American) Pennyroyal.—The dried leaves and flowering tops, U.S.P. 1830–1900; N. America, sandy fields, hills, open woods, scenting the atmosphere. Annual herb; stem 25–37.5 Cm. (10–15') high, quadrangular, pubescent, branched; root fibrous, yellowish. Leaves opposite, 15–35 Mm. ($\frac{3}{8}$ –1 $\frac{3}{8}$ ') long, thin, obtuse, obscurely serrate, glandular-hairy beneath, petiolate; flowers, axillary fascicles; calyx tubular, 5-toothed, bilabiate; corolla pale blue, spotted, bilabiate, containing 2 sterile and 2 fertile stamens; odor strong, mint-like; taste aromatic, pungent; solvents: alcohol, boiling water par-

tially; contains volatile oil 1 p. c., bitter principle, tannin. Stimulant, carminative, emmenagogue, aromatic; flatulent colic, nausea, indigestion, corrective to purgatives; hot infusion—diarrhea, bronchitis, rheumatism, amenorrhea (hot hip and foot baths); odor repulsive to fleas, mosquitoes, etc.; large doses, for suppressed catamenia or for inducing abortion, have occasioned death from narcosis. Dose, gr. 15–60 (1–4 Gm.); fluidextract (diluted alcohol), \mathfrak{z} ss–2 (2–8 cc.); infusion, 5 p. c., \mathfrak{z} ij (60 cc.), every hour; spirit (oil 1, + alcohol 9), externally and in spray. Volatile oil (*Oleum Hedeomæ*), U.S.P. 1820–1900, often added to liniments as a rubefacient. *Mentha Pulegium*, *European Pennyroyal*, resembles closely the above, having oval, serrate leaves, and purplish flowers, cymes, corolla 4-lobed; *Hedeoma piperita*, Mexico, is used for peppermint, while *H. thymoides*, Texas, having more agreeable odor, as aromatic, diaphoretic.

5. *Melissa officinalis*, *Melissa*, *Balm*.—The leaves and tops, U.S.P. 1840–1890; Asia Minor, S. Europe. Perennial herb with fragrance of lemons, growing in waste places; stems several, quadrangular, .3–1 M. (1–3°) high, branched at base, pubescent; flowers yellowish-white, purplish, calyx 5-toothed, tubular, bell-shaped; corolla bilabiate, 4 stamens. Leaves, 5 Cm. (2') long, petiolate, ovate, obtuse, crenate, hairy, glandular, branches square; fragrant, aromatic, astringent, bitter; contains volatile oil .25 p. c., bitter principle, tannin, gum; solvents: diluted alcohol, boiling water. Carminative, diaphoretic, stimulant, antispasmodic; used as a refreshing drink; when cold for febrile affections, when hot acts slightly on the skin. Dose, gr. 15–60 (1–4 Gm.); water (*Aqua Melissa*), leaves (1) distilled with water (10); compound spirit (*Spiritus Melissa Compositus*), balm 14 + lemon peel 12, nutmeg 6, cinnamon 3, clove 3, alcohol 150, water 250, distil 200 parts; fluidextract, \mathfrak{m} xv–60 (1–4 cc.); infusion, \mathfrak{z} j–2 (30–60 cc.); oil, \mathfrak{m} j–2 (.06–.13 cc.).

6. *Origanum vulgare*, *Wild Marjoram*.—The herb, U.S.P. 1820–1850; 1870–1880; Asia, Europe, N. Africa, naturalized in N. America. Perennial herb, .3–.5 M. (12–18') high; stem square, purplish, downy; leaves 2.5 Cm. (1') long, ovate, entire, pellucid-punctate, hairy beneath, flowers pale purple, calyx 5-toothed, corolla 2-lipped, 4 exerted didynamous stamens, aromatic, pungent, bitter; contains volatile oil 1 p. c., bitter principle, resin, tannin. *Oleum Origan*, U.S.P. 1820–1850, 1870; consists mainly of terpene, $\text{C}_{10}\text{H}_{16}$. Carminative, stimulant, emmenagogue, diaphoretic, tonic, fomentation; dyspepsia, indigestion, nausea, colic, rheumatism, neuralgia; in infusion. Dose, gr. 15–60 (1–4 Gm.); oil used in liniments, carious teeth, flatulence, \mathfrak{m} v–10 (.3–.6 cc.). The closely allied *Origanum Majorana*, *Sweet Marjoram*, is cultivated largely, being used as a condiment in cooking.

7. *Lythrum virginicus*, *Bugle Weed*.—The herb, U.S.P. 1830–1870; N. America. Plant has smooth, obtusely quadrangular stem, 15–60 Cm. (6–24') high; leaves 5 Cm. (2') long, elliptic, glandular; flowers

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purple, 4-lobed, stamens 2, mint odor and bitter taste, root perennial, creeping; contains volatile oil, resin, bitter principle, tannin. Astrin-
gent, tonic, sédative, narcotic; hemorrhage, diarrhea, dysentery; infu-
sion, decoction. Dose, gr. 5–30 (.3–2 Gm.).

THYMUS. THYME, *N.F.*

Thymol. **Thymol**, $C_{10}H_{14}O$, *U.S.P.*

Thymus vulgaris, { A phenol occurring in the volatile oil of this and
Linné. { other plants.

Habitat. S. Europe (Portugal to Greece); cultivated in gardens, etc.

Syn. Common Garden Thyme, Mother of Thyme; Acidum Thymicum, Thymic
Acid, Methyl-propyl phenol; Fr. Acide Thymique; Ger. Herba Thymi, Thymian;
Thymolum, Thymiansäure.

Thymus. L. fr. Gr. *θύμος*, strength, its invigorating smell. Used in temples as
incense.

Vul-ga'ris. L. ordinary, common—*i. e.*, the kind growing wild and in common
use.

PLANT.—Small shrub, 25–30 Cm. (10–12') high; stem and branches
quadrangular; bark pale brown, shoots purplish; stems .5 Mm. ($\frac{1}{50}$ ')
thick, grayish-brown, pubescent, nodes 5–20 Mm. ($\frac{1}{5}$ – $\frac{1}{2}$ ') apart. Thy-
mus, Thyme, *N.F.* Leaves and flowering tops with not more than
3 p. c. of stems over 1 Mm. ($\frac{1}{25}$ ') thick, or other foreign organic matter,
yielding not more than 4 p. c. of acid-insoluble ash. Leaves linear-
lanceolate, ovate, .5–6 Mm. ($\frac{1}{50}$ – $\frac{1}{4}$ ') long, .5–2 Mm. ($\frac{1}{50}$ – $\frac{1}{12}$ ') broad,
acute, base tapering into short petiole, revolute, grayish-green,
puberulent, many non-glandular hairs, grayish, pubescent beneath;
numerous glandular secreting hairs above, depressed in cuticle giving
glandular-punctate appearance; flowers polygamous, bilabiate, small,
pubescent, upper lip 3-toothed, lower 2-toothed, purplish; fruit nutlets,
.5 Mm. ($\frac{1}{50}$ ') broad, spheroidal. Powder, light-green—non-glandular
hairs 2 types, glandular hairs 2 types, leaf chlorenchyma with vascular
tissue and epidermal cells, stomata, pollen grains.

CONSTITUENTS.—Volatile oil 2.5 p. c. (thymol), resin, tannin, gum,
ash 14 p. c.

Oleum Thymi. **Oil of Thyme, *N.F.***—A volatile oil distilled from the
flowering plant containing not less than 20 p. c., by volume, of phenols.
It is a colorless or red liquid, characteristic odor and taste, soluble in
2 vols. 80 p. c. alcohol, sp. gr. 0.912, levorotatory; contains at least
20 p. c., by volume, of phenols, also cymene, $C_{10}H_{14}$, *l*-pinene, borneol,
linalool; the phenol content in the French and German oil, amounting
to 25–42 p. c., is mostly thymol, but sometimes carvacrol, or a mixture
of the two, whereas in the Spanish oil it is chiefly carvacrol, amounting
to 50–70 p. c. *Adulterations:* Oil of turpentine which lowers specific

gravity and increases angle of rotation, while wild thyme oil only does the latter. *Test*: 1. Shake 1 cc. with hot distilled water 10 cc., cool, pass aqueous layer through a wetted filter—filtrate not blue or violet with a drop of ferric chloride T. S. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, m-j-5 (.06–.3 cc.).

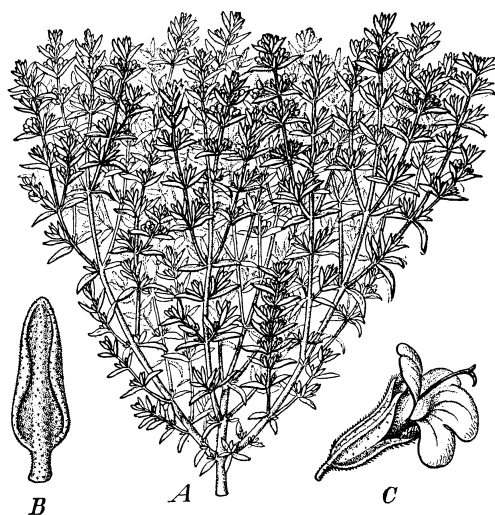


FIG. 343.—*Thymus vulgaris*: A, plant in bloom; B, leaf seen from under surface, magnified 4 diam.; C, flower seen from the side, magnified 5 diam.

Thymol. *Thymol, U.S.P.*—This monatomic phenol, occurring in the volatile oils of *Thymus vulgaris*, *Monarda punctata*, and *Ptycho'tis Cop'tica* (*Ajowan*—Umbelliferae), the latter alone supplying most of the commercial article, is obtained by subjecting to freezing the residue left upon distilling any of these oils below 200° C. (392° F.), whereby thymol crystallizes out; or may agitate this residue with sodium hydroxide solution, and after a time add hot water to separate sodium thymol ($\text{NaC}_{10}\text{H}_{13}\text{O}$) solution from thymene, and to allow unattacked oil to float on top; to sodium hydroxide solution add hydrochloric acid which sets thymol free as an oily layer and upon cooling crystallizes when a crystal of thymol is added; yield 20–61 p. c. It is in large colorless, translucent, rhombic prisms, aromatic, thyme-like odor, pungent, aromatic taste, very slight caustic effect upon the lips; soluble in glacial acetic acid, fixed or volatile oils, water (1000), alcohol (1), chloroform (.7), ether (1.5); olive oil (1.7); alcoholic solution (1 in 20) neutral, optically inactive; isomeric with carvone (carvol, carvacrol); as a solid heavier than water, when liquefied by fusion lighter than water, melts at 50° C. (122° F.); liquefies when triturated with equal weight of

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camphor or menthol. *Tests*: 1. Dissolve a small crystal in glacial acetic acid 1 cc., add sulphuric acid 6 drops and nitric acid 1 drop—liquid deep bluish-green by reflected light. 2. Heat 1 Gm. with 5 cc. of a 10 p. c. solution of sodium hydroxide—clear, colorless, or pale red solution, darker on standing, without separating oily drops; add few drops of chloroform, agitate—violet color; volatilize 2 Gm. on water-bath—residue .05 p. c. 3. Alcoholic solution (1 in 20), + ferric chloride T. S.—not violet (abs. of phenol). *Impurities*: Phenol, etc. Should be kept in well-closed containers. Dose, antiseptic, gr. 1–5 (.06–.3 Gm.); anthelmintic, gr. 15 (1 Gm.), per die.

PREPARATIONS.—THYMOL: 1. *Nebula Thymolis*, N.F., 1 p. c. 2. *Cataplasma Kaolina*, N.F., $\frac{1}{20}$ p. c. 3. *Liquor Antisepticus*, N.F., $\frac{1}{10}$ p. c. 4. *Liquor Aromaticus Alkalinus*, N.F., $\frac{1}{20}$ p. c. 5. *Liquor Procainæ Hydrochloridi*, N.F., $\frac{1}{50}$ p. c. 6. *Nebula Aromatica*, N.F., $\frac{1}{10}$ p. c. 7. *Petroxolinum Sulphuratum Compositum*, N.F., $\frac{3}{10}$ p. c. 8. *Pulvis Antisepticus*, N.F., $\frac{1}{10}$ p. c. OIL: 1. *Linimentum Saponato-Camphoratum*, N.F., $\frac{3}{10}$ p. c. 2. *Liquor Antisepticus*, N.F., $\frac{1}{33}$ p. c. 3. *Mistura Oleo-Balsamica*, N.F., $\frac{2}{5}$ p. c. 4. *Oleum Hyoscyami Compositum*, N.F., $\frac{1}{5}$ p. c. THYME: 1. *Fluidextractum Thymi*, N.F. (1st menstruum: glycerin 10, alcohol 25, water 65, 2d: 25 p. c. alcohol). Dose, $\mathfrak{M}\text{xv}$ –60 (1–4 cc.): Prep.: 1. *Syrupus Thymi*, N.F., 20 p. c.: Prep.: 1. *Syrupus Thymi Compositus*, N.F., 50 p. c. Dose, $\mathfrak{J}\text{j}$ –2 (4–8 cc.).

Unoff. Preps.: THYMOL: Capsules. Inhalation, 1 gr. (.06 Gm.) in each. Ointment, 1–5 p. c., Pills.

PROPERTIES.—THYMOL: Stimulant, antiseptic, deodorant, disinfectant, parasiticide, antipyretic, local anesthetic; anthelmintic. Its action stands between phenol and oil of turpentine, being 10 times less poisonous than the former, yet a far more powerful and permanent antiseptic; it is anesthetic to the skin and mucous membranes, paralyzing the ends of sensory nerves; it is eliminated by breath and urine. OIL: Stimulant, tonic, emmenagogue, antispasmodic. If excessive doses given, have vomiting, depression, coldness, death by exhaustion, increased urine, which acquires green color and violet odor.

USES.—THYMOL: Precisely like the oil, not much internally, except for fermentative gastritis, and hook-worm; for this latter give on an empty stomach gr. 15–30 (1–2 Gm.) mixed with an equal quantity of lactose, repeat in 2 hours and follow 2 hours later, by full dose of Epsom salt, or compound cathartic pills (avoid castor oil); mostly externally as an antiseptic in surgery, to lessen fetor from sores, ulcers, gangrene, in stomatitis, diphtheria, fetid bronchitis, coryza, rhinitis, ozena, conjunctivitis, otorrhea, gonorrhea, uterine lochia, cancer, leucorrhea, warts, skin diseases (psoriasis, eczema, etc.), diarrhea, dysentery, typhoid fever, diabetes. A good dressing is thymol 1 Gm., alcohol 10 cc., glycerin 30, water q. s. 1000 cc. Flies are fond of and often become attracted by it, which is its only objection. *Poisoning*: Have nausea, vomiting, headache, dizziness, weakness, ringing in the

ears, thready pulse, low temperature—treat symptoms, withdraw drug. OIL: Chlorosis, rheumatism, neuralgia, bronchitis, diarrhea, gleet, gonorrhea, leucorrhea, vesical catarrh; externally in baths, lotions for scabies, muscular rheumatism, to correct fetor from sores, ulcers, gangrene. Applied to cotton for toothache, earache, for veterinary practice, scenting soap.

Thymacetin, $C_6H_5 \cdot CH_3OC_2H_5C_3H_7NH \cdot COCH_3$, a derivative, has the same relation to thymol that phenacetin has to phenol, and is prepared similarly; it is a white crystalline powder, soluble in alcohol, slightly in water. Analgesic, hypnotic, antiseptic; used in neuralgic headache like phenacetin. Dose, gr. 5–15 (.3–1 Gm.).

Thyme plant (fresh) is used as a condiment to aid digestion of fat pork, goose, duck, etc., and to flavor insipid dishes, as is sage, marjoram, parsley; it is used also with other aromatic herbs in baths, cataplasms, fomentations, for rheumatism, gout, scabies, indolent ulcers.

MENTHA VIRIDIS. SPEARMINT, *U.S.P.*

Mentha spicata, *Linné*.
(**Mentha viridis**, *Linné*.) { The dried leaves and tops with not more than 2 p. c. of stems over 3 Mm. ($\frac{1}{8}$ ') thick, or other foreign organic matter.

Habitat. England, wild in Europe, N. America; cultivated in the United States.
Syn. Menth. Vir., Mint, Mackerel, Lady's, Brown, Lamb or Common Garden Mint, Lammint, Sage of Bethlehem, Herba Menthae Romanae (Acutae); Fr. Menthe (romaine) verte, Baume vert; Ger. Grüne Minze, Römische Minze.

Men'tha. L. fr. Gr. *μινθη*, Minthe, a nymph, daughter of Cocytus, fabled to have been changed into a mint plant by Proserpine in a fit of jealousy (Theophrastus).

Spi-ca'ta. L. spiked—*i. e.*, the flowers.

Vir'i-dis. L. green—*i. e.*, the stem.

Spear'mint—*spur* + *mint*, from its spiry, spear-like inflorescence.

PLANT.—Perennial herb; rootstocks with elongated suckers, by which it multiplies extensively; stems .6–1.3 M. (2–4°) high, acutely quadrangular, branches opposite, smooth, often tinged with purple; flowers Aug.-Sept., spikes, calyx tubular, 5-toothed, corolla 4-lobed, light purple. LEAVES, ovate-lanceolate, 1–9 Cm. ($\frac{2}{5}$ – $3\frac{3}{5}$ ') long, unequally serrate, nearly sessile, or petiole only 4 Mm. ($\frac{1}{8}$ ') long, bright green, somewhat glandular-hairy on under surface; more or less crumpled and mixed with large proportion of the light brown, purplish stems, occasionally with their characteristic opposite branches; stems distinctly quadrangular, 1–3 Mm. ($\frac{1}{25}$ – $\frac{1}{8}$ ') thick, nearly glabrous; flowers in opposite clusters, or more or less interrupted or crowded, lanceolate, nearly acute spikes; bracts linear-lanceolate, subulate, 7–10 Mm. ($\frac{1}{4}$ – $\frac{2}{5}$ ') long, subtending the flower clusters; calyx tubular, 5-toothed, glandular-punctate, somewhat pubescent near the teeth;

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corolla nearly white, light brown; stamens exserted; odor slightly pungent, characteristic; taste aromatic, characteristic, not followed by cooling sensation in the mouth. POWDER, green—closely resembles that of peppermint but without crystals from the globular heads of the glandular hairs. Should be collected in dry weather, Aug.–Sept., just as flowers appear, if for oil, just after flowers have expanded, and is heavier, weaker and less pungent than peppermint, being probably the cultivated form of *M. longifo'lia* (*sylves'tris*), *Horse-mint*; loses on drying 75–85 p. c. *Solvents*: alcohol; water partially. Dose, gr. 30–60 (2–4 Gm.).

ADULTERATIONS.—Mostly through carelessness—leaves of other *Mentha* species, chiefly *M. piperita*, sometimes 30–50 p. c. in that coming from the South (Va., N. Ca., S. Ca.); its own odor and taste (lack of coldness), unequally serrate sessile leaves, slender interrupted spikes, and long calyx teeth should suffice for ready recognition.

CONSTITUENTS.—Volatile oil .5 p. c., resin, tannin, gum.



FIG. 344.—*Mentha spicata* (*viridis*):
flowering tops.



FIG. 345.—*Mentha spicata* (*viridis*):
leaf, natural size.

Oleum Menthæ Viridis. Oil of Spearmint, U.S.P.—(Syn., Ol. Menth. Vir., Spearmint Oil; Fr. Essence de Menthe verte; Ger. Krause-minzöl, Romisch Minzöl.) This volatile oil, distilled from the flowering plant (fresh or partly dried) is a colorless, yellow, greenish-yellow liquid, characteristic odor and taste of spearmint; soluble in 80 p. c. alcohol (1) with clear solution that becomes cloudy on further dilution with alcohol, sp. gr. 0.925, levorotatory; contains at least 43 p. c. of

carvone, $C_{10}H_{14}O$, limonene, $C_{10}H_{16}$, 43 p. c., possibly pinene, $C_{10}H_{16}$, and an unidentified alcohol, $C_{10}H_{17}OH$. It is preserved for a long time by adding 3-4 p. c. of alcohol. Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, $\text{mj}-5$ (.06-.3 cc.).

PREPARATIONS.—LEAVES AND TOPS: 1. *Spiritus Menthæ Viridis*. Spirit of Spearmint. (Syn., Sp. Menth. Vir., Essence of Spearmint, Tinctura Olei Menthæ Viridis; Ger. Grüne Minzessenz.)

Manufacture: Macerate for 1 hour spearmint leaves 1 Gm. in water 50 cc., strongly express; mix oil of spearmint 10 cc. in alcohol 80, add macerated leaves, and alcohol q. s. 100 cc., macerate mixture for 6 hours, frequently shaking, filter. Should be kept in amber-colored bottles. Dose, $\text{mx}-30$ (.6-2 cc.).

Prep.: 1. *Elixir Manacæ Compositum*, N.F., 1.5 p. c.

OIL: 1. *Aqua Menthæ Viridis*. Spearmint Water. (Syn., Aq. Menth. Vir.; Fr. Eau de Menthe verte; Ger. Römisch Minzwasser.)

Manufacture: $\frac{1}{5}$ p. c. Similar to *Aquæ Aromaticæ*: shake often during 15 minutes, oil .2 cc. with distilled water 100, in a capacious bottle, set aside 12 hours or more, filter, adding distilled water q. s. 100 cc., or triturate oil .2 cc. with purified talc 1.5 Gm. and recently boiled distilled water q. s. 100 cc., filter until clear. Dose, $\text{ss}-1$ (15-30 cc.).

Prep.: 1. *Liquor Sodæ et Menthæ*, N.F., 98 p. c.

2. *Spiritus Menthæ Viridis*, 10 p. c. 3. *Elixir Cataris et Fœniculi*, N.F., $\frac{1}{10}$ p. c.

Unoff. Preps.: LEAVES AND TOPS: *Infusion*, 5 p. c., $\text{ss}-2$ (30-60 cc.). *Fluidextract*, $\text{ss}-2$ (4-8 cc.). LEAVES AND TOPS, OR OIL: *Syrup*, $\text{ss}-4$ (4-15 cc.).

PROPERTIES.—Carminative, stimulant, nervine; flavoring.

USES.—Same as peppermint, but as it is much milder it is to be preferred in disorders of infancy, culinary purposes, confectionery, perfumery—flavoring chewing gum, world celebrated mint julep, mint sauce, peas and other green vegetables.

Allied Plants:

1. *Mentha cris'pa*, *Crisped-leaved*, *Cross* or *Curled Mint*.—This is the cultivated form of *M. spicata* (*viridis*), known also as *M. aquat'ica* var. *crispa*, leaves pubescent, cordate pointed, crisped; *M. sati'va*, *M. arven'sis*, and *M. rotundifo'lia*, are under cultivation and sometimes produce similar crisped leaves.

2. *Hyssopus officina'lis*, *Hyssop*.—S. Europe. Plant .3 M. (1°) high, stem square, leaves 2.5 Cm. (1') long, punctate on both sides, flowers purplish-blue, stamens 4, exserted; contains volatile oil .5 p. c., bitter principle, resin, fat. Used in Biblical times as a cathartic, now as a carminative, stimulant, sudorific; for dyspepsia, amenorrhea, rheumatism, bruises, bronchitis, sore throat, chronic catarrhs. Dose, gr. 15-60 (1-4 Gm.); infusion, 5 p. c.; oil $\text{mj}-2$ (.06-.13 cc.).

MENTHA PIPERITA. PEPPERMINT, U.S.P.

Mentha piperita, { The dried leaves and tops with not more than 2
Linné. p. c. of stems over 3 Mm. ($\frac{1}{8}$ ') thick, or other
foreign organic matter.

Habitat. Asia, Europe, N. America; wild in low ground, wet places; cultivated in Japan, Germany, England, Michigan, New York, etc.

Syn. Menth. Pip.; Brandy (Lamb) Mint, Lammint, Herba Menthæ Piperitæ; Fr. Menthe poivrée; Ger. Folia Menthæ piperitæ, Pfefferminzblätter.

Pi-pe-ri'ta. L. *piper*, *pepper*—peppery-mint—*i. e.*, from its aromatic burning taste.

Pep'permint—*pepper* + *mint*—*i. e.*, mint with pepper properties.

PLANT.—Perennial herb, possibly from *M. hirsuta*, *Water Mint*, by cultivation; rootstock creeping, producing long suckers by which it multiplies; stem square, purplish, .6–1.3 M. ($2-4^{\circ}$) high. LEAVES, ovate-oblong, 1–9 Cm. ($\frac{2}{3}$ – $3\frac{2}{3}$ ') long, petiole 4–15 Mm. ($\frac{1}{6}$ – $\frac{3}{5}$ ') long, pubescent, acute, sharply serrate, light green, purplish-brown, upper surface nearly glabrous, lower surface glandular-hairy, especially on veins; more or less crumpled and frequently detached from stems, which are quadrangular, 1–3 Mm. ($\frac{1}{25}$ – $\frac{1}{8}$ ') thick, glabrous except for



FIG. 346.—*Mentha piperita*: flowering tops.

a few scattered deflexed hairs; flower-whorls in oblong (oval) spikes which are usually compact, or somewhat interrupted at base, 1–1.5 Cm. ($\frac{2}{3}$ – $\frac{3}{5}$ ') broad, rounded at summit, and in fruit 3–7 Cm. ($1\frac{1}{5}$ – $2\frac{4}{5}$ ') long; bracts oblong-lanceolate, very acuminate, 4–7 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') long, calyx tubular, equally 5-toothed, pubescent, glandular-punctate, often dark purplish; corolla tubular-campanulate, 4-cleft, 3 Mm. ($\frac{1}{8}$ ') long, often light purple; stamens 4, short; nutlets ellipsoidal, .5 Mm. ($\frac{1}{50}$ ') thick, blackish-brown; odor aromatic, characteristic; taste aromatic, pungent, followed by cooling sensation in the mouth. POWDER, green-

ish—leaf epidermis with wavy vertical walls, stomata, non-glandular hairs with papillose walls, glandular hairs with volatile oil and crystals, chlorenchyma, tracheæ, parenchyma, pollen grains. Should be collected in dry weather, Aug.-Sept., when in bloom; strongest and most pungent of all mints. *Solvents*: alcohol; water partially. Dose, gr. 15-60 (1-4 Gm.).

ADULTERATIONS.—Leaves chiefly of varieties of this species: (a) var. *officina'lis*—leaves narrower, spikes longer; (b) var. *vulga'ris*—leaves broader, base more rounded, spikes more blunt and close; spearmint leaves, which may readily be distinguished from peppermint which has leaves with petioles, inflorescence thicker and more crowded, flowers larger with shorter calyx-teeth, and its own distinctive odor and taste.

Commercial.—English is regarded best, Japanese is consumed chiefly for obtaining menthol (50-80 p. c.), while United States produces most.

CONSTITUENTS.—Volatile oil 1 p. c. (menthol), resin, tannin, gum, chlorophyll.

Oleum Menthae Piperitæ. Oil of Peppermint, U.S.P.—(Syn., Ol. Menth. Pip., Peppermint Oil; Fr. Essence de Menthe poivrée; Ger.



FIG. 347.—*Mentha piperita*: flower and corolla cut open; magnified 8 diam.

Pfefferminzöl.) This volatile oil, distilled from the fresh, overground parts of the flowering plant and rectified by steam distillation, is a colorless liquid, strong penetrating odor of peppermint, pungent taste, followed by a sensation of cold upon drawing air into the mouth; soluble in 4 vols. of 70 p. c. alcohol, showing not more than slight opalescence and no separation of oil globules (abs. of dementholized or impure peppermint oil), sp. gr. 0.912, levorotatory; contains 16 constituents: at least 5 p. c. of esters, calculated as menthyl acetate, $C_{10}H_{19}C_2H_3O_2$, and 50 p. c. of total menthol, free and as esters; also acetic and isovaleric acids, acetaldehyde, isovaleric aldehyde, amyl alcohol, pinene, phellandrene, limonene, $C_{10}H_{16}$, menthone, $C_{10}H_{18}O$, menthyl isovalerate, menthyl ester, cadinene, $C_{15}H_{24}$, a lactone, dimethyl sulphide; the hydrocarbons holding menthol dissolved are mainly the

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several terpenes (English—pinene, phellandrene, sesquiterpene; Japanese—sesquiterpene alone) with carvene odor, the higher boiling ones, $C_{15}H_{24}$, having less pleasant odor; menthol and its esters (first 2 constituents) are most important, the others occurring in small quantities, being objectionable for flavoring and removed by rectification with steam. *Tests*: 1. Distil oil 25 cc., collect the first 1 cc. and carefully superimpose it on 5 cc. of mercuric chloride T. S.—no white film at zone of contact in 1 minute (abs. of dimethyl sulphide, found in non-rectified peppermint oils). Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, mj-5 (.06–.3 cc.).

ADULTERATIONS.—Oil of erigeron, castor oil, oil of turpentine, oil of copaiba, oil of camphor, oil of sassafras, alcohol; the first, second, and third prevent its solubility in equal volume of 80 p. c. alcohol; the fourth gives buttery mass with sulphuric acid; oils of turpentine, camphor, and sassafras each render its action with iodine more violent, the two latter being red with nitric acid; dementholized oil (lower sp. gr.).

Menthol. **Menthol**, $C_{10}H_{19}OH$, *U.S.P.*—(Syn., Pipmenthol, Peppermint Camphor; Fr. Alcool Mentholique, Menthol Gauche, Camphre de Menthe; Ger. Mentholium, Pfefferminzkampfer, Mentha-kampfer.) This is a secondary alcohol (steaoptene), obtained from oil of peppermint or other mint oils (Japanese and Chinese oil of peppermint—*M. arven'sis* var. *piperas'cens*, *M. canadensis* var. *glabra'ta*). It is obtained by subjecting the volatile oil simply to refrigeration at -22.2°C . (-8°F .), by means of ice and salt; when solidified the temperature is allowed to rise gradually, the liquid portion poured off from time to time, and the crystals deprived of oil by expression; may purify by recrystallization. It is in colorless, acicular crystals, strong peppermint-like odor and taste, with a sensation of warmth followed by cold upon drawing air into the mouth; soluble in alcohol, chloroform, ether, petroleum benzin, liquid petrolatum, fixed or volatile oils, glacial acetic acid, slightly in water; alcoholic solution neutral, levorotatory; melts at 43°C . (110°F .); triturated with an equal weight of either camphor, phenol, thymol, or chloral hydrate—mixture becomes liquid; distilled with P_2O_5 yields menthene, $C_{10}H_{18}$, a colorless liquid of pleasant odor. *Tests*: 1. Heat 2 Gm. in open dish—gradually volatilizes with residue .05 Gm. (abs. of wax, paraffin, inorganic substances). 2. Few crystals dissolved in glacial acetic acid 1 cc., + sulphuric acid 3 drops and nitric acid 1 drop—not green (abs. of thymol). *Impurities*: Wax, paraffin, thymol, magnesium sulphate, inorganic substances. Should be kept cool, in well-closed containers. Dose, gr. 1–2 (.06–.13 Gm.).

PREPARATIONS.—LEAVES AND TOPS: 1. *Spiritus Menthe Piperitæ*. Spirit of Peppermint. (Syn., Sp. Ment. Pip., Essence of Peppermint; Fr. Alcoolat (Essence) de Menthe poivrée; Ger. (Englische) Pfefferminz (-essenz)-spiritus.)

Manufacture: Macerate for 1 hour peppermint leaves 1 Gm. in 50 cc. of water, strongly express; mix oil of peppermint 10 cc. in alcohol 80 cc., add macerated leaves, and alcohol q. s. 100 cc., macerate mix-

ture for 6 hours, frequently shaking, filter. Should be kept in amber-colored bottles. Dose, $\text{m}\bar{x}$ -30 (.6-2 cc.).

Preps.: 1. *Elixir Catharticum Compositum*, N.F., 1.4 p. c. 2. *Liquor Phosphori*, N.F., $\frac{1}{2}$ p. c. 3. *Mistura Opii et Rhei Composita*, N.F., 20 p. c. 4. *Mistura Rhei Alkalina*, N.F., $\frac{4}{5}$ p. c. 5. *Mistura Rhei Composita*, N.F., 3.5 p. c. 6. *Syrupus Ficus Compositus*, N.F., $\frac{3}{10}$ p. c.

OIL: 1. *Aqua Menthae Piperitæ*. Peppermint Water. (Syn., Aq. Menth. Pip.; Fr. Eau de Menthe poivrée; Ger. Pfefferminzwasser.)

Manufacture: $\frac{1}{5}$ p. c. Similar to *Aquæ Menthae Viridis*, page 523. Dose, ss -1 (15-30 cc.).

2. *Spiritus Menthae Piperitæ*, 10 p. c. 3. *Acetum Aromaticum*, N.F., $\frac{1}{10}$ p. c. 4. *Cataplasma Kaolini*, N.F., $\frac{1}{10}$ p. c. 5. *Elixir Euphorbiæ Compositum*, N.F., $\frac{1}{10}$ p. c. 6. *Gargarisma Guaiaci Compositum*, N.F., $\frac{1}{5}$ p. c. 7. *Lavatio Ori*, N.F., $\frac{1}{2}$ p. c. 8. *Linimentum Opii Compositum*, N.F., 2.5 p. c. 9. *Mistura Carminativa*, N.F., $\frac{1}{20}$ p. c. 10. *Mistura Chloroformi et Morphinae Composita*, N.F., $\frac{1}{5}$ p. c. 11. *Oleum Hyoscyami Compositum*, N.F., $\frac{1}{5}$ p. c. 12. *Pilula Cathartica Vegetabiles*, N.F., $\frac{1}{8}$ m . 13. *Pilula Rhei Composita*, N.F., $\frac{1}{18}$ m . 14. *Tabellæ Sodii Bicarbonatis*, N.F., $\frac{1}{20}$ m . MENTHOL: 1. *Menthol Camphoratum*, N.F., 47.5 p. c., + camphor 47.5, alcohol 5. 2. *Inunctum Mentholis*, N.F., 5 p. c., + hydrous wool fat 95. 3. *Inunctum Mentholis Compositum*, N.F., 5 p. c., + methyl salicylate 10, hydrous wool fat 85. 4. *Nebula Mentholis*, N.F., 2 p. c., + light liquid petrolatum q. s. 100. 5. *Nebula Mentholis Composita*, N.F., 1 p. c., + camphor 1, methyl salicylate $\frac{1}{2}$, eucalyptol $\frac{1}{5}$, oil of cinnamon $\frac{1}{5}$, light liquid petrolatum q. s. 100. 6. *Petroxolinum Mentholis*, N.F., 10 p. c. 7. *Dentifricium*, N.F., $\frac{1}{6}$ p. c. 8. *Dentilinum Aconiti Compositum*, N.F., 36 p. c. 9. *Dentilinum Aconiti et Iodi Compositum*, N.F., $2\frac{1}{5}$ p. c. 10. *Linimentum Sinapis Compositum*, N.F., 2 p. c. 11. *Liquor Antisepticus*, N.F., $\frac{1}{10}$ p. c. 12. *Liquor Pepsini Antisepticus*, N.F., $\frac{1}{20}$ p. c. 13. *Nebula Aromatica*, N.F., $\frac{1}{5}$ p. c. 14. *Pulvis Antisepticus*, N.F., $\frac{1}{10}$ p. c. Unoff. Preps.: LEAVES AND TOPS: *Fluidextract*, ss j-2 (4-8 cc.). *Infusion*, 5 p. c., ss j-2 (30-60 cc.). *Syrup*, ss j-4 (4-15 cc.). *Troches* (each contains oil $\frac{1}{4}$ m ; .009 cc.). MENTHOL: *Plaster* (Br.), 15 p. c., + yellow wax 10, rosin 75.

PROPERTIES.—Carminative, stimulant, nervine, antispasmodic.

USES.—Spasmodic stomach and bowel pains, flatulency, nausea, cholera morbus, diarrhea, dysentery, colic, dysmenorrhea, nervous headache, hiccough, heart palpitation, vomiting, as a flavoring agent; externally the oil and menthol for rheumatism, neuralgia, toothache, antibacterial.

Allied Plant:

1. *Collinsonia canadensis*, Stone-root, Horse-balm.—N. America. Rhizome 10 Cm. (4') long, branches short, knotty, white inside, inodorous, taste bitter, nauseous; contains volatile oil, resin. Diaphoretic, diuretic, tonic, astringent, irritant.

[Note: Pages 528-529 are missing from the original text. DM]

SOLANACEÆ

61. SOLANACEÆ. Nightshade (Potato) Family.

Sol-a-na'se-e. L. *Solan-um* + aceæ, fr. *sol*, the sun—*i. e.*, plants dislike sunlight, grow best in the shade, hence nightshade; or *solor*, to comfort—*i. e.*, the plants, soothing, narcotic effect; or *sulanum*, *sus*, hog—*i. e.*, plants act as cure for swine disease. Herbs, rarely shrubs, trees. Distinguished by having colorless juice, mydriatic alkaloids, alternate leaves; flowers regular, 5's, isomerous, plicate border; ovary superior, 2-celled, ovules many, embryo straight or coiled in fleshy albumin; fruit, capsule or berry, some edible. Differs from Convolvulaceæ by not twining and in having many seeds; universal, tropics; narcotic, stimulant, bitter, tonic, poisonous.

Genera: 1. **Capsicum**. 2. **Atropa**. 3. **Hyoscyamus**. 4. **Datura**.

CAPSICUM. CAPSICUM, U.S.P.

Capsicum frutescens,
Linne.

The dried ripe fruit, grown in Africa, with not more than 3 p. c. stems, calyxes, nor 1 p. c. other foreign organic matter, yielding not less than 12 p. c. non-volatile, ether-soluble extractive, nor more than 1.25 p. c. acid-insoluble ash.

Habitat. S. and C. America (Cayenne in Guiana), introduced into E. Indies, Java (by Portuguese), also into Africa; cultivated in United States, also in tropics.

Syn. Capsic., Cayenne Pepper, African Chillies, Spanish, Red, Bird, Garden, Cockspur, Pod, Chilly, Zanzibar, Goat's, Guinea, American Cayenne or African Cayenne Pepper, Chillies; Piper Hispanicum; Br. Capsici Fructus (C. minimum); Fr. Capsique, Piment (rouge) des jardins, Poivre de Cayenne-, Guinée or d'Inde; Ger. Fructus Capsici, Spanischer Pfeffer, Schlotenpfeffer.

Cap'si-cum. L. *capsa*, a box—*i. e.*, shape of the fruit; or from Gr. *κάπτω*, to bite—*i. e.*, from its hot, pungent properties.

Fru-tes'cens. L. *frutex*, shrub, bush—*i. e.*, somewhat shrub-like in habit and appearance.

PLANT.—Small, spreading shrub, .6–1 M. (2–3°) high; stem much branched; leaves alternate, 5–7.5 Cm. (2–3') long, entire, glabrous; flowers 2–3 together in the bifurcations, greenish-yellow, July–Aug.; ovary 2-celled, many ovules. FRUIT, oblong, conical, usually compressed, 10–25 Mm. ($\frac{2}{3}$ –1') long, 4–8 Mm. ($\frac{1}{6}$ – $\frac{1}{3}$ ') broad, 2–3-locular, dissepiments united to placenta at base of fruit, brownish-red, orange (pericarp), glabrous, dull, thin, shriveled, striate, membranous, 6–21 yellowish flattened seed, pointed micropyle; odor characteristic, sternutatory; taste intensely pungent. POWDER, yellowish-brown—thin-walled parenchyma with oil globules, epidermal cells of pericarp and seed-coat and stone cells of endocarp. *Tests:* 1. Fragments of pericarp with outer epidermis consisting of irregular cells not in rows but with strongly beaded radial walls and a hypodermis of angular cells with thickened, beaded walls—pres. of Japanese or East Indian capsicum.

2. Macerate 1 Gm. + alcohol 50 cc., 4 days, in a stoppered flask; add to .1 cc. clear supernatant liquid 140 cc. distilled water containing 10 p. c. of sucrose; 5 cc. of this dilution swallowed—at once the pungent sensation of capsicum in the throat of two out of three individuals. *Solvents*: alcohol; ether, hot water partially. Dose, gr. 1–5 (.06–.3 Gm.).

ADULTERATIONS.—*FRUIT*: Fruits of allied species; *POWDER*: Red oxide of lead, colored sawdust, bran, etc.—the former recognized by adding diluted nitric acid to dissolve lead and precipitating same with sodium sulphate—the two latter by the microscope; corn meal, starch (iodine test), ash 15–18.4 p. c.

Commercial.—Plant largely cultivated in our country to supply demand. Fruit is plucked, exposed to sun until dried, then packed in suitable shape for market; much imported from India, Africa—Liberia, Zanzibar, Natal, Bombay, Penang, Pegu, Cayenne, etc.



FIG. 348.—*Capsicum frutescens*.

CONSTITUENTS.—Capsaicin (capsacutin, capsin) .02 p. c., Capsicine, Volatile oil, fixed oil, fatty acids (oleic, stearic, palmitic), resin, red coloring matter (cholesterin ester of the fatty acids), ash 7 p. c., of which 1 p. c. is insoluble in hydrochloric acid.

Capsaicin, $C_{18}H_{28}O_3N$.—Considered the chief active constituent—identical with capsacutin, resides mostly in the pericarp and placenta, and is obtained by adding diluted caustic alkali to the petroleum extract, passing CO_2 through this alkaline solution, when it crystallizes out in colorless form. It is soluble in alcohol, ether, benzene, fixed oils, and its vapors are intensely acrid and irritating. It has also been obtained as an oleoresin (capsicin, capsicol), amorphous resin-like acid, to which the red coloring matter persistently adheres. Dose, gr. $\frac{1}{10}$ – $\frac{1}{4}$ (.006–.016 Gm.).

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Capsicine.—This occurs in small quantity; it is a volatile alkaloid, having odor of coniine—devoid of pungency—and is an oily liquid, not existing in the unripe fruit, but results from decomposition processes in ripening.

Volatile Oil.—Obtained by distillation and gives to the fruit its odor.

PREPARATIONS.—1. *Oleoresina Capsici*. Oleoresin of Capsicum. (Syn., Oleores. Capsic.; Fr. Oleoresine (Extrait éthéré) de Capsique; Ger. Spanisch-pfeffer-oelharz.)

Manufacture: Percolate slowly, in a covered glass percolator, 100 Gm. with ether, added in successive portions, until 160 cc. of percolate obtained, reclaim most of the ether on water-bath, transfer residue to a dish, allow remaining ether to evaporate spontaneously in a warm place, remote from a naked flame, pour off liquid portion, transfer remainder to a glass funnel with pledget of cotton; when separated fatty matter (which is to be rejected) has drained, mix liquid

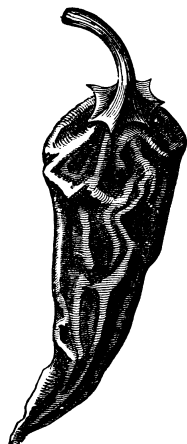


FIG. 349.—Capsicum fruit: magnified.



FIG. 350. — Capsicum fruit: cross-section, magnified.

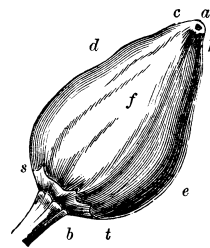


FIG. 351. — *Capsicum annuum*: fresh fruit one-half natural size.

portions; yield 12–15 p. c. Should be kept in well-stoppered bottles. Dose, $m\frac{1}{4}$ –1 (.016–.06 cc.).

Prep.: 1. *Emplastrum Capsici*. Capsicum Plaster. (Syn., Emp. Capsic.; Fr. Sparadra(pum) Capsici (de Capsique); Ger. Capsicumplaster.)

Manufacture: Apply oleoresin of capsicum to the surface of rubber plaster so as to form a thin, even coating, leaving a margin around the edges; each 15 □ Cm. of spread plaster contains .25 Gm. of oleoresin of capsicum—requiring about 6 m ; 4 cc.

2. *Tinctura Capsici*. Tincture of Capsicum. (Syn., Tr. Capsic.; Fr. Teinture de Piment des jardins; Ger. Spanischpfeffertinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: 95 p. c. alcohol. Dose, m x–60 (.6–4 cc.).

Preps.: 1. *Mistura Chloroformi et Morphinae Composita*, N.F., 2.5 p. c. 2. *Mistura Opii et Chloroformi Composita*, N.F., 10 p. c. 3. *Mistura Opii et Rhei Composita*, N.F., 10 p. c.

3. *Pulvis Aromaticus Rubefaciens*, N.F., 20 p. c. 4. *Pulvis Myricæ Compositus*, N.F., 5 p. c. 5. *Tinctura Capsici et Myrrhæ*, N.F., 3 p. c., + myrrh 12, 90 p. c. alcohol q. s. Dose, ℥x-60 (.6-4 cc.).

Unoff. Preps.: *Extract*, gr. $\frac{1}{2}$ -2 (.03-.13 Gm.). *Fluidextract* (alcohol), mj-5 (.06-.3 cc.). *Infusion*, 5 p. c., ʒij-4 (8-15 cc.). *Ointment* (Br.), 20 p. c.

PROPERTIES.—Stimulant, stomachic, rubefacient, condiment, diaphoretic; stimulates flow from salivary, gastric, and intestinal glands, also the stomach walls and heart. Long continuance may produce—chronic gastritis, abdominal pain; large quantity—acute gastritis, renal inflammation, strangury.

USES.—Indigestion, dyspepsia, atonic gout, alcoholism, delirium tremens, intermittents; flatulent colic, low fevers, cholera, menorrhagia, seasickness, tonsillitis, scarlet fever, diphtheria, hemorrhoids; externally—lumbago, rheumatism, neuralgia, chilblains, relaxed uvula. Was known to the Romans, and used in E. Indies from time immemorial.

Allied Plant:

1. *Capsicum an'nuum* (*lon'gum*).—Fruit, U.S.P. 1820-1860; Fruit 5-10 Cm. (2-4') long, 2.5-4 Cm. (1-1 $\frac{3}{4}$ ') thick, oblong, conical, sometimes curved or subglobular, yellow or red, brown when dry. Known in England as pod pepper, but often sold as *chillies* or *capsicums*, and is the kind recognized by the Ger. Phar. *C. fastigia'tum*.—Fruit, once official, and like that which is now official, 8-12 Mm. ($\frac{1}{3}$ - $\frac{1}{2}$ ') long, 3-4 Mm. ($\frac{1}{8}$ - $\frac{1}{4}$ ') thick. *C. cerasifor'me*, fruit resembles a cherry. All three sometimes used for purposes similar to official.

BELLADONNA. BELLADONNA.

1. BELLADONNÆ FOLIA. Belladonna Leaves, U.S.P.
2. BELLADONNÆ RADIX. Belladonna Root, U.S.P.

***Atropa Belladonna*,**
Linne.

- | | |
|---|---|
| { | 1. The dried leaves and tops with not more than 3 p. c. stems over 10 Mm. ($\frac{2}{3}$ ') thick, yielding not less than .3 p. c. alkaloids nor more than 3 p. c. acid-insoluble ash. 2. The dried root with not more than 10 p. c. stem-bases and woody crowns, yielding not less than .45 p. c. alkaloids nor more than 4 p. c. acid-insoluble ash. |
|---|---|

Habitat. C. and S. Europe, Asia Minor, Algeria, in waste ground, mountainous woods; cultivated in Germany, France, England, N. America.

Syn. Deadly or Sleeping Nightshade, Death's Herb, Banewort, Mekilwort, (Poison) Black Cherry, Doft- (Dway-) berry, Dwale; Bellad. Fol., Deadly Nightshade Leaves; Bellad. Rad., Deadly Nightshade Root; Fr. Belladone, Morelle furieuse, Feuilles de Belladone, Racine de Belladone; Ger. Toll-, Wolf-Kirsche, Tollkraut, Belladonna, Tollkirschenblätter, Tollkirschenwurzel.

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At'ro-pa. L. fr. Gr. Ἀτροπος = ἀ, priv., + τρέπειν, to turn—not to turn, to be inflexible. One of the mythological fates, whose office it was to cut the thread of life—*i. e.*, with this poisonous fruit or plant the functions of office could easily be performed.

Bel-la-don'na. L. *bella*, beautiful, + *donna*, a lady—*i. e.*, the berries were used by the Italian ladies as a cosmetic, and to dilate their eye pupils, thus giving them a strikingly handsome appearance.



FIG. 352.—*Atropa Belladonna*: branch, fruit, seed, and section of seed, the last two magnified.

PLANT.—Bushy perennial, 1–1.5 M. (3–5°) high; stems 12–25 Mm. ($\frac{1}{2}$ –1') thick, purplish, longitudinally wrinkled, older parts smooth, usually hollow, younger parts flattened, finely hairy; flowers 2.5 Cm. (1') long, yellowish-purple, campanulate, 5's; fruit dark green berry, size of cherry, subtended by dark green calyx; seed, small numerous. **LEAVES**, broadly ovate, 5–20 Cm. (2–8') long, 4–12 Cm. ($1\frac{3}{4}$ –5') broad, usually matted together, crumpled or broken, but pliable when soaked in water or steamed, brownish-green, acute, entire, narrowed into the petiole, few hairs, numerous whitish dots (crystal-cells) visible with lens; stems more or less hollow and flattened; flowers with campanulate corolla, yellowish-purple; fruit nearly globular, green, brown, numerous reniform seed; odor slight, somewhat tobacco-like when moistened; taste bitter, acrid. **POWDER**, brownish-green—microcrystals, crystal-cells, tracheæ, bast- and wood-fibers of stem, hairs and pollen grains; no calcium oxalate in rosette aggregates (abs. of stramonium leaves); no raphides (abs. of phytolacca leaves). Dose, gr. $\frac{1}{2}$ –3 (.03–.2 Gm.). **ROOT**, cylindrical or tapering pieces 10–30 Cm. (4–12') long, .5–4 Cm. ($\frac{1}{5}$ –1 $\frac{3}{5}$ ') thick, often split longitudinally or broken transversely, grayish-brown, wrinkled, soft periderm frequently abraded; fracture short, mealy and emitting a puff of dust (starch grains); internally whitish,

with distinct cambium zone, yellowish wood wedges; nearly odorless (dry), characteristic (moist), taste sweetish, bitter, acrid. POWDER, light brown—numerous starch grains, excentric hilum, microcrystals, tracheæ, few wood-fibers and bast-fibers (stem)—old fibrous roots contain excess of lignified tissue. *Solvents*: 75–83 p. c. alcohol; hot water partially. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

ADULTERATIONS.—LEAVES: *Digitalis*, *hyoscyamus*, *stramonium*, *ailanthus*—long tapering base; *verbascum*—hairy, more or less lobed, differently colored and veined; black nightshade (*Solanum ni'grum*)—

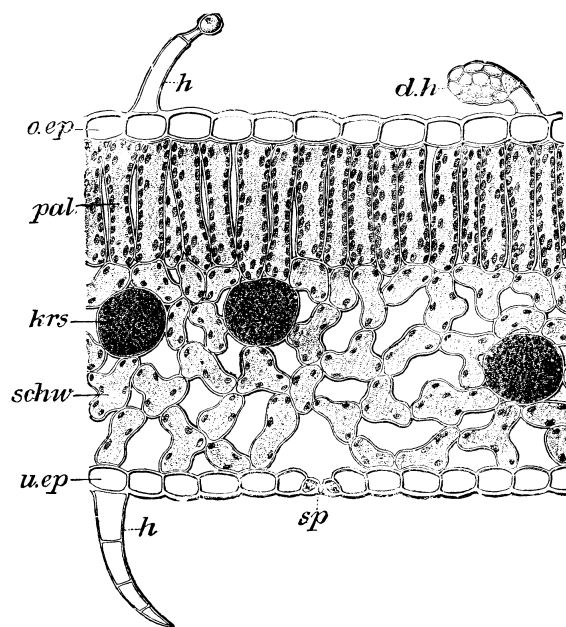


FIG. 353.—Belladonna leaf cross-section: *o.ep.* upper epidermis with a glandular hair having long stem with little head (*h*), and a very short-stemmed glandular hair with large many-celled head (*d.h*); *pal*, palisade tissue; *krs*, sand-crystal cell; *schw*, spongy parenchyma; *u.ep*, lower epidermis with stomata (*sp*), and a single multicellular hair (*h*), magnified 175 diam.

leaves smaller, dentate; *scopola* (*Scopola carniolica*)—leaves oblong-ovate, without stomata on upper surface, often 15–20 p. c.; poke root (*Phytolacca decandra*)—leaves detected by the more angular epidermal cells and calcium oxalate needles; Root: Rare—roots of allied species, rhizome of *scopola*—darker, tough, flexible, numerous stem-scars, transverse root-scars, thin bark, without short snapping fracture and puff of dust; *medicago* (*Medicago sativa*) stem-bases solid (not hollow), tough, flexible, thinner bark, without snapping fracture and puff of dust; *althea*—fracture tough; poke root—many needles of calcium

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oxalate (in powdered scrapings). Roots of inula, spikenard, and parsley have similar appearance.

Commercial.—Plant prefers limestone soil and grows in stony, shady, bushy places, along walls, amid rubbish. Of the wild and cultivated all parts practically are active alike, but the English is considered superior to the German. Leaves and roots should be collected when strongest—from plants 2–4 years old, the former in flowering, June–July, the latter in autumn or early spring; if younger the root fracture is horny, resinous, if older, woody, splintery, both indicating deficiency in alkaloids, which reside chiefly in the bark; large pieces often are split to avoid damage in drying, while hyoscyamine, under various conditions in making the preparations, is converted into atropine.

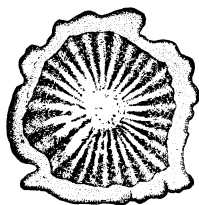


FIG. 354. — *Belladonna* root: transverse section, magnified 3 diam.

CONSTITUENTS.—Atropine, .2–.6 p. c., Belladonnine, Hyoscyamine, scopolamine (hyoscine), atropamine, atosin, malic acid, starch (autumn), sugar (spring); leaves have, in addition: chlorophyll, choline (bilineurine), albumin, mucilage, wax, asparagin, chrysotropic acid (scopoletin), succinic acid, nitrates, ash 7 (root)–20 (leaves) p. c. (Ca, Mg, K, carbonates).

Atropina, Atropine, $C_{17}H_{23}O_3N$, *U.S.P.*—(Syn., Atrop., Atropia; Fr. Atropine; Ger. Atropinum, Atropin.) This alkaloid in commerce always contains a little hyoscyamine, which is separated with difficulty, as they are extracted together by agitating an alcoholic tincture of the root with slaked lime, in order to decompose the natural salt and liberate the alkaloid, which remains in solution; acidify filtrate with diluted sulphuric acid, concentrate to remove alcohol, fat, resin, shake with chloroform to remove chlorophyll, and to filtrate add potassium carbonate in excess; purify by dissolving washed precipitate (atropine) in alcohol, add water until slightly turbid, crystallize. It is in white rhombic prisms, odorless, bitter, acrid, soluble in water (455), hot water (90), alcohol (2), glycerin (27), chloroform (1), ether (25), aqueous solution alkaline, melts at $115^{\circ}C$. ($239^{\circ}F$.); forms numerous salts (hydrobromide, hydrochloride, nitrate, sulphate, etc.). *Tests:* 1. Evaporate .01 Gm. + few drops of nitric acid to dryness—yellow residue, which upon cooling, + few drops of alcoholic potassium hydroxide T. S., + fragment of potassium hydroxide—intense violet, for atropine, hyoscyamine, hyoscine (abs. of strychnine, which masks reaction). 2. Solution in dilute hydrochloric acid (1 in 50) + gold chloride T. S.—lusterless precipitate (dist. from hyoscyamine—lustrous precipitate); incinerate .1 Gm.—ash negligible. 3. Heated with barium hydroxide becomes hydrolized into tropic acid, $C_9H_{10}O_3$, and tropine, $C_8H_{15}ON$,—tropine tropate—and by heating these together synthetic atropine results; other tropines (alkaloids, compound esters) have been formed with various organic acids, as tropine mandelate, which

yields homatropine. *Impurities:* Foreign alkaloids (platinic chloride T. S.—precipitate), apoatropine, belladonnine (ammonia water—turbidity), hyoscyamine, readily carbonizable substances (sulphuric or nitric acid—yellow, brown). Exercise great caution in tasting, using very dilute solution. Dose, gr. $\frac{1}{120}$ — $\frac{1}{60}$ (.0005–.001 Gm.).

Atropinæ Sulphas, Atropine Sulphate, $(C_{17}H_{23}O_3N)_2 \cdot H_2SO_4 \cdot H_2O$, *U.S.P.*—(Syn., Atrop. Sulph., Sulphate of Atropia; Fr. Sulfate d'Atropine; Ger. Atropinum sulfuricum, Atropinsulfat, Schwefelsaures Atropin.) Obtained by dissolving atropine mixed with water by means of diluted sulphuric acid, neutralizing, evaporating, or dissolve in alcohol, neutralize with sulphuric acid, evaporate; as such is accompanied usually by small amount of hyoscyamine sulphate, from which it cannot readily be separated. It is a white crystalline powder, efflorescent in dry air, odorless, soluble in water (4), alcohol (5), boiling alcohol (2.5), glycerin (2.5), chloroform (420), ether (3000); aqueous solution neutral; melts at 190° C. (374° F.). Exercise great caution in tasting, using very dilute solution. Dose, gr. $\frac{1}{120}$ — $\frac{1}{60}$ (.005–.001 Gm.).

Homatropinæ Hydrobromidum, Homatropine Hydrobromide, $C_{16}H_{21}O_3 \cdot N \cdot HBr$, *U.S.P.*—(Syn., Homatrop. Hydrobr., Homatropine Bromide; Fr. Bromhydrate d'Homatropine; Ger. Homatropinum hydrobromicum, Bromwasserstoffsäures Homatropin (Oxytoluyltropein).) Obtained by the condensation of tropine and mandelic acid—heating tropine, $C_8H_{15}ON$, with mandelic acid (tropine mandelate) for several days on a water-bath, in the presence of dilute (12 p. c.) hydrochloric acid, adding ammonia water and extracting liberated alkaloid with chloroform, evaporating chloroformic solution, neutralizing with hydrobromic acid, crystallizing. It is in white crystals or a white, odorless, crystalline powder, soluble in water (6), alcohol (40), chloroform (420), hot alcohol (12); insoluble in ether; aqueous solution (1 in 20) neutral; melts at 212° C. (414° F.) with partial decomposition. *Tests:* 1. Shake 1 cc. of aqueous solution (1 in 10) + chloroform 2 cc., + few drops of chlorine T. S.—chloroform becomes brownish. 2. Add to aqueous solution iodine T. S.—brown precipitate; silver nitrate T. S.—yellowish-white precipitate, insoluble in nitric acid; incinerate .1 Gm.—ash negligible. *Impurities:* Atropine, hyoscyamine, scopolamine (hyoscine), with tannic acid T. S. or platinic chloride T. S.—no precipitate, but with other alkaloids—precipitate. Exercise great caution in tasting, using very dilute solution. Should be kept dark, in well-closed containers. Superior to atropine in being less toxic, in decreasing instead of increasing heart-rate and blood-pressure, and in the effects passing off in one-fourth the time—1–2 days; inferior to it where lasting mydriasis is desired. Used to correct anomalies of refraction, in 1–2 p. c. solutions. Dose, gr. $\frac{1}{120}$ — $\frac{1}{60}$ (.0005–.001 Gm.).

Belladonnine, $C_{17}H_{23}O_4N$.—**Oxyatropine** and **Atropamine (Apoatropine, Aposterpine)**, $C_{17}H_{21}O_2N$.—All these may be one and the same; yellow powder decomposed very easily by mineral acids.

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Hyoscyamine (daturine, duboisine of other plants).—This has the same formula as atropine and scopolamine (hysocine), but is more soluble in water and diluted alcohol, and forms gold salts with a different fusing-point; is converted into atropine by alkalies in alcoholic solution.

Atrosin (*β -methyl α -sculetin*).—This is the red coloring matter, fluorescent.

Malic Acid.—This holds the alkaloids in combination.

The young roots contain only hyoscyamine, those of 8–10 years old also atropine; alkaloids are mostly in the bark, hence large woody roots should be rejected.

PREPARATIONS.—I. LEAVES: 1. *Extractum Belladonnæ*. Extract of Belladonna. (Syn., Ext. Bellad., Extractum Belladonnæ Foliorum (Alcoholicum); Fr. Extrait de Belladone; Ger. Belladonnaextrakt (Spirituöses), Tollkirschenextrakt.)

Manufacture: PILULAR, macerate, percolate 100 Gm. with 75 p. c. alcohol until exhausted (300 cc.), reclaim alcohol, evaporate residue at 70° C. (158° F.) to pilular consistence, frequently stirring, mix thoroughly; after assay add enough glucose for extract to contain 1.25 p. c. of total alkaloids, mix thoroughly. POWDERED, macerate, percolate 100 Gm. with alcohol, reserve first 100 cc. and continue until exhausted (100 cc.); reclaim alcohol from second percolate until residue in still is 10 cc., to which add first reserve and distil until residue of syrupy consistence; transfer to a dish, rinse still with little warm alcohol, which add to dish and evaporate at 70° C. (158° F.) to soft extract, stirring frequently, add dried starch 5 Gm., heat, with stirring, until nearly dry, incorporate thoroughly dried starch, 2 Gm., expose to current of warm air until dry, pulverize; after assay add enough dried starch for extract to contain 1.25 p. c. of total alkaloids, mix thoroughly, pass through fine sieve; contains 1.18–1.32—1.25 p. c. of the alkaloids; 1 Gm. represents about 4 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{4}$ – $\frac{1}{2}$ (.016–.03 Gm.).

Preps.: 1. *Emplastrum Belladonnæ*. Belladonna Plaster. (Syn., Emp. Bellad.; Fr. Emplâtre d'Extrait de Belladone; Ger. Belladonnapflaster.)

Manufacture: Melt adhesive plaster 70 Gm., add extract of belladonna 30 Gm., softened by heat, stir until homogeneous, cool; contains 30 p. c. of extract of belladonna, yielding .25–.30 p. c. of total alkaloids.

2. *Unguentum Belladonnæ*. Belladonna Ointment. (Syn., Ung. Bellad.; Fr. Pommade Belladonée; Ger. Tollkirschensalbe.)

Manufacture: Triturate pilular extract of belladonna 10 Gm. with diluted alcohol 5 cc., until a smooth mixture, add yellow wax 5, wool fat 30, petrolatum 50, previously melted together, mix thoroughly.

3. *Pilulæ Aloini, Strychninæ et Belladonnæ*, N.F., $\frac{1}{8}$ gr. 4. *Pilulæ Aloini, Strychninæ et Belladonnæ Compositæ*, N.F., $\frac{1}{8}$ gr. 5. *Pilulæ Aloini Compositæ*, N.F., $\frac{1}{4}$ gr. 6. *Pilulæ Aloes et Podophylli Compositæ*, N.F., $\frac{1}{4}$ gr. 7. *Pilulæ Laxativæ Compositæ*, N.F., $\frac{1}{8}$ gr.

2. *Fluidextractum Belladonnæ Foliorum*. Fluidextract of Belladonna Leaves. (Syn., Fldext. Bellad. Fol.; Fr. Extrait de Feuilles de Belladone; Ger. Belladonnablatterfluidextrakt, Tollkirschenblatterfluidextrakt.)

Manufacture: Similar to Fluidextractum Colchici, page 111; menstruum: alcohol 75 p. c.—reserve first 80 cc. in which dissolve soft extract, assay, and add enough menstruum for the 100 cc. to contain .27–.33—.3 Gm. of total alkaloids. Dose, $\text{m}\frac{1}{3}$ –5 (.02–.3 cc.).

3. *Tinctura Belladonnæ*. Tincture of Belladonna. (Syn., Tr. Bellad., Tinctura Belladonnæ Foliorum; Br. Tinctura Belladonnæ; Fr. Teinture de Belladone; Ger. Belladonnatinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: diluted alcohol—percolate 95 cc., assay, and add enough menstruum for the 100 cc. to contain .027–.033—.03 Gm. of total alkaloids. Dose, mj –30 (.06–2 cc.).

II. Root: 1. *Fluidextractum Belladonnæ Radicis*. Fluidextract of Belladonna Root. (Syn., Fldext. Bellad. Rad., Fluid Extract of Belladonna Root; Br. Extractum Belladonnæ Liquidum; Fr. Extrait fluide de Racine de Belladone; Ger. Tollkirschen(wurzel) fluidextrakt.)

Manufacture: Similar to Fluidextractum Colchici, page 111; menstruum: 83 p. c. alcohol; reserve first 80 cc., in which dissolve soft extract, assay, and add enough menstruum for the 100 cc. to contain .405–.495—.45 Gm. of total alkaloids. Dose, mj –5 (.06–.3 cc.).

Prep.: 1. *Linimentum Belladonnæ*, N.F., 95 p. c., + camphor 5.

Unoff. Preps.: I. LEAVES: *Extractum Belladonnæ Viride*—express juice, heat, strain, evaporate, add coloring matter strained out, gr. $\frac{1}{4}$ –1 (.016–.06 Gm.). *Infusion*, 5 p. c., 5j –3 (4–12 cc.). *Succus Belladonnæ*—expressed juice (3), and alcohol (1), mv –15 (.3–1 cc.). II. Root. *Abstract*, gr. $\frac{1}{10}$ –1 (.006–.06 Gm.). *Extract*, gr. $\frac{1}{8}$ – $\frac{1}{2}$ (.008–.03 Gm.). *Suppositoria Belladonnæ* (Br.), each contains $\frac{1}{60}$ gr. (.001 Gm.) of alkaloids. III. ATROPINE: *Lamellæ Atropinæ* (Br.), each $\frac{1}{5000}$ gr. (.000013 Gm.). *Lamellæ Homatropinæ* (Br.), each $\frac{1}{1000}$ gr. (.0006 Gm.). *Oleate*, 2 p. c.; used externally. *Unguentum Atropinæ* (Br.) 2 p. c.

PROPERTIES.—Sedative, narcotic, diuretic, mydriatic, antispasmodic, anodyne. Like all medicines that act through nervous system, small doses, stimulate, large ones paralyze. Diminishes most secretions (salivary, mammary, skin, stomach, liver, pancreas, intestines) by paralyzing peripheral nerve-endings, increases peristalsis by paralyzing terminations of involuntary intestinal muscles; dilates pupil, increases pulse and urine by paralysis; often causes erythematous eruption.

USES.—Lessens pain, rheumatism, gout, neuralgia, sciatica, cancer, pelvic derangements, encephalitis, meningitis, myelitis, erysipelas,

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to check profuse sweating, serous diarrhea, urinary flow, ptyalism. Inflammation of lungs, iris, bladder, kidneys, breast, acute catarrh, sore throat, asthma, whooping-cough, spasms, constipation, spermatorrhea, prophylactic against scarlet fever. Locally in abscesses, carbuncles, skin diseases, scarlet fever rash, to check mammary secretion, relieve vomiting of pregnancy; smoke leaves with opium for phthisis. Atropine (hypodermic) is the sheet-anchor in poisoning by opium, physostigmine, and hydrocyanic acid.

Poisoning: Within 15 minutes have dryness of mouth, dry burning throat, dilated pupils, intense thirst which nothing allays, indistinct and double vision, giddiness, burning in stomach, nausea, difficult deglutition, hallucinations, delirium or fits of laughter, rambling talk, feeble and rapid pulse, cold extremities, coma, convulsions, death; sometimes face red and swollen, rash resembling scarlet fever, desquamation, inability to urinate. Give emetics or use pump, enemas, tannic acid, then morphine, physostigmine, or pilocarpine (hypodermic) for nervous disturbance; stimulants, brandy, caffeine, strychnine, artificial respiration, cold to head, warmth to feet, empty bladder. Children often eat the sweet fruit in excess, and should receive this treatment.

Incompatibles: Muscarine, physostigmine, pilocarpine, aconite, opium, tannin, caustic alkalies (evolve ammonia), quinine.

Synergists: Mydriatic drugs (hyoscyamus, stramonium, duboisia).



FIG. 355.—*Solanum Dulcamara*.

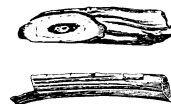


FIG. 356.—*Dulcamara* (Nat.).

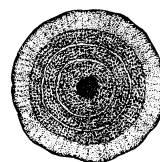


FIG. 357. — *Dulcamara*: transverse section of a branch magnified 3 diam.

Allied Plants:

1. *Solanum Dulcamara*, *Dulcamara*, *Bittersweet*, *N.F.*—The dried stem with not more than 2 p. c. of foreign organic matter; Europe, Asia (N. America). Climbing pubescent shrub, around dwellings, in thickets; leaves cordate, halberd-shaped, pubescent beneath; flowers

purple, whitish; fruit oval red berry, many-seeded. Stem woody at base, branching 3–4.5 M. (10–15°) high, collected when 1–2 years old, autumn or early spring, cut into short sections, 8 Mm. ($\frac{1}{3}$ ') long, 5 Mm. ($\frac{1}{3}$ ') thick, cylindrical, hollow, angular, striate, warty; bark thin, greenish-brown, glabrous, wood yellowish, in 1–2 concentric rings; odor slight; taste bitter, then sweet. Powder, greenish-yellow—tracheæ with pores, markings, wood-fibers, bast-fibers, cork cells, few hairs, starch grains, numerous microcrystals; solvents: diluted alcohol, water partially; contains dulcamarin (picroglycion, dulcarin) .4 p. c., solanine, resin, gum, wax, benzoic acid, starch, calcium lactate. Narcotic, diuretic, diaphoretic, alterative, deobstruent; large doses produce vomiting, faintness, vertigo, convulsive muscular movements, dryness and constriction of the throat, thirst, diarrhea, weakened heart action, paralysis. Cutaneous eruptions, rheumatism, gout, bronchitis, whooping-cough, nasal, vesical, and pulmonary catarrhs, mania with strong venereal desire, neuralgia. *Poisoning*: Same as for belladonna. Dose, \mathfrak{z}_{ss} –1 (2–4 Gm.); 1. *Fluidextractum Dulcamaræ* (diluted alcohol), dose, \mathfrak{z}_{ss} –1 (2–4 cc.).

2. *S. carolinense*, *Solanum*, *Horse-nettle*, *Berries*, *N.F.*—The air-dried ripe fruit with not more than 5 p. c. of immature fruit nor 2 p. c. of foreign organic matter; C. and S. United States. Perennial herb, .3–.6 M. (1–2°) high, stellate-pubescent, grayish-green, sharp yellow prickles. Fruit, globose, shriveled, .8–2 Cm. ($\frac{1}{3}$ – $\frac{2}{3}$ ') thick, orange-yellow, glabrous, fleshy, 2-celled, many-seeded, calyx persistent; stellate, pubescent, enclosing half of berry, seed orbicular, flat, yellow, shining; odor pepper-like; taste bitter, acrid. Powder, brownish—numerous fragments of seed-coat and epicarp, cells with yellowish amorphous content; solvent: diluted alcohol; contains solanine, solanidine, resin, fat, volatile oil, ash 6 p. c. Tonic, antiepileptic, antitetanitic; tetanus, epilepsy, convulsions—albuminuria, pregnancy; better than bromides; disastrously fatal to cattle. Dose, \mathfrak{z}_{ss} –1 (2–4 Gm.); 1. *Fluidextractum Solani* (67 p. c. alcohol), dose, \mathfrak{z}_{ss} –1 (2–4 cc.); *Tincture*. *S. paniculatum*, S. America; tonic, diuretic, antiperiodic; vesical catarrh.

3. *Scopolia carniolica*, *Scopola*.—The dried rhizome containing .5 p. c. of mydriatic alkaloids, U.S.P. 1900; C. Europe, Germany, Austro-Hungary, Carniola. Shrub, 20–60 Cm. (8–24') high, usually branchless; leaves oblong-lanceolate, wavy or notched toward apex, petiolate, reticulate, flowers tubular, campanulate, brownish-purple; fruit capsule, circumscissile, dehiscent. Rhizome flexuous, cylindrical, mostly in pieces 2.5–7.5 Cm. (1–3') long, .8–1.6 Cm. ($\frac{1}{3}$ – $\frac{2}{3}$ ') thick, often split before drying; upper surface with large, closely set cup-shaped stem-scars, margins irregularly contracted, brownish, longitudinally wrinkled, obscurely annulate, nodular-roughened, fracture short, sharp; wood indistinctly radiate, central pith horny; nearly inodorous; taste sweetish, bitterish, acrid; solvents: 80 p. c. alcohol, water partially; contains scopolamine .05 p. c., hyoscyamine .5 p. c., atropine, scopoletin, ash 7–10 p. c. Mydriatic, analgesic,

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hypnotic, antiphlogistic; glaucoma, ptialism, hyperidrosis. Should not be given in renal affection nor in advanced age, and cases of poisoning should be treated as in belladonna. Dose, gr. 1-3 (.06-.2 Gm.); extract, gr. $\frac{1}{4}$ - $\frac{1}{2}$ (.016-.03 Gm.); scopolamine, gr. $\frac{1}{250}$ - $\frac{1}{60}$ (.00025-.001 Gm.). *S. japonica*, *Japanese Belladonna*, plant resembles very closely *S. carniolica*, differing only in having the style curved, calyx-teeth unequal, leaves less obovate with longer petioles; rhizome 10 Cm. (4') long, 12 Mm. ($\frac{1}{2}$ ') thick; this also yields atropine, scopolamine, etc.



FIG. 358.—*Scopolia carniolica*: a, flowering and fruiting branch ($\frac{1}{4}$ nat. size); also flower, stamen, anther, pistil, fruit, seed, enlarged.

4. *Mandrag'ora officina'lis* (*Atropa mandragora*), together with var. *autumna'lis*, having blue flowers, and var. *verna'lis*, white flowers; S. Europe—all are acaulescent plants, having constituents similar to those of belladonna.

5. *Lyc'ium vulga're*.—United States, Europe; *L. af'rum*, N. Africa, and *L. umbro'sum*, S. America; leaves of all in infusion good for erysipelas and skin diseases.

HYOSCYAMUS. HYOSCYAMUS, U.S.P.

Hyoscyamus niger,
Linné.

The dried leaf, with or without the tops, with not more than 2 p. c. stems, none more than 7 Mm. ($\frac{1}{4}$ ') thick, yielding not less than .065 p. c. alkaloids, nor more than 12 p. c. acid-insoluble ash.

Habitat. Europe, Asia, waste places, neglected ruins, old gardens, sandy soil; naturalized in N. America (New England to Michigan); cultivated in England, etc.

Syn. Hyosc., Henbane, Black Henbane, Hog's-bean, Poison Tobacco, Fetid (Stinking) Nightshade, Insane-root, Henbell; Br. Hyoscyami Folia; Fr. Jusquiame noire, Feuilles Jusquiame noire, Belene, Chenile; Ger. Folium(-a) Hyoscyami, Bilsenkrautblätter.

Hy-os-cy'a-mus. L. fr. Gr. *hós*, a hog, + *κῆμος*, a bean, hog bean—*i. e.*, its fruit (bean) acts on swine and fowls, as a poison or intoxicant, but cows, horses, dogs, and goats can tolerate a great quantity.

Ní'ger. L. black—*i. e.*, inside throat of flowers purplish-black.

Hen'bane. *Hen* + *bane*—*i. e.*, whole plant fatal to poultry—bane to hens.

PLANT.—Biennial herb, .6–1.3 M. (2–4°) high; stem subcylindrical, somewhat compressed, longitudinally wrinkled, green, appearing 2d year, covered with long, soft, jointed, glandular, white hairs, viscid, clammy, fetid odor; root large, brown, interior white, wrinkled, compact, fibrous; flowers May–June, 3 Cm. ($1\frac{1}{5}$ ') long, anthers and style



FIG. 359.—*Hyoscyamus niger*: flowering branch.



FIG. 360. — *Hyoscyamus* calyx, containing capsule, natural size.

purple. **LEAVES (LEAF)**, usually much wrinkled, matted, broken (with leaves, stems, flowering and fruiting tops), 25 Cm. (10') long, 10 Cm. (4') broad, ovate-lanceolate, inequilateral, lower with short petiole, upper sessile, acute, coarsely and angularly 1–4-toothed (lobed), hairy grayish-green; stems 2–7 Mm. ($\frac{1}{2}$ – $\frac{1}{4}$ ') thick, cylindrical, wrinkled, hairy; flowers nearly sessile, with urn-shaped, hairy, unequally 5-toothed calyx, campanulate corolla, yellowish with purplish veins; fruit 2-locular pyxis (capsule) 12 Mm. ($\frac{1}{2}$ ') broad, enclosed in calyx; odor distinctive; taste bitter, acrid. **POWDER**, grayish-green—glandular and non-glandular hairs, calcium oxalate crystals, prisms, rosette aggregates, sclerenchyma fibers, pollen grains, epidermal cells of seed-

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coat with thick walls incrustated with granular crystals of silicic acid; *H. muticus* (leaves, powder) recognized by characteristic, branching, non-glandular hairs. *Solvents*: diluted alcohol; boiling water partially. Dose, gr. 2–10 (.13–.6 Gm.).

ADULTERATIONS.—Leaves of allied species, also of stramonium, digitalis, belladonna, verbasum.

Commercial.—Plant by cultivation has become so diversified as to give varieties and almost species, all differing somewhat in medicinal strength; the annual form is usually .3–.6 M. (1–2°) high, having smaller parts, less toothed leaves, and faintly or not purple-veined corolla; the biennial form produces in the first year a fleshy fusiform root (resembling that of parsley for which it has been eaten with serious results), and a radical rosette of large, coarsely toothed (lobed), long petioled leaves, and in the second year the flowering and fruiting stem, after which it dies; in this latter stage the root is spongy, hollow, while the radical leaves are wanting, those of the stem being broader, shorter petioled, and sessile at apex. The stem leaves of the biennial plant are, as a rule, stronger and should be collected when two-thirds of the flowers have expanded; leaves of the first year, as also those of the annual plant, are often of equal strength; the perfect biennial root is three times richer than any other portion.

CONSTITUENTS.—Mydriatic alkaloids .05–.3 p. c.: Hyoscyamine, Scopolamine (Hyoscine), Hyoscipierin, choline, mucilage, albumin, chlorophyll, potassium nitrate 2 p. c., ash 30 p. c. In the seed also fixed oil 25 p. c.

Hyoscyamine, $C_{17}H_{23}O_3N$.—A crystalline alkaloid obtained from the mother-liquors of atropine, or by freeing hyoscyamus seed of fat by petroleum benzin, drying, exhausting with 85 p. c. alcohol, adding hydrochloric acid, reclaiming alcohol, treating filtered residue again with petroleum benzin (fat, coloring matter), rendering alkaline with ammonia or potassium carbonate, shaking with repeated portions of chloroform, evaporating chloroformic solution, purifying by solution in dilute sulphuric acid, filtering, crystallizing; to obtain alkaloid render aqueous solution alkaline, extract with chloroform, evaporate; yield—leaves: .041–.224 p. c.; seed: .08–.16 p. c.; root: .006–.307 p. c. Occurs in white silky needles; if impure, deliquescent, becoming brown; identical with duboisine, isomeric with atropine, into which it is converted by heating to 120° C. (248° F.) for 6 hours; it also splits into tropine, $C_8H_{15}ON$, and tropic acid, $C_9H_{10}O_3$, and forms numerous salts (hydrobromide, hydrochloride, sulphate, etc.).

Hyoscyaminæ Hydrobromidum, **Hyoscyamine Hydrobromide**, $C_{17}H_{23}O_3N.HBr$, *U.S.P.*—(Syn., Hyoscyamin. Hydrobr., Hyoscyamine Bromide, Hyoscyaminæ Hydrobromas; Fr. Bromure d'Hyoscyamine; Ger. Hyoscyaminum hydrobromicum, Hyoscyaminbromid.) This hydrobromide of the preceding alkaloid is obtained by dissolving hyoscyamine (10) in 25 p. c. hydrobromic acid (11), concentrating, crystallizing; it is in white, odorless, deliquescent crystals, very soluble

in water, alcohol (2.5), chloroform (1.7), ether (2260); aqueous solution (1 in 20) neutral, levorotatory, melts at 152° C. (306° F.). *Tests*: 1. Aqueous solution + silver nitrate T. S.—yellowish-white precipitate, insoluble in nitric acid. 2. Shake 1 cc. of aqueous solution (1 in 10) with chloroform 2 cc., + few drops of chlorine T. S.—chloroform brownish. 3. Add .01 Gm. to 5 drops of nitric acid, evaporate to dryness; residue + alcoholic potassium hydroxide T. S.—violet color. 4. Aqueous solution (1 in 20) with platinic chloride T. S.—no precipitate (dif. fr. most other alkaloids); incinerate .1 Gm.—ash negligible. *Impurities*: Atropine, scopolamine, other alkaloids, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.).

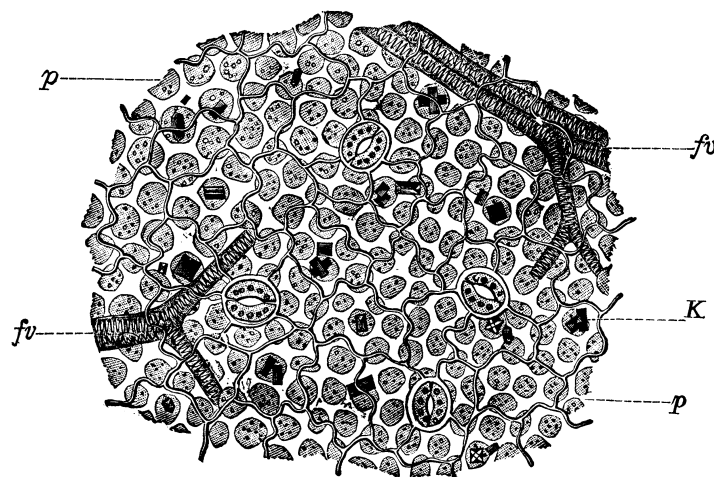


FIG. 361.—Hyoscyamus: view of upper side of leaf revealing through epidermis the stomata and crystals (*K*) and palisade cells (*p*), and fibro-vascular bundles (*fv*).

Scopolamine (Hyoscine, Amorphous Hyoscyamine), $C_{17}H_{21}O_4N$. This exists in various plants of the Solanaceæ, being chemically and otherwise identical with hyoscine, and thought to consist of two bases, scopolamine and atosin (optically inactive scopolamine); it is obtained from the mother-liquor of hyoscyamine by adding gold chloride, to form a less soluble gold double salt, which crystallizes out, dissolving this in water, removing gold by hydrogen sulphide, precipitating scopolamine with potassium carbonate. It is a semi-liquid tenacious mass, isomeric with hyoscyamine, levorotatory, yielding tropic acid and pseudotropine, $C_8H_{15}ON$; forms numerous salts (hydrobromide, hydrochloride, sulphate, etc.).

Scopolaminæ Hydrobromidum, Scopolamine Hydrobromide, $C_{17}H_{21}O_4N.HBr.3H_2O$, *U.S.P.*—(Syn., Scopolamin, Hydrobrom., Scopola-

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mine Bromide (Hydrobromate); Br. Hyoscine Hydrobromide; Fr. Bromhydrate d'Hyoscine; Ger. Skopolaminhydrobromid.) Obtained by dissolving scopolamine in slight excess of diluted hydrobromic acid, concentrating, crystallizing. It is in colorless, transparent, rhombic crystals, some large; odorless, slightly efflorescent, levorotatory, very poisonous (use great care in tasting and then only in dilute solution); soluble in water (1.5), alcohol (20), slightly in chloroform, insoluble in ether, aqueous solution (1 in 20) neutral, slightly acid; melts when anhydrous at 191° C. (376° F.). *Tests*: 1. Dry to constant weight—loses 13 p. c.; over sulphuric acid—loses water of crystallization slowly; incinerate .1 Gm.—ash negligible. 2. Add .01 Gm. to 5 drops of nitric acid, evaporate to dryness, add alcoholic potassium hydroxide T. S.—violet color; aqueous solution with silver nitrate T. S.—yellowish-white precipitate, insoluble in nitric acid. 3. Shake aqueous solution (1 in 20) 1 cc., to which a few drops of chlorine T. S. have been added, with chloroform 1 cc.—chloroform brownish color. 4. To 1 cc. aqueous solution (1 in 20) add few drops of ammonia T. S.—no turbidity; add to another 1 cc. potassium hydroxide T. S.—whitish transient turbidity (abs. of foreign alkaloids). *Impurities*: Apoeatropine, morphine, foreign alkaloids, carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. $\frac{1}{250}$ — $\frac{1}{100}$ (.00025–.0006 Gm.); hypodermically, gr. $\frac{1}{400}$ — $\frac{1}{200}$ (.00015–.0003 Gm.).

Hyoscipicrin $C_{27}H_{32}O_{14}$.—A neutral, bitter glucoside, soluble in water, alcohol, precipitated by tannin, converted by hydrochloric acid into fermentable sugar, and a yellowish, acrid, bitter resin.

PREPARATIONS.—1. *Extractum Hyoscyami*. Extract of Hyoscyamus. (Syn., Ext. Hyosc., Extract of Henbane; Fr. Extrait de Jusquiame; Ger. Bilsenkrautextrakt.)

Manufacture: **PILULAR**, macerate, percolate 100 Gm. with 75 p. c. alcohol until exhausted, reclaim alcohol, evaporate residue at 70° C. (158° F.) to pilular consistence, frequently stirring, mix thoroughly; after assay add enough glucose for extract to contain .25 p. c. of total alkaloids; mix thoroughly. **POWDERED**, macerate, percolate 100 Gm. with alcohol, reserve first 100 cc., continue until exhausted; reclaim alcohol from 2d percolate until residue in still is 10 cc., to which add 1st reserve and distil until residue of syrupy consistence; transfer to a dish, rinse still with a little warm alcohol, which add to dish, evaporate at 70° C. (158° F.) to soft extract, stirring frequently, add dried starch 5 Gm., heat, with stirring, until nearly dry, now incorporate thoroughly dried starch 2 Gm., expose to current of warm air until dry, pulverize; assay, add enough dried starch for extract to contain .22–.28—.25 p. c. of the alkaloids; mix thoroughly; 1 Gm. represents about 4 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

Preps.: 1. *Mistura Chloralis et Potassii Bromidi Composita*, N.F., $\frac{1}{2}$ p. c. 2. *Pilulæ Catharticæ Vegetabiles*, N.F., $\frac{1}{2}$ gr.

2. *Fluidextractum Hyoscyami*. Fluidextract of Hyoscyamus. (Syn., Fldext. Hyosc., Fluid Extract of Hyoscyamus, Fluidextract of Henbane; Fr. Extrait fluide de Jusquiame; Ger. Bilsenkrautfluidextrakt.)

Manufacture: Similar to Fluidextractum Colchici, page 111; menstruum: 75 p. c. alcohol; after dissolving soft extract in the reserve, assay, and add enough menstruum for the 100 cc. to contain .055–.075—.065 Gm. of total alkaloids. Dose, mij–10 (.13–.6 cc.).

3. *Tinctura Hyoscyami*. Tincture of Hyoscyamus. (Syn., Tr. Hyosc., Tincture of Henbane; Fr. Teinture de Jusquiame; Ger. Bilsenkrauttinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: diluted alcohol—percolate 95 cc., assay, and add enough menstruum for the 100 cc. to contain .0055–.0075—.0065 Gm. of total alkaloids. Dose, ʒss–1 (2–4 cc.).

4. *Oleum Hyoscyami Infusum*, *N.F.*, leaves 10, alcohol 10, ammonia water .2, sesame oil q. s. 100; Prep.: 1. *Oleum Hyoscyami Compositum*, *Balsamum Tranquillans*, *N.F.*, oils of lavender, peppermint, rosemary, thyme, āā .2, infused oil of hyoscyamus q. s. 100.

Unoff. Preps.: *Abstract* (alcohol), gr. 1–5 (.06–.3 Gm.). *Extractum Hyoscyami Viride*—express juice, heat, strain, evaporate, add coloring matter strained out, gr. 2–8 (.13–.5 Gm.). *Infusion*, 5 p. c., ʒj–3 (4–12 cc.). *Succus Hyoscyami*—expressed juice (3), and alcohol (1), ʒss–1 (2–4 cc.). *Baume Tranquille* (Fr. Codex)—leaves of hyoscyamus, belladonna, stramonium, black nightshade, poppy, āā 50 Gm., macerate in alcohol 200 cc., add poppy seed oil 5000, heat for 6 hours, strain, cool, add oils of lavender, peppermint, rosemary, thyme, āā 1; used externally.

PROPERTIES.—Anodyne, hypnotic, narcotic, mydriatic, laxative, carminative, similar to belladonna, stramonium, and duboisia, but less powerful and irritating, yet the most calmative and hypnotic of the group, sedative to urinary tract. Hyoscyamine is less active than atropine; it is more an anodyne or anesthetic than narcotic or soporific, depresses spinal but excites cerebral function. Scopolamine (hyoscine) is much stronger than hyoscyamine, being a powerful cerebral and spinal sedative; lessens pulse and respiration; habitually used produces muscular paralysis, violent delirium.

USES.—Mostly with children, and where opium is contraindicated; acute and chronic mania, delusional insanity, insomnia with hallucinations, delirium tremens, monomania of hypochondriacs, whooping-cough, nervous cough, colics, tremor in paralysis, mercurial poisoning, locomotor ataxia, irritation of bladder, constipation, chorea, tetanus, morphine habit, corrective to griping and nauseating medicine.

Poisoning: Same as for belladonna; but for scopolamine (hyoscine) use chiefly chloral hydrate.

Incompatibles, Synergists: Same as those of belladonna.

Hyoscyami Semen.—U.S.P. 1830–1870. These are stronger than leaves, and used mostly for extraction of alkaloids; they are roundish

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reniform, flattened, 1–1.5 Mm. ($\frac{1}{25}$ – $\frac{1}{16}$ ') long, testa finely pitted, grayish-brown, sharp near the raised portion (dif. from stramonium seed), inodorous, taste oily, bitter, acrid. Dose, gr. 1–5 (.06–.3 Gm.).

Allied Plants:

1. *Hyoscyamus pallidus*.—Flowers are pale yellow and have no purple (*niger*) veins in the corolla. *H. agrestis* (of the field, wild); small annual, .3 M. (1°) high, less villous; with leaves smaller, and fewer flowers. *H. muticus*, leaves yellowish, stem remnants and calyxes longer, trichomes prominent and branched. *H. albus* and *H. aureus*, the former with white flowers, the latter with golden-yellow; both less active than the official.

2. *Duboisia myoporoides*.—Australia. Small tree having properties similar to those of belladonna and hyoscyamus; leaves 7.5–10 Cm. (3–4') long, 12–25 Mm. ($\frac{1}{3}$ –1') broad, petiolate, midrib prominent, entire, taste bitter; contains duboisine .3–1 p. c., a volatile alkaloid (mixture of hyoscyamine, scopolamine, and atropine), which forms numerous salts. Dose of leaves, gr. 1–3 (.06–.2 Gm.), duboisine hydrobromide or sulphate, gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.); used externally for eye affections, in solution (1 p. c. in water).

STRAMONIUM. STRAMONIUM, *U.S.P.*

Datura Stramonium,
Linné.

{ The dried leaves and flowering tops, with not more than 3 p. c. stems over 8 Mm. ($\frac{1}{3}$ ') thick, nor 4 p. c. acid-insoluble ash, yielding not less than .25 p. c. alkaloids.

Habitat. Asia; naturalized universally (Europe, England, N. America, etc.).

Syn. Stramon., Jamestown Weed, Jimson Weed, Thorn-apple, Devil's (Mad) Apple, Stink-weed, Stink-wort, Devil's Trumpet, Fire-weed, Jamestown Lily, Apple of Peru; Br. Stramonii Folia; Fr. Stramoine, Pomme Épineuse, Feuilles de Stramoine; Ger. Stechapfel, Dornapfel, Stechapfelblätter.

Da-tu'ra. L. fr. Hind. *dhatūra*, a plant, or an alteration of Ar. *tatorah*—*i. e.*, their name for the plant.

Stra-mo'ni-um. L. contr. of Gr. *στρήκνον μανικόν*, used by Dioscorides for this and for *Atropa Belladonna*.

Jimson-weed. For Jamestown, Va., where first found growing on ship rubbish.

PLANT.—Course annual bushy herb, rank, noxious odor; stems cylindrical, flattened, longitudinally wrinkled, occasionally 1–more-furrowed, succulent, greenish, purplish-brown, nearly solid, 1–1.5 M. (3–5°) high, 2.5–4 Cm. (1–1 $\frac{3}{8}$ ') thick, 2–3-branched above ground; root tapering, white; flowers June–Sept., calyx tubular, green, 4 Cm. (1 $\frac{3}{8}$ ') long, 5's, corolla white, purplish, tubular, funnel-shaped, 7.5–10 Cm. (3–4') long, 5 Cm. (2') broad, 5's; fruit capsule, 5 Cm. (2') long, ovate, obtusely quadrangular, covered with unequal, sharp, rigid spines, 4-celled, dehiscing half-way down into 4 segments; ovary 2-carpelled, 2-celled; seed numerous, brownish-black, angled, flattened, 4 Mm. ($\frac{1}{6}$ ') long. **LEAVES**, 5–30 Cm. (2–12') long, 4–15 Cm. (1 $\frac{3}{8}$ –6') broad, usually matted, wrinkled, crushed, petiolate, inequilaterally

ovate, acuminate, sinuate-toothed or angled, teeth few, acute with rounded sinuses, sparsely hairy, dark green, under surface light green; stems often flattened, wrinkled, furrowed; odor distinct, heavy, narcotic taste unpleasant, nauseous. POWDER, brownish-green—stomata with 3 neighboring cells, calcium oxalate in rosette aggregate crystals; non-glandular hairs, few glandular hairs, tracheæ, stem fragments with spiral tracheæ, wood-



FIG. 362.—*Datura Stramonium*: flowering branch.

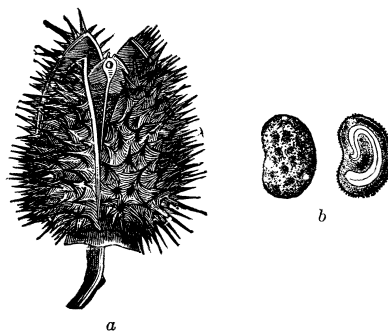


FIG. 363.—*Datura Stramonium*: a, fruit; b, stramonium seed and section, magnified 3 diam.

fibers, collenchymatous cells, parenchyma cells, microcrystals, no bast-fibers. *Solvents*: 75 p. c. alcohol; diluted alcohol; hot water partially. Dose, gr. 1-5 (.06-.3 Gm.).

ADULTERATIONS.—Leaves of allied species (usually smaller), *bella-donna*, French cultivated, and *Xanthium Strumarium*.

Commercial.—Plants were known possibly to the ancients, but not described until the 16th century (Gerarde), nor introduced into medicine before 1672 (Störck). They infest fields, roadsides, waste places, near houses (never in mountains or woods), exhale rank, heavy, repellant narcotic odor, and grow well with us, especially in Michigan and other western States, all parts being medicinal. Gypsies brought leaves and seeds to Europe from Asia in the middle ages, and used the smoke therefrom to intoxicate their dupes. Leaves should be gathered while flowering, by pulling up entire plant, then quickly removing and drying, by which they often become broken or cut into pieces.

CONSTITUENTS.—Daturine .2-4 p. c., volatile oil (containing daturic acid, $C_{17}H_{34}O_2$), chlorophyll, mucilage, albumin, potassium nitrate, ash 17-20 p. c.

Daturine.—An alkaloid combined with malic (daturic) acid, and consisting of hyoscyamine, atropine (the former usually predomi-

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nating), and probably little scopolamine (hyosine); forms salts (hydrochloride, sulphate, etc.). Dose, gr. $\frac{1}{120}$ – $\frac{1}{60}$ (.0005–.001 Gm.).

PREPARATIONS.—1. *Extractum Stramonii*. Extract of Stramonium. (Syn., Ext. Stramon.; Fr. Extrait de Feuilles de Stramoine; Ger. Stechapfelblätterextrakt.)

Manufacture: PILULAR, macerate, percolate 100 Gm. with 75 p. c. alcohol until exhausted, reclaim alcohol, evaporate residue at 70° C. (158° F.) to pilular consistence, frequently stirring, mix thoroughly; after assay add enough glucose for extract to contain 1 p. c. of total alkaloids, mix thoroughly. POWDERED, macerate, percolate 100 Gm. with alcohol, reserve first 100 cc. and continue until exhausted (100 cc.); reclaim alcohol from second percolate until residue in still is 10 cc., to which add first reserve and distill until residue of syrupy consistence; transfer to a dish, rinse still with little warm alcohol, which add to dish and evaporate at 70° C. (150° F.) to soft extract, frequently stirring, add dried starch 5 Gm., heat, with stirring, until nearly dry, thoroughly incorporate dried starch 2 Gm., expose to current of warm air until dry, pulverize; after assay add enough dried starch for extract to contain 1 p. c. of total alkaloids, mix thoroughly, pass through fine sieve; contains .9–1.1—1 p. c. of the alkaloids; 1 Gm. represents 4 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{6}$ – $\frac{1}{2}$ (.01–.03 Gm.).

Prep.: 1. *Unguentum Stramonii*, N.F., pilular ext. 10 p. c., hydrous wool fat 20, benzoined lard 65, diluted alcohol 5.

2. *Tinctura Stramonii*. Tincture of Stramonium. (Syn., Tr. Stramon.; Br. Tinctura Stramonii, Tincture of Stramonium; Fr. Teinture de Stramoine; Ger. Stechapfeltinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: diluted alcohol—percolate 95 cc., assay, and add enough menstruum for the 100 cc. to contain .0225–.0275—.025 Gm. of total alkaloids. Dose, m̄v–30 (.3–2 cc.).

3. *Fluidextractum Stramonii*, N.F., (80 p. c. alcohol). Dose m̄j–5 (.06–.3 cc.).

Unoff. Preps.: Plaster, Juice (*Succus Stramonii*), Cigarettes, Fomentation.

PROPERTIES.—Narcotic, anodyne, antispasmodic, diuretic, mydriatic. Internally very similar but stronger than belladonna; weaker externally. Large doses produce dry throat, cardiac irregularity, high fever with delirium, increase sexual desire, possibly laughing and hallucinations (like in cholera, alcoholism), dizziness, fainting, red eruptions, dilated pupils, insomnia, black objects appear green; pneumogastric becomes paralyzed, thus stopping the inhibitory action, hence whole system paralyzed finally by over-stimulation, including the heart, then delirium, stupor, convulsions, death by asphyxia; in case of recovery remember nothing that has occurred; does not affect some animals, as caterpillar tribe, goats, etc.

USES.—Insanity, mania, melancholia, epilepsy, nervous asthma (gr. 15 (1 Gm.) of leaves smoked with tobacco or sage at each paroxysm), whooping-cough, dysmenorrhea, retention of urine, hepatic colic, laryngeal cough, chorea. Ointment in ulcers, hemorrhoids, fissures, skin diseases, poison-ivy eruptions, rheumatism, bruises, sprains. In the absence of belladonna may use stramonium with good results.

Poisoning, Incompatibles, Synergists: Same as for belladonna.

Allied Plants:

1. *Datura Tat'ula*, *Purple Thorn-apple*.—Similar to official and considered by some the same, but has purple stems, petiole, and corolla; was recognized, along with *D. Stramonium*, U.S.P. 1910.

2. *D. fastuosa (alba)*—*Datura Folia*, *Datura Semina* (Br.); India. Used natively as a criminal poison; capsule small, subglobular, spinous, seed yellowish-brown, triangular, rough. *D. Met'el*, *Entire-leaved Thorn-apple*, Africa, S. Asia; capsule and seed like *D. fastuosa (alba)*, leaves nearly entire, downy. *D. sanguinea*, Peru; large shrub, or tree, leaves nearly entire, downy beneath, flowers large, upper half of corolla yellow, lower half blood-red.

3. *Brunfel'sia Hopeana*, *Manaca*, *Mercurio Vegetal*, N.F.—The dried root; S. America, Amazon valley. A large shrub. Root nearly cylindrical, tortuous, variable length, 3 Cm. (1½') thick, dark brown, wrinkled, yellowish cork patches easily removed from thin cortex adhering closely to hard yellowish wood; fracture short, very tough; odor slight; taste bitter. Powder, pale yellow—lignified fibers, medullary ray cells, tracheæ, few cork cells, cortical parenchyma with brownish amorphous content, starch grains, stone cells, calcium oxalate rosettes; solvent: diluted alcohol; contains resin, alkaloid (? manacine). Motor depressant (spinal centers); full doses—difficult breathing, profuse sweating, depression, nausea, vomiting, urination, purgation; over-doses—acid depressing poison; chronic muscular rheumatism, syphilis (substitute for mercury). Dose, gr. 15–30 (1–2 Gm.); 1. *Fluid-extractum Manacæ* (75 p. c. alcohol), dose, ℥xv–30 (1–2 cc.); Prep.: 1. *Elixir Manacæ Compositum*, 16.5 p. c., + sodium salicylate 14, lithium salicylate 1.75, salicylic acid 5.5, potassium bicarbonate 3.97 +, dose, ʒj–2 (4–8 cc.).

4. *Nicotiana Tabacum*, *Tabacum*, *Tobacco*.—The commercial dried leaves, U.S.P. 1820–1890; C. and S. America (cultivated). Coarse robust annual, 1–2 M. (3–6°) high; stem erect, unbranched, solid, green, hairy; root long, fibrous; flowers rose-color, calyx bell-shaped, hairy, viscid, corolla 4–5 Cm. (1½–2') long, tubular, inflated; fruit ovate capsule, 2.5 Cm. (1') long, opening at summit; seed many, reniform, reticulate, brownish. Leaves, about .5 M. (20') long, 10–15 Cm. (4–6') wide, ovate-lanceolate, acute, entire, waved, brown, friable, hairy; odor heavy, peculiar; taste nauseous, bitter, acrid. Plant not known to be wild, and leaves in curing undergo a sweating process (chemical change) by which odor is modified through generation of a new volatile principle, and amount of nicotine decreases owing to its

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volatility; contains nicotine .7–5–11 p. c. (colorless oily liquid), nicotine (nicotia) 2 p. c., nicotelline, nicotimine, pirolidine (?), nicotianin (tobacco camphor), tannin, resin, gum, malates, citrates, ash 14–18–27 p. c. (Ca, K, NH_4 —phosphates, sulphates, malates, chlorides, nitrates); solvents: alcohol, hot water. Narcotic, sedative, diuretic, emetic, myotic, diaphoretic, cathartic, antiseptic; first stimulates (causing convulsions) then paralyzes motor nervous system (spine), produces vomiting, purging, collapse, contracted pupils, depressed then increased heart action (rapid, feeble pulse), cold extremities, death by paralysis of respiration and heart; excessive use causes dyspepsia, diminished sexual power, nervousness, angina pectoris, and in the young impairs body nutrition. So severe as to be little employed as a medicine, but

FIG. 364.—*Nicotiana Tabacum*.

may be used to relax spasms, relieve local pain, constipation, spasmodic asthma, tetanus, as an enema in intussusception, strangulated hernia, impacted cecum, hemorrhoids, scabies, strychnine poisoning. *Poisoning*: By tobacco or nicotine, give tannin, emetics, then strychnine (physiological antidote), alcohol, ammonia, digitalis, belladonna, iodides, artificial respiration, maintain recumbent position; tobacco heart (cardiac irregularity and palpitation)—abandon use. The toxic effect of tobacco smoke is mostly due to nicotine, but there are present collidine, pyridine, picoline, ethylamine, acids, etc. Dose, gr. $\frac{1}{2}$ –3 (.03–.2 Gm.); wine (vinum), 10 p. c., m v–60 (.3–4 cc.); enema tabaci, 5 p. c.; Oleum Tabaci, U.S.P. 1850–1870 (from distilling leaves—acrid, poisonous, dark brown oily liquid); aqueous extract, fluidextract, infusion, ointment, poultice.

N. rus'tica, Wild Tobacco, and *N. quad-rival'is*, Canada, E. United States. *N. rep'an'da*, Cuba. *N. Per'sica*, Persia. *N. rustica*, cultivated in Turkey, India, etc. All may be used similarly.

5. *Fabia'na imbrica'ta*, *Pichi*.—Peru, Chile. Plant 1.5–2 M. (5–6°) high, growing on rocky hill-tops, resembling somewhat the pines; the woody branches are used, being resinous, with aromatic odor and taste; contain fabianine, resin, volatile oil. Diuretic, tonic, cholagogue; chronic vesical catarrh, gravel, renal, urethral, or cystic calculi. Should not be used in organic disease. Dose, gr. 5–40 (.3–2.6 Gm.).

62. SCROPHULARIACEÆ. Figwort Family.

Skrof-u-la-ri-a'se-e. L. *Scrophulari-a* + *aceæ*—*i. e.*, from its efficacy in scrofula. Herbs, rarely shrubs. Distinguished by stamens 2–4–5,

didynamous or 2 perfect, inserted on 2-lipped corolla-tube; flowers irregular, 4–5's, 2-lipped; ovary 2-celled, central placenta, superior, style 1; seeds many in fleshy albumin; fruit, capsule or berry; universal; bitter, astringent, emetic, purgative, diuretic, narcotic, poisonous, often cultivated for beautiful flowers.

Genus: 1. **Digitalis**.

DIGITALIS. DIGITALIS, U.S.P.

Digitalis purpurea,
Linné. { The dried leaf, assayed biologically (frog), with
not more than 2 p. c. browned leaves, stems,
flowers or foreign organic matter, yielding not
more than 5 p. c. acid-insoluble ash.

Habitat. W. and C. Europe; in sandy soil, edges of woods, thickets; naturalized in Australia, Oregon, etc.

Syn. Digit., Foxglove, American or Purple Foxglove, Fairy Gloves, Folks' or Ladies' Glove, Dog's Finger, Fairy Fingers, Dead Men's Bells, Finger Flower, Thimbles, Fairy Cap, Lion's Mouth, Scotch Mercury, Throatwort, Rabbit's flower; Br. *Digitalis Folia*; Fr. *Feuilles de Digitale pourprée* (de grande Digitale), Doigtier; Ger. *Fingerhutblätter*.

Dig-i-ta'lis. L. pertaining to the fingers, fr. *digitus*, a finger—*i. e.*, the finger-shaped corolla, named by Fuchs, 1542, after Ger. *fingerhut*, a thimble.

Pur-pu're-a. L. *purpureus*, purple-colored—*i. e.*, its purple flowers.

Foxglove. Corruption of *Folks' glove*, *Folk*, synonym of *Fairies*.

PLANT.—Biennial or perennial, succulent, downy, leafy herb, .6–1.5 M. (2–5°) high; flowers July–Aug., tubular, campanulate, 5-lobed, outside purple, inside dark-spotted upon a white ground, mouth hairy, terminal, 1-sided racemes; one variety with white flowers; fruit 2-celled pyramidal capsule; seed many, small, brownish-gray. **LEAVES (LEAF),** more or less crumpled or broken, 10–25 Cm. (4–10') long, 5–15 Cm. (2–6') broad, contracted into winged petiole, crenate, irregular, thin, dark green above, grayish beneath from dense tomentose pubescence, venation reticulate, midrib and principal veins broad and flat, larger veins often purplish, lower veins continued into the wings of petiole; odor slight (dry), peculiar and characteristic (moist); taste very bitter. **POWDER,** dark green—numerous fragments of epidermis, non-glandular hairs 2–8-celled, few glandular hairs, fragments of veins and petioles with tracheæ, no calcium oxalate. Should be kept, thoroughly dried, in air-tight containers. **Solvents:** 75–83 p. c. alcohol; boiling water partially. Dose, gr. 1–2 (.06–.13 Gm.).



FIG. 365.—*Digitalis purpurea*.

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ADULTERATIONS.—LEAVES: First year's leaves—radical, with very long petioles; also leaves of *D. ambigua* (*ochroleuca*)—nearly smooth; *Verbascum Thapsus*—yellowish-white, entire, densely long-tomentose, mucilaginous; *Symphytum officinale*—entire, scabrous; *Onyza* (*Inula squarrosa*)—scabrous, entire. POWDER: Distinguished from all adulterations by the 2–8-celled hairs and absence of calcium oxalate crystals.

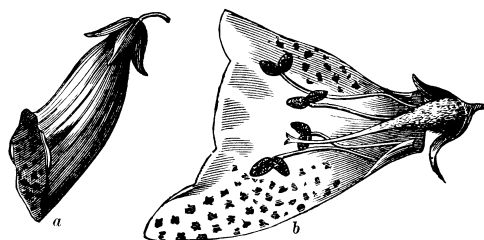


FIG. 366.—*Digitalis purpurea*: a, single flower; b, the same opened.

Commercial.—Plant cultivated for ornament and medicine, producing the first year a large fleshy root and a rosette of radical leaves, but no flowering and fruiting stem until the second year. Leaves

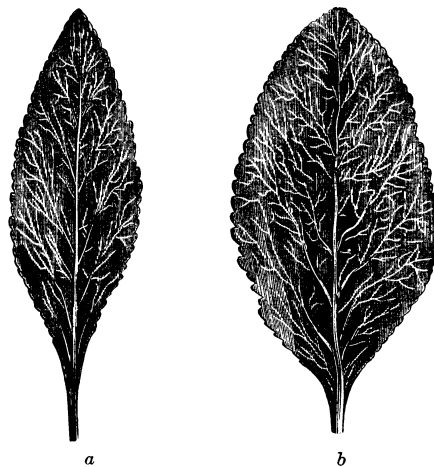


FIG. 367.—*Digitalis* leaves, upper surface: a, of the first year's growth; b, of the second year's growth.

should be collected from wild plants growing in mountainous regions when two-thirds of the flowers are expanded, July-Sept., from the fact that two series of compounds are formed in plants by the action of light and air: 1, *nutritious*, those for nutrition (constructive metab-

olism); 2, *secretious*, or secretions of waste products (destructive metabolism). It is only during the flowering stage that every nutritive avenue and substance is taxed and used for flower perfection, thereby leaving elsewhere, as in leaves, etc., the waste products, alkaloids, etc., in a most concentrated form; for the same reason belladonna, hyoscyamus, and many other plants should have leaves (all official parts) gathered when in bloom—the second year of growth, hence the second crop of leaves. However, some claim that most digitoxin is present before flowering, and inversely proportional to moisture in herbage. Only those full grown and fresh are collected, then carefully and quickly dried without exposure to sun or undue heat, and protected from external moisture, each being placed separate, or in baskets, in dark drying stoves; or the entire plant may be hung up carefully by the roots in a current of warm air, such yielding most digitoxin, that by which the drug's value is determined; carelessness in this process often renders the product inert. When dry should be kept in air-tight, dark containers (or tins, over lime—old Dutch method), and not longer than 1 year if exposed to light and moisture, as quality depends upon color, odor, taste, and yield of digitoxin; seed are much stronger, keep better, and do not deteriorate upon drying; lose on drying 75 p. c.; cultivated leaves are thicker, deeper color, less hairy, active and acute.

CONSTITUENTS.—Digitoxin, Digitophyllin, Gitalin (digitalein, digalen), digitonin, gitin, digitsaponin (digitalin + saponin), enzymes, manganese, volatile oil, fixed oil 5 p. c., gum, starch, sugar, chlorophyll, inosit, pectin, coloring matter (red, yellow), digitalosmin, antirrhinic acid, digitalic (malic) acid, ash 15 p. c.

Digitoxin, Digitophyllin, Gitalin (digitalin-group).—Heart stimulant glucosides, the two former soluble in alcohol, the latter also in water, which alone occurs (+ digitsaponin) in the infusion, making it possibly the most important content.

Gitin, Digitsaponin (saponin-group).—Inactive, but presence may increase the activity of the glucosides.

Enzymes (oxydases—only in fresh leaves).—Oxidize or hydrolyze the glucosides (digitoxin, digitophyllin, gitalin) into glucose, digitoxigenin and digitaligenin—all inactive, the associated manganese aiding in the decomposition—this latter being averted only by quickly drying fresh leaves and keeping them dry.

Digitalin, Digitalinum.—This name has been given to four distinct substances each supposedly representing the important cardiac content; as such it may not exist in the drug, for, being very complex, it may become modified in process of extraction. Of these four varieties, two have commercial prominence: 1, *German*, mostly used with us, consisting of digitoxin, digitophyllin, digitalein (heart stimulants), chiefly digitonin (diuretic), digitalin and digitin (inert); yellowish-white amorphous powder, soluble in water, alcohol; 2, *French*—amorphous (yellowish-white, bitter powder), crystalline (needle-shaped

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crystals, very bitter, insoluble in water—chiefly digitoxin). Digitalin may be obtained by precipitating alcoholic extracts with tannin, washing precipitate, or by heating German variety with alcohol (4) until dissolved, adding ether (5), setting aside, evaporating ether-alcoholic solution, adding water, setting aside to deposit, washing with alcohol.

Owing to its varying composition uniform doses, become impossible; usual dose gr. $\frac{1}{60}$ – $\frac{1}{30}$ (.001–.002 Gm.); crystalline, dose, gr. $\frac{1}{200}$ – $\frac{1}{100}$ (.0003–.0006 Gm.).

PREPARATIONS.—1. *Infusum Digitalis*. Infusion of Digitalis. (Syn., Inf. Digit.; Fr. Tisane de Digitale; Ger. Fingerhutaufguss.)

Manufacture: 1.5 p. c. Macerate for 1 hour 1.5 Gm. with boiling water 70 cc., filter, add alcohol 10 cc., + cinnamon water 15 cc. to filtrate, pass through residue on the filter cold water q. s. 100 cc., mix well. Must be freshly prepared. Dose, ζ ij–4 (8–15 cc.).

2. *Tinctura Digitalis*. Tincture of Digitalis. (Syn., Tr. Digit.; Fr. Teinture de Digitale; Ger. Fingerhuttinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: 80 p. c. alcohol. Exhaust 10 Gm., in glass percolator, with purified petroleum benzin until free from fat; air dry, and percolate with 80 p. c. alcohol; adjust the volume of finished tincture to conform to biological standard. Dose, \mathfrak{m} v–30 (.3–2 cc.).

3. *Fluidextractum Digitalis*, N.F. (83 p. c. alcohol), Dose, \mathfrak{m} j–2 (.06–.13 cc.).

4. *Pilulæ Digitalis, Scillæ et Hydrargyri*, Niemeyer's (*Guy's Pills for Dropsy*, N.F., 1 gr., + squill, mass of mercury, $\bar{a}\bar{a}$ 1 gr.

Unoff. Preps.: *Abstract*: gr. $\frac{1}{4}$ –1 (.016–.06 Gm.). *Extract* (evaporate fluidextract cautiously to one-fourth its volume), gr. $\frac{1}{6}$ – $\frac{1}{2}$ (.01–.03 Gm.).

While the infusion is the best diuretic, the tincture is the best for heart action; this latter, and the fluidextract, owing to alcohol present, contains most digitoxin and digitophyllin, with little gitalin—some of the digitoxin being precipitated; the extract has also digitoxin, while infusion mostly gitalin, digitonin and digitsaponin.

PROPERTIES.—Cardiac tonic, vascular stimulant, diuretic, motor-excitant, paralyzant, anaphrodisiac, sedative, narcotic, emetic; normal doses make the pulse slower, firmer, stronger. The diastole (periodic

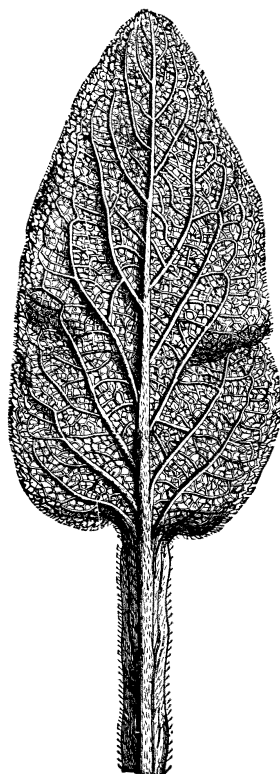


FIG. 368.—Digitalis leaf: under surface.

dilatation) is prolonged, owing to stimulation of the pneumogastric; the systole (periodic contraction) is not altered as to duration, but is in degree, the force being increased greatly, owing to stimulation of the heart muscle and its contained ganglia, which may be so powerful as to squeeze out all of the blood, thus causing death in systole by over-stimulation. Temperature is lowered by the lessening of blood supply to the tissues. Blood-pressure in the glomeruli of the kidneys is increased, causing diuresis. Recumbent position is best when under its influence. The rapid pulse is due to over-stimulation of the pneumogastric (inhibition) and consequent exhaustion, thus allowing the sympathetic alone to control the action. Digitalis and aconite slow the heart, otherwise are antagonistic; the former increases inhibition, stimulates motor apparatus; the latter does the converse, thus weakening

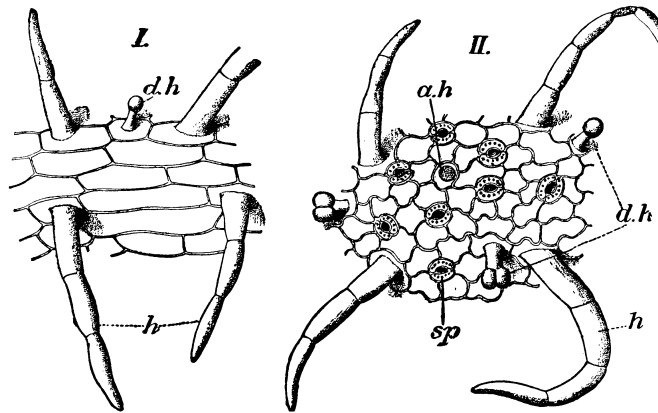


FIG. 369.—Digitalis leaf: I, epidermis of upper side seen from above with velvet hairs (*h*) and glandular hairs (*d.h*); II, epidermis of under side with stomata (*sp*), velvet hairs (*h*), glandular hairs (*d.h*), and the scar of a broken hair (*a.h.*) magnified 175 diam.

the beat, both finally paralyze cardiac ganglia—digitalis by over-stimulation, aconite by direct depression. Arterial tension is raised by digitalis, lowered by aconite; the latter acts quickly, the former slowly, possessing cumulative action—*i. e.*, several doses given at proper intervals may show no result until suddenly the combined action of all the doses is manifested at once, proving sometimes fatal if not very cautious. In consequence of this, aconite becomes a more valuable antagonist in digitalis poisoning than digitalis in aconite poisoning.

USES.—Where heart is rapid and feeble, deficient and poor circulation (as it causes the heart to expel much more blood than normally), renal disease, venous engorgement, dropsy, pneumonia, scarlet fever, congestive headache, hemicrania in mania, delirium tremens, hemorrhages, menorrhagia, rheumatic fever, spermatorrhea, pleurisy, peri-

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carditis, chronic bronchitis, epilepsy. Locally to enlarged glands, abdominal and renal dropsy.

Poisoning: Have sneezing, nausea, vomiting of mucus, bile, and dark green matter, colic, purging with severe pain, headache; heart beats violently; pulse small and shallow, yet upon rising rapid, weak, and irregular; vertigo, yellow vision, face pale, pupils usually dilated, sometimes contracted, eyeballs protruding, sclerotic blue colored, pain in back and limbs, diarrhea, suppressed urine, salivation, conscious until near the end, delirium, coma, convulsions, death suddenly by paralysis of heart muscle. Wash out stomach with warm water and tannin, give diffusible stimulants (injections), aconitine (best to antagonize large quantities of digitalis), opium (best to antagonize long usage of digitalis), saponin, senegin (best physiological antagonist), Epsom or Rochelle salt, fluidextract of quillaja, and senega, external heat, horizontal position.

Incompatibles: Cinchona, tannin, iron sulphate, lead acetate, tincture of ferric chloride, syrupy and watery solutions, which may decompose drug's active principles.

Synergists: Cardiac stimulants, belladonna, ergot, etc.

Allied Plants:

1. *Veronica virginica*, *Leptandra*, *Culver's Root*, N.F.—The dried rhizome and roots with not more than 5 p. c. of stem-bases or other foreign organic matter, yielding not more than 6 p. c. of acid-insoluble ash; N. America, low grounds. Perennial herb, .6–2 M. (2–6°) high,

angular, smooth or downy; leaves lanceolate, serrate, 7.5–10 Cm. (3–4') long, whorls; flowers, spikes, whitish, tubular, stamens 2, exserted; fruit small, compressed capsule. Rhizome, horizontal, nearly cylindrical, branched, 4–10 Cm. ($1\frac{3}{8}$ –4') long, 4–13 Mm. ($\frac{1}{8}$ – $\frac{1}{2}$ ') thick, grayish-brown, annulate from circular scars of bud-scales,



FIG. 370.—*Veronica officinalis*: flowering branch.



FIG. 371.—*Veronica virginica*: transverse sections of rhizome and root.

numerous stem-scars above, coarse roots on sides and beneath; fracture tough, woody, wood and bark thin, latter, resinous, pith large, more or less hollow; roots 1–10 Cm. ($\frac{2}{3}$ –4') long, .5–2 Mm. ($\frac{1}{50}$ – $\frac{1}{12}$ ') thick, with light brown central cylinder; odor characteristic; taste very bitter, acrid. Powder, yellowish-brown—numerous fragments with chloral

hydrate T. S.—pink or violet, starch grains, tracheæ, wood-fibers, parenchyma with brownish resin often adherent to starch grains in the cells preventing separation of latter; solvents: 75 p. c. alcohol, water; contains (mostly in bark) leptandrin, resin 6 p. c., tannin, saponin, gum, volatile oil. Emeto-cathartic, cholagogue, alterative, tonic; duodenal atony, chronic constipation with insufficiency of biliary and intestinal secretions; acts violently on some persons. Dose, gr. 15–60 (1–4 Gm.); 1. *Extractum Leptandræ* (75 p. c. alcohol), dose, gr. 1–5 (.06–.3 Gm.); 2. *Fluidextractum Leptandræ* (75 p. c. alcohol), dose, ℥xv–60 (1–4 cc.). Tincture, ʒj–2 (4–8 cc.); *leptandrin* (similar to podophyllin), gr. 1–5 (.06–.3 Gm.). *V. officinalis*, *Common Speedwell*; Europe, N. America. —Procumbent, pubescent, perennial, stem ascending, 7.5–25 Cm. (3–10') high; leaves obovate, petioled, 2–4 Cm. ($\frac{1}{2}$ –1 $\frac{3}{4}$ ') long, serrate, grayish-green; flowers axillary racemes, wheel-shaped, 4-parted, pale blue corolla with dark blue stripes, 2 exserted stamens; contains bitter principle, tannin; plant used as alterative, diuretic (urinary, calculus disorders), diaphoretic, expectorant (skin diseases, scurvy); in infusion. Dose, gr. 30–60 (2–4 Gm.).



FIG. 372.—*Verbascum Thapsus*.

2. *Verbas'cum Thap'sus*, *Verbasci Folia*, *Mullein Leaves*, *Great Mullein*, *N.F.*—The dried leaves with not more than 2 p. c. of foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; Europe, nat. in N. America—growing in fields, waste places. Stout woolly perennial, .3–1.3 M. (1–4°) high; flowers, spike, yellow, 2.5–4 Cm. (1–1 $\frac{3}{4}$ ') broad, thick, tough (moist), brittle (dry), greenish-gray, densely long-tomentose, numerous non-glandular hairs; nearly odorless; taste mucilaginous, slightly bitter. Powder, dark green—numerous lignified hairs, glandular hairs, epidermal cells, stomata, chlorenchyma with fibro-vascular tissue; solvent: diluted alcohol; contains resin, tannin, volatile oil, mucilage, sugar, ash 14 p. c. Demulcent,

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pectoral, anodyne, nutritive; consumption, nasal catarrh, coughs—smoked. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Verbasci Foliorum* (diluted alcohol), dose, mxx–60 (1–4 cc.); Infusion.

3. *V. phlomoïdes*, or *V. thapsifor'me*, *Clasping-leaved Mullein*, *Verbasci Flores*, *Mullein Flowers*, *N.F.*—The dried corollas with adhering stamens and not more than 2 p. c. of foreign organic matter—flowers which have become brown should not be used. Plants similar to preceding; stem .3–1.2 M. (1–4°) high, usually simple; leaves oblong, crenate, woolly-tomentose; corolla light yellow, woolly, 14–30 Mm. $\frac{3}{5}$ – $1\frac{1}{5}$ ' broad, rotate, 2-lipped, tube 1–2 Mm. ($\frac{1}{25}$ – $\frac{1}{12}$ ') long and broad; stamens 5, didynamous, filaments thick, fleshy, pollen grains smooth; odor peculiar, agreeable; taste mucilaginous; with boiling water—yellow, with dilute sulphuric acid—green, becoming brown with alkali; solvents: water, diluted alcohol; contains volatile oil, resin, tannin, fixed oil, gum, glucoside, coloring, ash 6 p. c. Diaphoretic, demulcent, diuretic, anodyne, resolvent, antispasmodic, emollient; bronchial affections. Dose, ʒj–2 (4–8 Gm.); 1. *Species Pectorales*, 10 p. c. Fomentation, Infusion.

4. *Ses'amum in'dicum*; *Oleum Sesami*, *Sesame Oil*, *Teel Oil*, *Benne Oil*, *N.F.*—Padaliacæ. The fixed oil obtained from the seeds of one



FIG. 373.—*Sesamum indicum*: a, flowering branch; b, section of seed enlarged.

or more cultivated varieties; India, Africa, cult. in S. United States. Annual herb, 1–1.3 M. (3–4°) high, quadrangular, hairy; leaves lanceolate-ovate; flowers campanulate, 4 Cm. ($1\frac{3}{5}$ ') long, pale purple; fruit, capsule, 2.5–5 Cm. (1–2') long, quadrangular, pericarp leathery, olive-green, dehiscent; seed 5 Mm. ($\frac{1}{5}$ ') long, testa thick, yellowish, variegated; contain fixed oil 47–56 p. c., proteins 22 p. c., mucilage 4 p. c., ash 4.8 p. c. *Oleum Sesami*, pale yellow cily liquid; almost odorless, bland taste, slightly acid, slightly soluble in alcohol, miscible with ether, chloroform, petroleum benzin, carbon disulphide, sp. gr. 0.918; contains triglycerides of oleic (chiefly) and linoleic acids 75 p. c., also myristin, palmitin, stearin 20–25 p. c., sesamin. Laxative, demulcent, emol-

lient, nutritious; similar to olive oil, but less agreeable and digestible; mostly in hair preparations, liniments; internally in emulsion. Dose, ʒss–2 (15–60 cc.); 1. *Linimentum Ammonia*, 75 p. c., + aq. ammon. 25 p. c.; 2. *Olea Infusa*, 100 p. c.

Allied Products:

1. *Ground-nut*, *Pea-nut Oil* (*Ar'achis hypogæ'a*).—Tropical America; seed contain fixed oil 45 p. c.; used instead of sesame and olive oil.

2. *Soy Oil* (*Glyci'ne* (*So'ja*) *his'pida*), Japan; seed reniform, used as food and for making a sauce (soy); contain bland fixed oil 15–20 p. c.
3. *Ben Oil*, *Behen Oil* (*Morin'ga ap'tera*, *M. pterygosper'ma*), E. India; seed called *ben-nuts*, have elongated, membranous wings; yield fixed oil 30 p. c.; used as purgative and in extracting perfume from flowers.

63. RUBIACEÆ. Madder Family.

Ru-bi-a'se-e. *L. Rubi-a* + aceæ, madder, fr. *rubeus*, *rubere*, red—*i. e.*, referring to color of the roots. Trees, shrubs, herbs. Distinguished by versatility of important uses; stems round or angular; leaves opposite, stipulate, calyx 4–5-toothed, superior; corolla 4–5, regular, epigynous; stamens 4–5, on corolla-tube, anthers 2-celled; ovary inferior, 2–4-celled; fruit inferior, dry or succulent, edible, 2-celled; seeds 1 or more in each cell; temperate climates, tropics; tonic, febrifuge, astringent, emetic, purgative, diuretic, emmenagogue, dyeing, tanning, poisonous.

Genera: 1. **Cinchona**. 2. **Orouparia**. 3. **Coffea**. 4. **Cephaëlis**.

CINCHONA. CINCHONA, U.S.P.

Cinchona { **succirubra**, + hybrids, *Pavon*,
Ledgeriana, + hybrids, *Moens*,
Calisaya, + hybrids, *Weddell*,
 and other species. } { The dried bark yielding
 not less than 5 p. c.
 alkaloids.

Habitat. S. America; cultivated in Java, India, Ceylon, E. Africa, Straits Settlements; unsuccessfully in Brazil, Jamaica, Mexico, Fiji, etc.

Syn. Jesuit Bark (Powder), Countess' Powder; 1. Red Peruvian Bark, Red Bark, Saint Ann's Bark; Br. *Cinchona Rubra* Cortex; Fr. *Quinquina rouge*; Ger. Cortex Chinae, Chinarine, Rothe Chinarine. 2, 3. Yellow Cinchona, Calisaya Bark, Yellow Peruvian Bark, *Cinchona Flava*, *Cinchona Flavæ* Cortex; Fr. *Quinquina* (Calisaya) jaune; Ger. China Regia, Kalisayarinde, Königschina.

Cin-cho'na, better *Chinchona*, after Countess Ana de Osorio, wife of fourth Count of Chinchon, Spanish Viceroy of Peru (Chinchon, a town in Spain, near Madrid). She was cured of tertian fever by this bark, 1638, through the recommendation of a Jesuit, brought it to Europe, 1640, extolled its virtues, and thus published the hitherto Jesuit secret.

Suc-ci-ru'bra. *L. succus*, juice, + *ruber*, red—*i. e.*, sap first colorless, then white, and red on exposure.

Ledg-er-i-a'na. *L. Ledgerian*, of or belonging to Ledger—*i. e.*, after C. Ledger, who obtained the seed, 1865, from the Caupolican province, Bolivia.

Cal-i-sa'ya. Name given the bark by Spaniards and Indians.

Quina (Gheena), Peruv. Indian name for bark; *quina-quina*—medicinal bark; this name they apply also to other barks, and from it comes Fr. *Quinquina rouge*; Ger. China, very similar to Sp. *cascarilla*, dim. of *cascara*.

PLANTS.—Evergreen trees, 6–24 M. (20–80°) high, .1–.6 M. (4–24') thick; leaves opposite, entire, caducous, bright green, shining, glabrous above, paler, pubescent beneath (best scrobiculate, except *C. succirubra*), lamina 7.5–20 Cm. (3–8') long, 2.5–7.5 Cm. (1–3') broad, ovate, midrib prominent often purplish, petiole pubescent, reddish; flowers tubular, pinkish, fragrant, 15 Mm. ($\frac{3}{8}$ ') long, 5-divided; fruit dehiscent

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capsule, 12-18 Mm. ($\frac{1}{2}$ - $\frac{3}{4}$ ') long, ovate, smooth, 2-celled, seeds winged, numerous. BARK, quills, curved pieces, broken fragments, 2-8 Mm. ($\frac{1}{2}$ - $\frac{1}{3}$ ') thick, brown, reddish-brown, usually with white or gray lichens, corky ridges, protuberances, transverse fissures, rarely numerous or much intersected and with sloping sides (Red), or with numerous intersecting transverse and longitudinal fissures with nearly vertical

FIG. 374.—*Cinchona succirubra*.

sides (Yellow); inner surface brown, reddish-brown, striate; fracture short, granular (outer), splintery (inner); odor faintly aromatic; taste astringent; very bitter. POWDER, brown—bast-fibers spindle-shaped, with thick lignified lamellated walls having pores, parenchyma and cork brown; starch grains up to .02 Mm. ($\frac{1}{250}$ '), minute spheroidal microcrystals. *Test*: 1. Heat 1 Gm. in dry test-tube—bright red

distillate (*C. succirubra*), or—tarry distillate, purplish, granular (*C. Ledgeriana* + *C. Calisaya*). *Solvents*: 75 p. c. alcohol; acidified water. *Dose*, gr. 15–60 (1–4 Gm.).

ADULTERATIONS.—Inferior grades through ignorance, substituting one variety for another intentionally, Maracaibo for the yellow; barks treated with ammonia gas (thereby producing cinchona-red) for red bark; powder with residual inferior barks.

Commercial.—Plants natively hug mountain sides; in S. America from 10° north latitude to 20° south latitude, on the eastern slopes of central Andes chain (Bolivia to Peru, Ecuador) and western Cordilleras chain, thence to the highlands of Colombia, Venezuela, Caracas, and Caribbean Sea. Of the 36 species recognized, the 3 official with their hybrids are considered the richest alkaloid producers, that upon which value depends. Formerly the slight variation in color of the bark and specific district sufficed to impress trade importance, but this now turns solely upon assay, making the following classification largely of historic interest: 1, *Red* (*C. succirubra*); 2, *Yellow* (*C. Ledgeriana*, *C. Calisaya*); 3, *Pale* (*Crown*, *Loxa*—*C. officinalis*, var. (a) *Condamineae*, (b) *Bonplandae*, (c) *crispae*); 4, *Gray* (*C. nitida*, *C. micrantha*, *C. peruviana*); 5, *Colombian* (*C. pitayensis*, *C. lancifolia*, *C. cordifolia*). The best species flourish where mean annual temperature is 13° C. (55° F.) and rainy season continues 9 months, rainfall being heavy at night with intermingled fog and sunshine during the day—the other 3 months (Jan., Feb., March) having nights frequently below freezing and days 24° C. (75° F.) with dense fogs; inferior species thrive where moisture is less uniform and average temperature 20° C. (68° F.). Valleys, owing to locations having to be well-drained, are not so desirable as forest slopes, where trees grow singly or few together at an elevation of 1500–2400 M. (5000–8000°); *C. barbacensis*—most worthless species, so low as 100 M. (330°), while *C. succirubra* is valuable at 700 M. (2300°), and others do well at 3500 M. (11500°). Their area is limited to within 11 degrees north and south of Loja (Loxa), outside of which barks are almost worthless, the most southern being *C. australis*, the most northern *C. tucujensis* and *C. cordifolia*. The alkaloids reside largely in the cork and bast-layer of old bark, while that of young bark contains absolutely none; the root-bark of all species is the richest, that of the branches the poorest.

Cultivation.—Cinchona trees, growing natively in mountain forests along with bamboos, begonias, coca, fuchsias, orchids, palms, tree ferns,

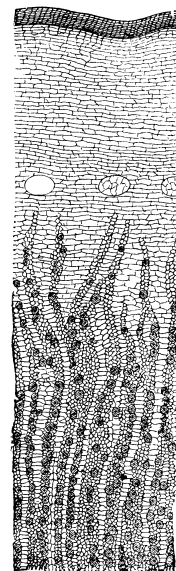


FIG. 375.—*Cinchona succirubra*: transverse section of bark, magnified 30 diam.

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etc., mostly unprotected and without owners, became, as a rule, common property and a prey to mercenary parties having little regard for future production; with increasing demand and decreasing supply it was only a question of time when the destruction would be complete, a condition that naturally aroused the concern of medical and other scientific men. Although the natives guarded jealously their indigenous inheritance, early endeavoring to prevent its transplanting through foreign visitation and interests, yet it was surmised correctly that the plant would flourish anywhere under approximate climatic conditions. La Condamine first attempted the experiment with failure in 1737;

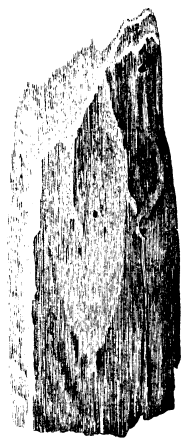


FIG. 376.—Calisaya bark, showing digital furrow and short fibrous fracture.

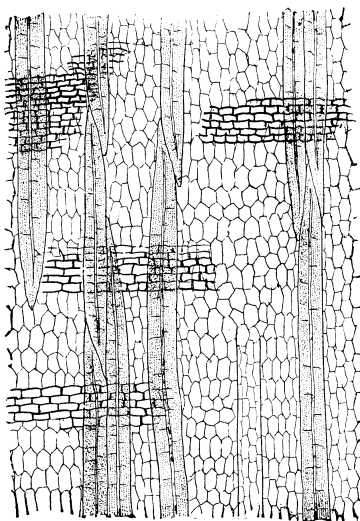


FIG. 377.—Calisaya bark: radial longitudinal section through liber, showing cinchona bast-fibers, bast-parenchyma, and medullary rays, magnified 60 diam.

Dr. Weddell sent seeds to France, 1846–1847, that yielded only ornamental plants, while Hasskarl and Junghuhn (Dutch) were the first, 1853, to obtain practical results from plants they collected and sent to Batavia. Then followed Markham (English), 1859, Ledger, Spruce, Cross, and others, who in various visits to S. America procured seeds, cuttings and scions which were distributed to India, Ceylon, Java, where now three-fourths of the world's bark is grown by cultivation. In fact the native product is so deficient in alkaloids (2–4 p. c.) that it constitutes only about 5 p. c. (1 p. c. from wild, 4 p. c. from cultivated) of the sum-total annually used, and as all demand is for cultivated tree-bark, its commerce has been revolutionized in quantity,

quality, and price. The genus, *Cinchona*, hybridizes well, so that species and varieties have been formed yielding 5, 10, 15 p. c. of total



FIG. 378.—*Cinchona succirubra*: natural quill; *d*, transverse section.

alkaloids (red—5–8–11 p. c.), and those yielding only 3–4 p. c. are in S. India and Java, uprooted by whole plantations and replaced by supposed richer hybrids. Propagation by cuttings is slow, so seeds are

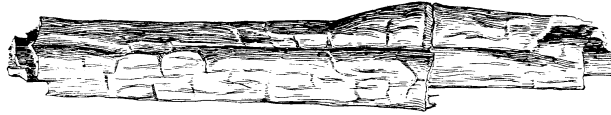


FIG. 379.—*Cinchona Calisaya* (young): natural size.

planted in nurseries, scions grafted and transplanted into orchards, which are cared for like cultivated fruit trees. *C. Calisaya*, and *C. Ledgeriana* (by some considered only a variety of the former) are the



FIG. 380.—Mossed *C. officinalis* (Nat.).

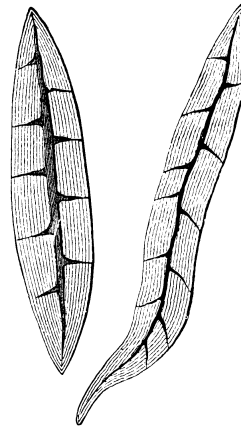


FIG. 381.—Cinchona bast-fibers.

species, owing to their richness in quinine, mostly cultivated, the latter largely predominating, while *C. succirubra*, although rich in alkaloids

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(chiefly cinchonidine, with some cinchonine and quinidine) is poor in quinine—only 20–40 p. c. of the total, causing its demand to decrease greatly and its cultivation to be practically abandoned. Most of the cultivated bark is grown in Java, considerable in India; formerly a great deal was produced in Ceylon, but a disease fatal to the trees and the substitution of tea-planting have almost eliminated that supply; Bolivia and the Straits Settlements furnish some. When trees are about 15 years old the bark becomes more or less worthless, consequently they are cut down and replaced. The mountains best adapted for this cultivation are Neilgherry, Himalaya, and Blue.

Collection. 1. *Wild S. American Bark.*—Formerly this was collected by gangs of *cascarilleros*, managed for companies by *major-domos*; each gang left the seacoast in dry weather on donkeys, for the distant mountains, being away several months, and upon arriving in the cinchona districts, encamped near a stream, planted corn and beans, built huts, and depended upon game for meat. Having with a mallet loosened, then removed the lower trunk-bark, the tree was felled and stripped entirely of bark, which was carried to the huts and, in the sun or under shelter, allowed to dry in quills or pieces pressed flat by rocks, and when dried, the best was put in canvas bundles (150 pounds; 70 Kg.) and the return trip begun. At the coast ports these bundles were sewed up in fresh hides, forming, when dry, tight seroons, which were shipped as such, or in bales or boxes, from Guayaquil, Payta, Lima, Cartagena, Santa Marta, Buenos Ayres, etc. Bolivia is the only local country in which the trees are cultivated.

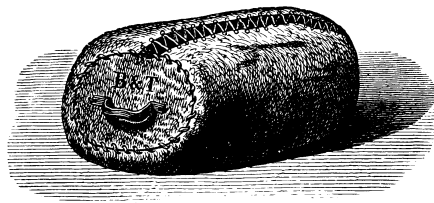


FIG. 382.—Cinchona seroon.

2. *Cultivated India Bark.*—This is cared for and collected in several ways: 1, *Uprooting*, which consists in pulling up and barking the whole tree and replanting the ground—the bark of each tree-part being marketed separately; 2, *Coppicing*, mostly practised, and consists in felling the trees, allowing shoots to spring from the stumps, and collecting the bark as soon as “ripe,” when plants 6–9 years old and trunks 15–20 Cm. (6–8') thick—as such furnishing when in quills, “Druggists' bark,” or when broken up and compressed to save transportation charges, “Manufacturers' bark,” being purchased upon assay-unit, each unit corresponding to 1 p. c. of quinine in a pound (.5 Kg.); 3, *Shaving (Scraping)*, which consists of shaving off with drawing-knives

the outer bark of plants 3–5 years old, leaving intact the liber, upon which another growth of richer bark soon forms; 4, *Mossing*, which consists of taking off yearly alternating strips of bark and covering the decorticated portion with moss, grass, straw, hay, rags, paper, etc., thereby giving an annual yield of rich bark (*mossed, renewed*) during the tree's entire life. Bark thus covered is stronger in alkaloids, as it prevents the sun converting the alkaloids into coloring matter, especially on the side exposed to direct rays (most quinine and quinidine in bark from trees grown in mid-woods (shade), most cinchonidine and cinchonine from trees exposed to sun). The last two methods not only furnish richest bark, but also replace it rapidly, at the same time they are attended with the drawback of exposing new-forming bark-cells to the attack of stag-beetles, ants, etc.; most alkaloids, especially quinine, are stored in outer bark fibers, but the purest in cellular tissue of inner bark. The average annual exportation of cinchona bark is about as follows: Java 14,726,000 pounds (6,693,190 Kg.); India 1,020,000 pounds (63,640 Kg.); Ceylon 407,000 pounds (185,000 Kg.); S. America 775,000 pounds (352,273 Kg.); Africa 178,872 pounds (81,305 Kg.). Most of the cultivated bark is in quills, whereas most of the wild-grown was in large pieces (*tabla*), thereby rendering examination easy.

CONSTITUENTS.—From 21–32 natural alkaloids: Quinine, Quinidine, Cinchonine, Cinchonidine, Quinamine, Chinoidine, (Conquinamine, Cupreine, Homoquinine, Hydroquinine, Paytine, Concusconine, etc.); 8 artificial alkaloids: Quinicine, Cinchonicine, Quinamicine, Apoquinamine, etc., Quinic acid, Quinovic acid, Cincho-tannic acid, Quinovin, Cinchona-red, volatile oil, resin, starch, gum, sugar, wax, calcium oxalate, ash 1–3 p. c.

The first 4 alkaloids are the most important, and can be obtained by mixing a concentrated infusion of cinchona with milk of lime, whereby this latter combines with the acids and coloring matter, thus liberating the alkaloids; now strain, and exhaust the residue with boiling alcohol (benzin, kerosene), acidify with sulphuric acid, treat with animal charcoal, filter, and while hot neutralize with sodium hydroxide V. S., when quinine sulphate crystallizes out; to the mother-liquor add large excess of ammonia water, which precipitates cinchonine and cinchonidine, while quinidine remains in solution; dissolve the precipitate in boiling alcohol, and upon cooling cinchonine separates; by evaporating the two remaining solutions we get on the one hand cinchonidine, and on the other quinidine. The respective salts may be prepared by dissolving the several alkaloids in water, adding sufficient of the desired acid for neutralization, allowing to crystallize.

Quinina, Quinine, $C_{20}H_{24}O_2N_2 \cdot 3H_2O$, U.S.P.—(Syn., Quin., Chininum; Fr. Quinine; Ger. Chinin.) This alkaloid, obtained from the bark of various cinchona species, may be prepared by precipitating a solution of quinine sulphate in acidified water with an alkali, thereby yielding the anhydrous, white, curdy, amorphous alkaloid, which by

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being kept under water changes to the crystalline form. It is a white, microcrystalline powder, odorless, bitter taste which is intense and persistent, efflorescent, soluble in water (1560), boiling water (800), alcohol (.8), chloroform (1.1), ether (1.9), ammonia water (1890); alcoholic solution (1 in 10) levorotatory, alkaline; solution in sulphuric acid—vivid blue fluorescence. *Tests*: 1. Aqueous solution (1 in 100) 1 cc. + diluted sulphuric acid to dissolve, + ammonia water 1 cc., + 2–3 drops of bromine T.S.—emerald-green color (thalleioquin). 2. Dry to constant weight—loses not more than 15 p. c. (water); incinerate—ash .1 p. c. 3. .1 Gm. + sulphuric acid 2 cc.—not darker than light yellow (abs. of readily carbonizable substances). 4. .2 Gm. + sodium hydroxide T. S. 2 cc., heated on a water-bath—no odor of ammonia (abs. of ammonium salts). *Impurities*: Ammonium salts, water, other cinchona alkaloids, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, 1–20 (.06–1.3 Gm.).

Quininæ Bisulphas, Quinine Bisulphate, $C_{20}H_{24}O_2N_2 \cdot H_2SO_4 \cdot 7H_2O$, *U.S.P.*—(Syn., Quin. Bisulph., Quininæ Acid Sulphate; Fr. Sulfate acide (Bisulfate) de Quinine (neutre); Ger. Chininum bisulfuricum, Saures Chininsulfat.) This acid sulphate is obtained by dissolving neutral quinine sulphate (100) in warm distilled water (500) + diluted sulphuric acid (115), setting aside to crystallize. It is in colorless, transparent, whitish, orthorhombic crystals or small needles, odorless, very bitter taste, efflorescent, yellow on exposure to light, soluble in water (9), boiling water (.7), alcohol (23), hot alcohol (.7), glycerin (15), chloroform (625), ether (2500). *Tests*: 1. With barium chloride T. S.—white precipitate insoluble in hydrochloric acid; also responds to those under Quinina; dry to constant weight—loses not more than 24 p. c.; incinerate—ash .05 p. c. *Impurities*: Ammonium salts, other cinchona alkaloids, water, inorganic salts, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. 1–20 (.06–1.3 Gm.).

Quininæ Dihydrochloridum, Quinine Dihydrochloride, $C_{20}H_{24}O_2N_2 \cdot 2HCl$, *U.S.P.*—(Syn., Quin. Dihydrochl., Quinine Bimuriate; Br. Quininæ Hydrochloridum Acidum, Acid Quinine Hydrochloride; Fr. Chlorhydrate acide de Quinine; Ger. Chininum dihydrochloricum, Chinindihydrochlorid.) Obtained by dissolving quinine hydrochloride (10) in distilled water (20), adding 25 p. c. hydrochloric acid (3.7), crystallizing; may also be made by double decomposition between quinine bisulphate and barium chloride. It is a white powder, odorless, very bitter taste, soluble in water (.6), alcohol (12), slightly in chloroform, very slightly in ether; aqueous solution (1 in 20) strongly acid. *Tests*: 1. Aqueous solution (1 in 20) with silver nitrate T. S.—white precipitate, insoluble in nitric acid but soluble in ammonia T. S.; also responds to those under Quinina; dried to constant weight—loses not more than 3 p. c.; incinerate—ash .05 p. c. *Impurities*: Barium sulphate, readily carbonizable substances, water, other cinchona alkaloids. Should be kept dark, in well-closed containers. Owing to great solubility very

valuable hypodermically—whooping-cough of children, etc. Dose, gr. 1–20 (.06–1.3 Gm.); child, gr. 1–5 (.06–.3 Gm.), 25 p. c. solution; 1. *Ampullæ Quininae Dihydrochloridi, N.F.*, 8.5 gr. (.55 Gm.). Dose, 1–2 ampuls.

Quininae Æthylcarbonas, Quinine Ethylcarbonate, $C_{20}H_{23}O_2N_2 \cdot CO_2 \cdot C_2H_5$, *U.S.P.*—(Syn., Quin. Æthylcarb., Euquinine; Fr. Æthylcarbonate de Quinine; Ger. Äthylkohlsäurechininester, Euchinin.) Obtained by passing carbonyl chloride (phosgene) into dehydrated alcohol, rectifying resulting chlorocarbonic ester, which then acts upon solution (ether) of anhydrous quinine; purified by washing and crystallizing. It is in white, fine soft needles, usually matted in fleecy masses, odorless, practically tasteless, but masticated slowly develops slight bitterness, darkens on exposure, soluble in alcohol (2), chloroform (1), readily in dilute acids, slightly in water; melts at $90^\circ C.$ ($194^\circ F.$); aqueous solution slightly alkaline, solution in diluted sulphuric acid—blue fluorescence. *Tests*: 1. To aqueous solution (1 in 1000) 5 cc., made with diluted sulphuric acid, add 2–3 drops of bromine T. S., + 1 cc. ammonia T. S.—green-colored liquid (thalleioquin). 2. Warm .2 Gm. with 2 cc. sodium hydroxide T. S., + 5 cc. iodine T. S.—odor of iodoform; incinerate—ash .2 p. c. *Impurities*: Chloride, sulphate, water. Should be kept dark, in well-closed containers. Dose, gr. 1–30 (.06–2 Gm.).

Quininae Hydrobromidum, Quinine Hydrobromide, $C_{20}H_{24}O_2N_2 \cdot HBr \cdot H_2O$, *U.S.P.*—(Syn., Quin. Hydrobr., Quinine Bromide, Quininae Hydrobromas; Fr. Bromhydrate de Quinine (basique); Ger. Chininhydrobromat, Bromwasserstoffsäures Chinin.) Obtained by dissolving quinine (alkaloid) in warm diluted hydrobromic acid, neutralizing, crystallizing; may also be made by double decomposition between quinine sulphate and barium bromide, in hot water. It is in white, light, small needles, scale-like crystals; odorless, very bitter taste, efflorescent, soluble in water (40), hot water (3.2), alcohol (1), glycerin (7), chloroform (.6), ether (23); aqueous solution (1 in 50) neutral, slightly alkaline; with excess of diluted sulphuric acid—vivid blue fluorescence. *Tests*: 1. To aqueous solution (1 in 50) 5 cc. add sodium hydroxide T. S. 1 cc., heat, cool, filter, acidulate with dilute hydrochloric acid, add chloroform 1 cc. + few drops of chlorine T. S., shake gently—chloroform reddish-brown color; also responds to those under Quinina; dried to constant weight—loses not more than 5 p. c.; incinerate—ash .05 p. c. *Impurities*: Barium, other cinchona alkaloids, water, inorganic salts, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. 1–20 (.06–1.3 Gm.).

Quininae Hydrochloridum, Quinine Hydrochloride, $C_{20}H_{24}O_2N_2 \cdot HCl \cdot 2H_2O$, *U.S.P.*—(Syn., Quin. Hydrochl., Quinine Chloride, Quininae Hydrochloras, Muriate of Quinine; Fr. Chlorhydrate de Quinine (basique); Ger. Chininum hydrochloricum, Chininhydrochlorid, Salzsäures Chinin.) Obtained by dissolving quinine in warm diluted hydrochloric acid until solution neutral, crystallizing; or by double

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decomposition of quinine sulphate and barium chloride, in hot water. It is in white, silky, glistening needles, odorless, very bitter taste, efflorescent, soluble in water (16), hot water (.5), alcohol (.8), glycerin (7), chloroform (.7), ether (340); aqueous solution (1 in 25) neutral, slightly alkaline, non-fluorescent, except when highly diluted or diluted sulphuric acid added. *Tests*: 1. Aqueous solution (1 in 20) with silver nitrate T. S.—white precipitate, insoluble in nitric acid, but soluble in ammonia T. S.; also responds to those under Quinina; dried to constant weight—loses not more than 10 p. c.; incinerate—ash .05 p. c. *Impurities*: Barium, other cinchona alkaloids, water, inorganic salts, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. 1–20 (.06–1.3 Gm.); 1. *Elixir Ferri, Quinina et Strychnina*, N.F., .875 p. c. 2. *Syrupus Phosphatum cum Quinina et Strychnina*, N.F., .44 p. c. Dose, each ʒj–2 (4–8 cc.). 3. *Tinctura Antiperiodica*, N.F., 1.5 p. c.

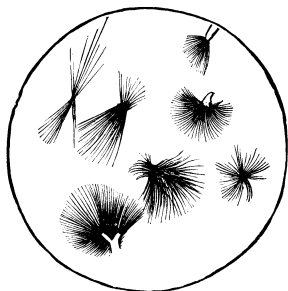


FIG. 383.—Quinine sulphate: microscopic crystals.

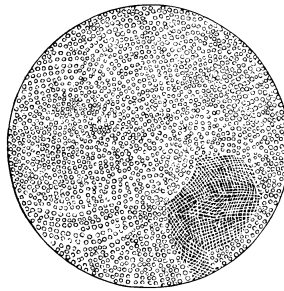


FIG. 384.—Quinine sulphate with KSCN: microscopic granules.

Quininæ Sulphas, Quinine Sulphate, $(C_{20}H_{24}O_2N_2)_2 \cdot H_2SO_4 \cdot 7H_2O$, U.S.P. —(Syn., Quin. Sulph., Quininæ Sulphas, Sulfas Quinicus; Fr. Sulfate de Quinine (basique); Ger. Chininum sulfuricum, Chininsulfat, Schwefelsaures Chinin.) Obtained by exhausting powdered bark with acidified water (HCl , H_2SO_4), precipitating with an alkali, or by mixing powdered bark with milk of lime, dissolving out alkaloids with petroleum oil, treating with diluted sulphuric acid, neutralizing with sodium carbonate, crystallizing. It is in white, silky, light, flexible, glistening crystals, making a very light, easily compressible mass, or hard, prismatic, monoclinic needles, odorless, persistent, very bitter taste, efflorescent (rapidly), becoming lusterless, brownish on exposure, soluble in water (725), hot water (47), alcohol (107), hot alcohol (12), glycerin (30), slightly in chloroform, ether, freely in a mixture of chloroform (7) and dehydrated alcohol (4); saturated aqueous solution neutral, slightly alkaline; with diluted sulphuric acid—vivid blue fluorescence. *Tests*: 1. Aqueous solution with barium chloride T. S.—white precipitate, insoluble in hydrochloric acid; also responds to

those under Quinina; dried to constant weight—loses not more than 16.2 p. c.; incinerate—ash .05 p. c. *Impurities:* Other cinchona alkaloïds, water, inorganic salts, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. 1–20–40 (.06–1.3–2.6 Gm.).

Most of the world's supply of quinine is produced by 20 factories: France—5, America—4, England—3, Germany—2, Italy—2, Bengal, Holland, Java, Madras Presidency, each—1; the average annual Asiatic output is about: Madras—15.711 pounds (7.141 Kg.), Bengal—11.297 pounds (5.135 Kg.), Java—43.750 pounds (19.886 Kg.).

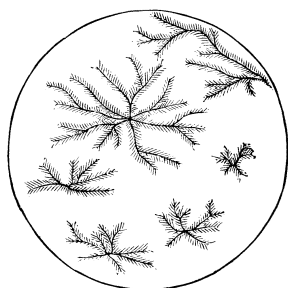


FIG. 385.—Quinidine sulphate with KSCN: microscopic crystals.

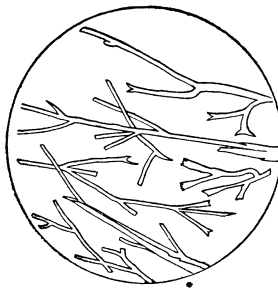


FIG. 386.—Cinchonine sulphate with KSCN: microscopic crystals.

Quininæ Tannas, Quinine Tannate, $C_{20}H_{24}O_2N_2 \cdot 3C_{14}H_{10}O_8 \cdot 8H_2O$, *U.S.P.*—(Syn., Quin. Tan., Tasteless (Neutral) Quinine; Fr. Tannate de Quinine; Ger. Chininum tannicum, Chinintannat, Gerbsaures Chinin.) Obtained by dissolving quinine sulphate (9) in water (225), + 16 p. c. sulphuric acid (10), adding to filtrate tannic acid (21) + sodium bicarbonate (3.5) dissolved in water (250), washing precipitate, drying, pulverizing. It is a pale yellow, yellowish-white, amorphous powder, odorless, tasteless, slightly bitter, astringent taste, slightly soluble in water, chloroform, ether, somewhat more so in alcohol; melts to purplish, viscous mass; contains 30–35 p. c. of anhydrous quinine, composition being somewhat varying. *Tests:* 1. Aqueous or alcoholic solution with ferric chloride T. S.—blue-black color; dry to constant weight—loses not more than 10 p. c.; incinerate—ash .3 p. c. *Impurities:* Uncombined quinine, chloride, sulphate, water, heavy metals. Should be kept dark, in well-closed containers. Dose, gr. 1–10 (.06–.6 Gm.); excellent for children in diarrhea, whooping-cough, but too insoluble as an antiperiodic—in syrup, mucilage, chocolate (quinine chocolates); troches 1 gr., +.

Quininæ et Ureæ Hydrochloridum, Quinine and Urea Hydrochloride, $C_{20}H_{24}O_2N_2 \cdot HCl \cdot CO(NH_2)_2 \cdot HCl \cdot 5H_2O$, *U.S.P.*—(Syn., Quin. et Urea Hydrochl., Quinine and Urea Chloride, Carbamidated Quinine Dihy-

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drochloride; Fr. Chlorhydrate de Quinine et de Urée; Ger. Chinin-Harnstoff Hydrochlorid, Chininum bimuriaticum carbamidatum.) Obtained by dissolving quinine hydrochloride (400) in diluted hydrochloric acid (800), mixing solution with urea, $\text{CO}(\text{NH}_2)_2$, (58), warming until dissolved, filtering through glass wool, crystallizing, washing crystals, drying. It is in colorless, translucent prisms, white, granular powder, odorless, very bitter taste, permanent, soluble in water (.9), alcohol (2.4); aqueous solution (1 in 20) strongly acid; contains 58 p. c. of anhydrous quinine. *Tests*: 1. To a cold solution of 1 Gm. in 2 cc. of distilled water add 2 cc. of nitric acid, cool to 0°C . (32°F .)—leaflets of urea nitrate on standing; after draining dissolve in little distilled water, + few drops of mercuric nitrate T. S. + sodium hydroxide T. S.—white precipitate. 2. Aqueous solution with silver nitrate T. S.—white precipitate, insoluble in nitric acid; incinerate—ash .05 p. c. *Impurities*: Ammonium compounds, readily carbonizable substances, other cinchona alkaloids. Should be kept dark, in well-closed containers. Dose, gr. 1–20 (.06–1.3 Gm.); very effective in malaria; anesthetic like cocaine, locally for operations, chiefly hypodermically, one dose daily, in 50 p. c. solution; 1. *Ampullæ Quininae et Ureae Hydrochloridi*, N.F., 8.5 gr. (.55 Gm.). Dose, 1–2 ampuls.

Quinidina, Quinidine, $\text{C}_{20}\text{H}_{24}\text{O}_2\text{N}_2$, N.F.—An alkaloid isomeric with quinine. It is in acicular white crystals, amorphous white powder, crystallizing from alcohol in monoclinic prisms with 1 molecule of alcohol, fluorescent, dextrorotatory, alkaline, soluble in alcohol (32), ether (53), chloroform (1.5), slightly in petroleum benzin, almost insoluble in water; odorless, intense persistent bitter taste. *Tests*: 1. Aqueous solution (1 in 1000) 10 cc., + few drops of bromine T. S., made with sufficient diluted sulphuric acid, + ammonia water in slight excess—liquid emerald-green. 2. Dissolve .5 Gm. in distilled water with least possible sulphuric acid, + 5 Gm. of potassium iodide in 5 cc. distilled water, shake slightly, cool to 15°C . (59°F .) for an hour, stirring occasionally—white precipitate (dif. from quinine); forms numerous salts. *Impurities*: Quinine, other cinchona bases. Dose, gr. 1–30 (.06–2 Gm.): 1. *Syrupus Quinidinae, Bitterless Syrup of Quinidine*, 3.3 p. c.

Quinidinæ Sulphas, Quinidine Sulphate $(\text{C}_{20}\text{H}_{24}\text{O}_2\text{N}_2)_2 \cdot \text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$. U.S.P.—(Syn., Quinidin. Sulph.; Fr. Sulphate de Quinidine; Ger. Chinidin Sulfas.) Obtained by dissolving quinidine in water, aided by sulphuric acid, and crystallizing. It occurs as fine, needle-like, white crystals, frequently masses, odorless, very bitter, darkens on exposure, soluble in water (90), hot water (15), alcohol (10), soluble in chloroform, almost insoluble in ether, aqueous solution (1–100) neutral or slightly alkaline, dextrorotatory (dif. from quinine sulphate). *Tests*: 1. Aqueous solution (1 in 1000) + sulphuric acid—vivid blue fluorescence, + 1–2 drops bromine T. S., + ammonia T. S. 1 cc.—emerald-green (thalleioquin). 2. Add silver nitrate T. S. 1 cc. to 5 cc. aqueous solution (1 in 100), stir with rod—white precipitate (dif. from

many other alkaloids). 3. With barium chloride T. S.—white precipitate insoluble in hydrochloric acid (sulphate). *Impurities*: Other cinchona alkaloids, water, readily carbonizable substances, ammonium and other inorganic salts. Should be kept dark, in well-closed containers. Dose, gr. 1-8 (.06-.5 Gm.).

Cinchonina, Cinchonine, $C_{19}H_{22}ON_2$.—It is in white lustrous prisms or needles, odorless, at first nearly tasteless, becoming bitter, soluble in alcohol (116), water (3760), chloroform (163), ether (526), no residue, precipitated from acid solution by ammonia water by which it is dissolved sparingly, but soluble in 300 parts of ether (dif. from quinine, quinidine, cinchonidine). Dose, gr. 1-30 (.06-2 Gm.).

Cinchoninae Sulphas, Cinchonine Sulphate $(C_{19}H_{22}ON_2)_2 \cdot H_2SO_4 \cdot 2H_2O$, *N. F.*—The sulphate of the preceding alkaloid. It is in white lustrous prismatic crystals; odorless, very bitter taste, permanent; soluble in water (60), alcohol (12.5), chloroform (47), ether (3230), hot water (33), hot alcohol (7); saturated aqueous solution neutral or slightly alkaline, dextrorotatory. *Tests*: 1. Aqueous solution (1 in 100) with barium chloride T. S.—white precipitate insoluble in hydrochloric acid. 2. Shake .1 Gm. with chloroform 10 cc.—dissolves (abs. of quinine or cinchonidine sulphate); incinerate—ash .1 p. c.; solution (1 in 1000) in diluted sulphuric acid—only slight blue fluorescence. *Impurities*: Quinine or cinchonidine sulphate, readily carbonizable organic substances. Dose, gr. 1-30 (.06-2 Gm.); 1. *Elixir Cinchonæ Alkaloidorum*, $\frac{1}{10}$ p. c.: same, *et Ferri*, or *Ferri et Bismuthi*, or *Ferri, Bismuthi et Strychninæ*. Dose, each, $\mathfrak{z}\text{j}$ -2 (4-8 cc.).

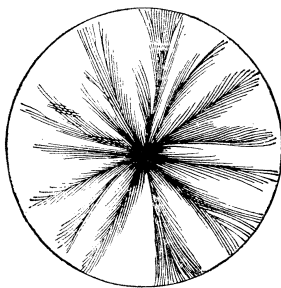


FIG. 387

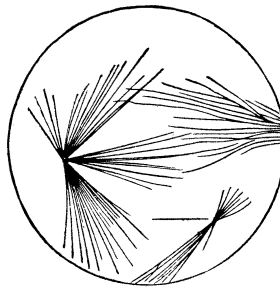


FIG. 388

FIGS. 387, 388.—Cinchonidine sulphate with KSCN: microscopic crystals.

Cinchonidina, Cinchonidine, $C_{19}H_{22}ON_2$.—This is non-fluorescent, isomeric with cinchonine; with chlorine or bromine water + ammonia water—white color or precipitate; soluble in alcohol (20), ether (188), water (1600), precipitated from its associated alkaloids by sodium tartrate. Dose, gr. 1-30 (.06-2 Gm.).

Cinchonidinæ Sulphas, Cinchonidine Sulphate, $(C_{19}H_{22}ON_2)_2 \cdot H_2SO_4 \cdot 3H_2O$, *U.S.P.*—(Syn., Cinchonid. Sulph.; Fr. Sulfate de Cinchonidine

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(basique); Ger. Cinchonidinum sulfuricum, Cinchonidinsulfat.) It is in white, glistening, silky needles, prisms, permanent, odorless, very bitter taste, soluble in water (65), hot water (22), alcohol (90), warm alcohol (41), chloroform (620), nearly insoluble in ether; saturated aqueous solution neutral, faintly alkaline, levorotatory; when anhydrous melts at 200° C. (392° F.) with partial decomposition. *Tests*: 1. Aqueous solution + barium chloride T. S.—white precipitate, insoluble in hydrochloric acid. 2. Aqueous solution (1 in 100) + ammonia T. S.—white precipitate (cinchonidine), slightly soluble in ammonia T. S. or in ether; aqueous solution (1 in 100) + sodium tartrate T. S.—white precipitate of cinchonidine tartrate (dif. from cinchonine). 3. Dry to constant weight—loses 12 p. c.; incinerate 1 Gm.—ash .1 p. c.; solution in diluted sulphuric acid (1 in 1000)—faint blue fluorescence (abs. of quinine, quinidine). *Impurities*: Cinchonine or quinidine sulphate, readily carbonizable substances. Should be kept dark, in well-closed containers. Dose, gr. 1–30 (.06–2 Gm.); 1. *Elixir Cinchonæ Alkaloidorum*, $\frac{1}{10}$ p. c.: same, *et Ferri*, or *Ferri et Bismuthi*, or *Ferri, Bismuthi et Strychninæ*.

Quinami(n)a, Quinamine, $C_{19}H_{24}O_2N_2$.—In long white prisms, non-fluorescent, nearly tasteless, acid solution very bitter, soluble in ether, hot alcohol.

Chinoidinum, Chinoidin, Quinoidin; U.S.P. 1880.—A blackish amorphous alkaloid, resulting from evaporation of mother-liquor of the preceding alkaloids, and precipitating with sodium hydroxide—purify by dissolving in dilute hydrochloric acid, precipitating by ammonia, washing, drying; it is one-half the strength of quinine. Dose, gr. 2–30 (.13–2 Gm.).

Quinic Acid (Kinic, Chinic or Cinchonic), $C_7H_{12}O_6$.—5–9 p. c.

Quinovic Acid (Kinovic), $C_{32}H_{48}O_6$.—Tasteless shining crystals.

Cincho-tannic Acid (Quino-tannic), $C_{14}H_{16}O_9$.—3–4 p. c.

The alkaloids are combined with one or more of these acids; the first acid (quinic) with sulphuric acid and manganese dioxide yields kinone, $C_6H_4O_2$; the first and second (quinic and quinovic) produce quinate (kinates) and quinovates (kinovates), as quinate (kinate) of quinine, lime, etc.; the last (cincho-tannic) is a glucoside, being the soluble red coloring matter; when boiled with sulphuric acid gives sugar and cinchona-red.

Quinovin (Kinovin, Chinovin, Quinovic Bitter), $C_{30}H_{48}O_8$.—Bitter glucoside; to alcoholic solution add hydrochloric acid gas, get quinovic (kinovic) acid and quinovin (kinovin) sugar (mannitan).

Cinchona-red, $C_{28}H_{22}O_{14}$.—This is from cincho-tannic acid, soluble in alcohol and alkaline solutions. Red cinchona bark may contain 10 p. c.

PREPARATIONS. — BARK: 1. *Fluidextractum Cinchonæ*. Fluid-extract of Cinchona. (Syn., Fldext. Cinchon., Fluid Extract of Cinchona, Fluidextract of Calisaya Bark; Br. Extractum Cinchonæ Liquidum; Fr. Extrait fluide de Quinquina jaune; Ger. Extractum Chinæ fluidum, Chinafluidextrakt, Kalisayarindenfluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st menstruum: alcohol 80 cc., glycerin 10, hydrochloric acid 10; 2d menstruum: 80 p. c. alcohol; after dissolving soft extract in the reserve, assay, and add enough 80 p. c. alcohol for the 100 cc. to contain 4–5–4.5 Gm. of alkaloids. Dose, mxxv –60 (1–4 cc.).

2. *Tinctura Cinchonæ*. Tincture of Cinchona. (Syn., Tr. Cinch., Tincture of Yellow Cinchona—Peruvian Bark, *Tinctura Cinchonæ Flavæ*; Fr. Teinture de Quinquina (jaune); Ger. Tinctura Chinæ, Chinatinktur.)

Manufacture: 20 p. c. Similar to Tinctura Veratri Viridis, page 104; 1st menstruum: glycerin 7.5 cc., alcohol 67.5 cc., water 25 cc., percolate, finish with 67 p. c. alcohol, and adjust with same for the 100 cc. to contain .8–1—.9 Gm. of alkaloids. Dose, ʒj –2 (4–8 cc.).

3. *Tinctura Cinchonæ Composita*. Compound Tincture of Cinchona. (Syn., Tr. Cinch. Co., Huxham's Tincture of Bark; Compound Tincture of Peruvian Bark; Fr. Teinture de Quinquina composée, Elixir fébrifuge d'Huxam; Ger. Tinctura Chinæ composita, Zusammen-gesetzte Chinatinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; using cinchona 10 Gm., bitter orange peel 8, serpentaria 2; 1st menstruum: glycerin 7.5 cc., alcohol 67.5 cc., water 25 cc., percolate 95 cc., assay, and add enough 67 p. c. alcohol for the 100 cc. to contain .4–.5—.45 Gm. of total alkaloids. Dose, ʒj –2 (4–8 cc.).

Prep.: 1. *Gargarisma Guaiaci Compositum*, N.F., 10 p. c.

QUININE: 1. *Oleatum Quininæ*, N.F., 25 p. c. + oleic acid 75. 2. *Syrupus Ferri, Quininæ et Strychninæ Phosphatum*, N.F., 2.6 p. c. 3. *Liquor Hypophosphitum Compositus*, N.F., $\frac{1}{5}$ p. c. 4. *Syrupus Hypophosphitum Compositus*, N.F., $\frac{1}{10}$ p. c. Dose, each, ʒj –2 (4–8 cc.).

QUININE SULPHATE: 1. *Elixir Cinchonæ Alkaloidorum*, N.F., $\frac{1}{5}$ p. c. + cinchonidine sulph. $\frac{1}{10}$ p. c., cinchonine sulph. $\frac{1}{10}$ p. c., +. 2. *Elixir Ferri Pyrophosphatis, Quininæ et Strychninæ*, N.F., .875 p. c. Dose, each, ʒj –2 (4–8 cc.). 3. *Pilulæ Antiperiodicæ*, N.F., $1\frac{1}{2}$ gr. (.09 Gm.). 4. *Pilulæ Ferri, Quininæ, Aloes et Nucis Vomice*, N.F., 1 gr. (.06 Gm.). 5. *Pilulæ Ferri, Quininæ, Strychninæ et Arseni Fortiores*, N.F., 1 gr. (.06 Gm.). 6. *Pilulæ Ferri, Quininæ, Strychninæ et Arseni Mites*, N.F., 1 gr. (.06 Gm.). 7. *Pilulæ Opii, Digitalis et Quininæ*, N.F., 1 gr. (.06 Gm.). Dose, each, 1 pill.

Unoff. Preps.—BARK: *Extract* (75 p. c. alcohol), gr. 5–15 (.3–1 Gm. *Decoction*, *Infusion*, each, 6 p. c., + aromatic sulphuric acid 1 p. c., ʒss –2 (15–60 cc.). *Fluidextract* (aqueous), cinchona 100, hydrochloric acid 3, glycerin 12.5, water 500, + water q. s. QUININE: *Wine*, $\frac{1}{4}$ p. c., ʒss –1 (15–30 cc.). Various salts.

PROPERTIES.—Tonic, antiperiodic, febrifuge, astringent, stomachic, antiseptic, prevents fermentation and putrefaction. The S. American Indians still consider it poisonous, and always use milder remedies for fevers, while the Ecuador cascarilleros believe their red bark is used only for dyeing. It is thought the Jesuits first discovered its medicinal

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properties, and not the natives, hence the name Jesuits' powder, as they sold it for its weight in silver, grain for grain. Sir Robert Talbot cured Charles II. of tertian fever with it, 1679, and then sold the secret to Louis XIV., of France, who published it in 1681. The bark is astringent, the alkaloids are not; small doses increase appetite, saliva, gastric juice, peristalsis, heart action, cerebral functions, excretion of waste products; moderate doses diminish amount of urea, uric and phosphoric acids, interfere with oxygen-carrying function of red and prevent migration of white corpuscles, lessen fever by destroying or rendering inert the infective agent causing it, and by diminishing metabolism in the tissue; large doses depress heart, produce gastric irritation, eructation, chill and fever paroxysms, headache, dizziness, perspiration; also quinine, if taken when not indicated, may produce fever, a sense of constriction about the head, ringing in the ears, vertigo, staggering, deafness, headache, delirium—*cinchonism*. Inasmuch as this will produce that which it cures, Hahnemann, it is said, was influenced by this fact, along with some others, to revive and reestablish homeopathy as based upon *similia similibus curantur*. Quinidine and cinchonidine are similar to quinine, but cinchonidine produces less marked head symptoms. Cinchonine is the weakest alkaloid, but causes much headache and muscular weakness.

USES.—Atonic dyspepsia, convalescence, gastric catarrh, asthma, bronchitis, amenorrhea, enlarged spleen.

Quinine as a specific in malaria, acting as a direct poison to the *plasmodium malariae*, which, infesting the blood, cause the disease. In intermittents give gr. 10 (.6 Gm.) of sulphate in sweating stage, and same quantity 5 hours before the next paroxysm; in the intervals of paroxysms give arsenic; treatment should be preceded by a good purge (calomel), thus rendering the liver more active and the drug more efficacious; absorption is accelerated by hot drinks, or diluted acids. In remittents give gr. 20–30 (1.3–2 Gm.) at a dose, once or twice daily, until temperature reduced. In typhus and typhoid fevers, variola, pneumonia, pyemia, septicemia, neuralgia, scarlet fever, erysipelas, measles, skin affections, whooping-cough, hay fever, to stimulate uterine contraction in labor.

Cinchona bark itself is not much used now, because of its excessive bulkiness, and owing to its alkaloids representing in such a concentrated form the medicinal properties without astringency.

Administration.—The hydrochloride, owing to its greater solubility, is the best salt of quinine for general use, the hydrobromide ranking next; the tannate and sulphate are the most insoluble and possess lower alkaloidal strength, but the latter, in spite of this, is employed mostly. The pill, capsule, or tablet disguises best the taste, but solutions are more effective, and their taste may be modified by ext. glycyrrh., chocolate, glycyrrhizin, yerba santa syrup or fluidextract, etc., in which condition the alkaloid should never be dissolved with acids, but simply suspended by mucilage.

Poisoning: Give potassium bromide and hydrobromic acid, and if associated with quinine will act as preventive; may need cardiac and respiratory stimulants. Morphine counteracts its cerebral action, atropine its nervous, cardiac, and antipyretic effects.

Incompatibles: Agents promoting waste: salts of mercury, copper, zinc, lead; tannin with decoction or infusion; alkalies—alkaline carbonates, alkaline earths, and iodine preparations with the alkaloidal solutions, the latter forming insoluble compounds, and all the rest precipitating them.

Synergists: Constructive agents, iron, salicylic acid, arsenic, eucalyptus, phenol, creosote.



FIG. 389.—*Cinchona scrobiculata* bark.



FIG. 390.—*Cinchona pubescens* bark.

Allied Barks:

1. *Maracaibo* or *Hard Yellow Bark* (*C. cordifolia*).—This constitutes nearly all of the wild-grown bark; contains 2.5 p. c. of alkaloids.
2. *Pitaya Bark* (*C. pitayensis*).—Smooth, with circular scars, liber reddish cinnamon-brown, splintery, powder brownish-yellow.
3. *Cusco Bark* (*C. pubescens*).—Pale brownish-yellow to whitish, warty periderm, liber cinnamon-color, fracture coarse-splintery; contains cuscovatine, cusconadine, cuscamine.
4. *Carthagen Bark* (*C. lancifolia* and *C. cordifolia*).—Like the Cusco, only liber is reddish, fracture fibrous.
5. *Lima* or *Huanuco Bark* (*C. peruviana*, *C. nitida*, *C. micrantha*).—In quills and half-quills.
6. *Huamalies* or *Gray Bark* (*C. micrantha*, *C. purpurea*, *C. glandulifera*).—In ash-gray quills and half-quills.
7. *Jean* or *False Loxa Bark* (*C. Humboldtiana*).—A very inferior variety.

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Spurious Cinchona Barks:

1. *Cuprea* or *Copper-colored Bark* (*Remij'ia Purdiea'na*, *R. pedunculata*).—Colombia, Andes; contains alkaloids, 3 p. c.—quinine 2 p.c., the rest being quinidine, cinchonine, quinovin. The quinine exists as homoquinine and cupreine, $C_{19}H_{22}O_2N_2$; this latter is red-brown with ferric chloride, and converted into quinine by methyl chloride.

2. Barks belonging to other genera as *Cascarilla*, *Ladenbergia*, *Nau'clea*, *Exostem'ma*, etc. All distinguished by *Grahe's test*: The powdered bark heated in a dry test-tube yields a tarry distillate of red color; this test applies to cuprea bark, but with these genera have no reaction. Some of these barks resemble cinchona, others do not.

GAMBIR. GAMBIR, U.S.P.

Ourouparia Gambir,
(*Hunter*) *Baillon*.

{ The dried aqueous extract prepared from the
leaves and twigs, yielding not less than
70 p. c. water-soluble extractive, nor less
than 60 p. c. alcohol-soluble extractive.

Habitat. E. India Islands.

Syn. Gambier, Terra Japonica; Br. Catechu, Catechu Pallidum, Pale Catechu; Fr. Gambir cubique; Ger. Gambir Catechu, Gutta Gambir.

Ou-rou-pa'ri-a. Native name—*y-ourou-pari*, a Carib. name of the type species, fr. Gr. *oûpa*, a tail, tailed +, — *i. e.*, the seed.

Gam'bir. Native Malayan name of the extract.

PLANT.—Strong shrubby climber, stem woody, often angular; leaves oblong-ovate, 7.5–10 Cm. (3–4') long, petiolate, acuminate, entire, smooth; flowers small, pinkish, in clusters, calyx and corolla 5-divided, stamens 5, ovary 2-celled; fruit 2.5 Cm. (1') long, narrow, ovoid tapering at each end, dehiscent, pericarp dry; seed numerous, minute, pale brown, rough, tailed at each end. **EXTRACT** (gambir), usually in cubical or rectangular masses 20–30 Mm. ($\frac{4}{3}$ – $1\frac{1}{5}$ ') broad, grayish, reddish-brown, dull, porous, friable; internally light brown, dark gray color; inodorous; taste bitterish, very astringent. **POWDER**, light brown—masses of acicular crystals, few starch grains, .005–.030 Mm. ($\frac{1}{5000}$ – $\frac{1}{833}$ ') broad, epidermal fragments, few thick-walled, wavy non-glandular hairs. *Solvents*: water dissolves 65 p. c.; alcohol 60 p. c. Dose, gr. 5–30 (.3–2 Gm.).

Commercial.—The extract is made by boiling young leafy shoots in water for 6 hours, with continued stirring and bruising, evaporating decoction to proper consistency, allowing to cool under constant and peculiar stirring; within half an hour the gambir suddenly contracts and thickens, possibly by the sudden crystallization of the catechin. It is allowed to harden in various forms, the purest in thin cakes, flakes, small cubes. Nearly all exported in wooden cases from Singapore.

CONSTITUENTS.—Tannic acid 25–38 p. c., Catechin (catechuic acid) 20–29 p. c., ash 9 p. c.

PREPARATIONS.—1. *Tinctura Gambir Composita*. Compound Tincture of Gambir. (Syn., Tr. Gambir Co., Compound Tincture of Pale Catechu; Fr. Teinture de Gambir; Ger. Gambirtinktur.)

Manufacture: 5 p. c. Similar to *Tinctura Cardamomi Composita*, page 137—using gambir 5 Gm., cinnamon 2.5; menstruum: diluted alcohol q.s. 100 cc. Dose, $\overline{5}$ _{ss}–2 (2–8 cc.).

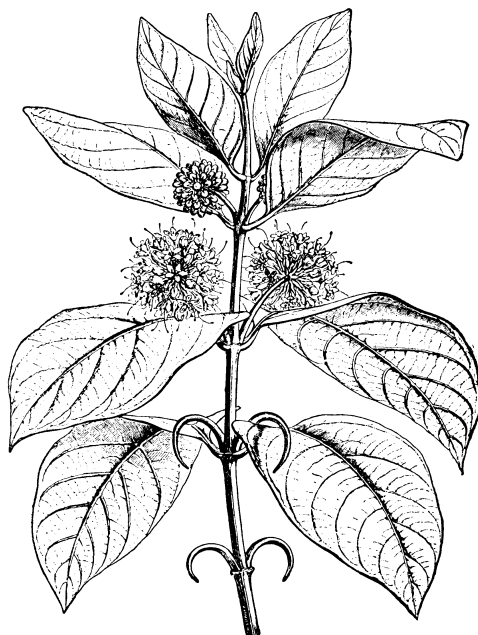


FIG. 391.—*Ourouparia Gambir*: blooming twig with the tendrils.

Prep: 1. *Tinctura Opii et Gambir Composita*, N.F., 6.4 p. c.

Unoff. Preps.: *Fluidextract*. *Infusion*. *Pulvis Gambir Compositus*, 40 p. c., + kino 20, krameria 20, cinnamon 10, myristica 10, dose, gr. 10–45 –.6–3 Gm.). *Troches*, 1 gr. (.06 Gm.), dose, 1 occasionally.

PROPERTIES.—Similar to tannic acid, astringent, tonic. The darker colored product is most powerful, acting more energetically and harshly than kino.

USES.—Diarrhea, leucorrhea, gonorrhea, cough, chronic sore throat, phthisis, bronchitis, hemorrhages, relaxed uvula, ulcerated nipples, chronic ulcers, relaxed oral mucous membrane and spongy gums (mouth-wash). In the arts—calico printing, dyeing, tanning, as an ingredient in boiler compounds to prevent formation of scaly crusts from certain kinds of water.

CAFFEA. COFFEE.

Caffeina. Caffeine, $C_8H_{10}O_2N_4 \cdot H_2O$, *U.S.P.*

Coffea arabica, *Linné*,
 and
Thea sinensis, *Linné*. $\left\{ \begin{array}{l} \text{A feebly basic substance (alkaloid) from the} \\ \text{seeds of the former and leaves of the latter} \\ \text{(Theaceæ), also occurring in other plants;} \\ \text{or prepared synthetically. See page 407.} \end{array} \right.$

Habitat. 1. Tropical Africa (Arabia, Abyssinia, Ceylon, Mocha); cultivated in tropical countries (Java, W. Indies, S. America—Brazil (most), Guatemala (best), etc.). 2. S. E. Asia (upper Assam, China, Japan, Java, S. United States); cultivated.

Syn. Caff., Semen Coffea; Fr. Café; Ger. Kaffee (bohnen), Caffeia; Caffein, Theine, Guaranine, Trimethylxanthine, Methyltheobromine; Fr. Caféine, Théine; Ger. Coffeinum, Koffein, Kaffein, Thein.

Coffe-a. L. for coffee, after Coffea, a province of Narea, in Africa, where it grows abundantly; Arabic name of the decoction—*chaubé*, *cavé*, *cahua*, *caova*.

A-rab'i-ca. L. Arabian—*i. e.*, its chief habitat.

PLANT.—Handsome shrub or small tree 3–4.5 M. (10–15°) high, by cultivation trimmed down to 1.5–2 M. (5–6°); bark smooth, gray; leaves 10–15 Cm. (4–6') long; 2.5–5 Cm. (1–2') wide, ovate, alternate, coriaceous, glossy, entire; flowers small, fragrant, white, funnel-shape, cymes; fruit oval, 12 Mm. ($\frac{1}{2}$ ') long, scarlet, but purple when ripe, 2-celled, 2-seeded drupe, each seed in a parchment-like endocarp; pericarp with scanty, scarcely succulent pulp, dehiscent; seed large, solitary in each cell, rounded back, flat on ventral surface (by which they face each other), hard, bony, grayish, deep narrow fissure in center.

ADULTERATIONS.—**SEED:** Inferior grades: natural discolored (yellow and brown grain); artificial colored (Prussian blue, indigo, sugar, egg-albumen)—removed by soaking in water; factitious coffee made of clay, kaolin, evaporated skimmed milk, etc.—sink in ether, have little taste and no groove on flat side. **GROUND COFFEE:** Sometimes roasted dandelion, chicory, amylaceous roots, corn, peas, beans, acorns, wheat, rye, sweet potatoes, coffee extract, etc.

CONSTITUENTS.—Caffeine (free and combined with caffeic acid) 1–2.3 p. c., caffearine, fat (olein, palmitin) 13 p. c., glucose, dextrin 15 p. c., proteins 13 p. c., caffeo-tannic acid, (chlorogenic, coffalic), volatile oil, citric acid, trigonelline, pectin, oxydase, moisture 12–15 p. c., ash 3–5 p. c., Mocha 7–8 p. c.—K, Na, Mg, carbonates, phosphates.

Caffeina. Caffeine.—While this is now prepared commercially—chiefly synthetically, or from tea and tea-dust (sweepings), it may be obtained from a strong infusion of tea or unroasted coffee by adding lead acetate to precipitate tannin, coloring matter, etc., filtering, removing excess of lead by hydrogen sulphide, concentrating, crystallizing. It is in white, flexible, silky, glistening needles, usually matted together in fleecy masses, odorless, bitter, efflorescent, soluble in water (46), hot water (5.5), alcohol (66), chloroform (5.5), ether (530), benzene (100), boiling benzene (22), acetone (50); saturated aqueous solution neutral; melts, when anhydrous, at 236° C. (457° F.). *Tests:* 1. Dissolve .01 Gm. in hydrochloric acid 1 cc., add potassium chlorate .1 Gm., evap-

orate to dryness, invert the container over a vessel containing a few drops of ammonia T. S.—residue purple, destroyed by fixed alkalis (murexide reaction). 2. Aqueous solution + tannic acid T. S.—precipitate, soluble in excess of reagent. 3. Dry to constant weight—loses 9 p. c.; incinerate—ash .05 p. c. 4. To .5 Gm. add sulphuric or nitric acid 5 cc.—colorless, faintly yellow (abs. of readily carbonizable substances). 5. Aqueous solution (1 in 50) + mercuric potassium iodide T. S.—no precipitate (abs. of alkaloids). *Impurities:* Alkaloids, readily carbonizable substances. Dose, gr. 1–5 (.06–.3 Gm.).



FIG. 392.—*Coffea arabica*: A, blooming and fruiting twig; B, fruit; C, fruit, cross-section; D, fruit, longitudinal section; E, seed still partly enclosed in the parchment-like endocarp.

Commercial.—Tree resembles our cherry, although more delicate, grows in clusters in hilly woods, 300–600 M. (1,000–2,000°) elevation; first known in Europe, 1652, as coming from Arabia, Abyssinia, where it was popular in the 15th century. The Dutch first grew it in Europe, 1690, and introduced it into America at Surinam, 1718, Cayenne, W. Indies, 1725. There are four varieties: 1, *Mocha*, best, smallest, dark yellow, growing on the Arabian hills around Mocha; 2, *Java* (*E. Indian*, *Ceylon*), largest, pale yellow; 3, *Rio*, *Brazilian* (*W. Indian*, *Demerara*), intermediate size, bluish or greenish-gray; 4, *Liberica*—most hardy and resistant to diseases, larger berries,

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finer flavor. The seeds are separated from papery endocarp by drying, passing between wooden rollers, and through a winnowing mill. In roasting at 250° C. (482° F.), the fat, sugar, and tannin are destroyed, some caffeine volatilized, and an empyreumatic volatile oil (coffeol, coffeone), or some other active principle, volatile or otherwise, is developed—losing 8 p. c. water, 9 p. c. organic matter, becoming pulverizable, more aromatic, and more soluble in water. Much care should be exercised in this process to use closed vessels and not too great heat. Caffeine exists in all plants as a complex tannoid, and as such possesses decided but different physiological activity from the free base (alkaloid). Decaffeinated coffee results from incipient germination, or dissolving out nine-tenths of the caffeine from raw beans, then roasting.

PREPARATIONS.—1. *Caffeina Citrata*. Citrated Caffeine. (Syn., Caff. Cit.; Br. Caffeinæ Citras, Caffeine Citrate; Fr. Citrate de Caféine; Ger. Koffeincitrat.)

Manufacture: Dissolve citric acid 50 Gm. in hot distilled water 100 cc., add caffeine 50 Gm., evaporate to dryness on water-bath, constantly stirring toward the end, reduce to fine powder. It is a white powder, odorless, slightly bitter, acid taste and reaction; forms clear syrupy solution with small quantity of water, but caffeine precipitates on dilution, being redissolved by additional water; compound unstable; contains 48–52 p. c. of anhydrous caffeine, $C_8H_{10}O_2N_4$. *Tests*: 1. Mix 2 cc. of aqueous solution (1 in 10) with lime water (50)—clear in the cold, but turbid upon boiling. 2. Dry to constant weight—loses 5 p. c.; incinerate—ash .1 p. c. 3. Aqueous solution (1 in 100) 5 cc. + mercuric sulphate T. S. 1 cc., heat to boiling, add potassium permanganate T. S. 1 cc.—white precipitate. 4. Heat .25 Gm. + sulphuric acid 5 cc. in dish on water-bath for 15 minutes, protected from dust—may be yellow, but not brown (abs. of tartrate). 5. Aqueous solution (1 in 100) 10 cc., acidulated with hydrochloric acid, + barium chloride T. S.—no turbidity (abs. of sulphate). *Impurities*: Heavy metals, tartrate, sulphate, water. Should be kept in well-closed containers. Dose, gr. 2–10 (.13–.6 Gm.).

2. *Caffeinæ Sodio-Benzoes*. Caffeine Sodio-Benzoate. (Syn., Caff. Sod.-Benz.; Fr. Soude benzoate de Caféine; Ger. Caffeinum-Natrium benzoicum, Koffein-Natriumbenzoat.)

Manufacture: Mix caffeine and sodium benzoate each 50 Gm., rub to smooth paste with alcohol q. s., dry in moderately warm place. It is a white powder, odorless, bitter, soluble in water (1.1), some caffeine separating on standing, alcohol (30), partly in chloroform; aqueous solution (1 in 20) neutral, slightly acid or alkaline, not reddened by phenolphthalein T. S.; contains 47–50 p. c. of anhydrous caffeine and 50–53 p. c. of sodium benzoate, $NaC_7O_2H_5$. *Tests*: 1. Heat—decomposes with evolution of white vapors of caffeine—carbonaceous residue effervesces with acids and colors flame yellow. 2. Aqueous solution + ferric chloride T. S.—salmon-colored precipitate; + diluted hydro-

chloric acid—white precipitate (benzoic acid). 3. Dry to constant weight—loses 5 p. c. *Impurities*: Heavy metals, water, chlorinated compounds, readily carbonizable substances. Dose, gr. 2–10 (.13–.6 Gm.), in powder, capsule, effervescent draught, hypodermically (?).

Prep.: 1. *Ampullæ Caffeinæ Sodio-Benzotatis*, *N.F.*, 8.5 gr. (.55 Gm.). Dose, 2–4 ampuls.

3. *Caffeinæ Sodio-Salicylas*, *N.F.*—caffeine, sodium salicylate, āā, 50 p. c., alcohol q. s. Dose, gr. 1–5 (.06–.3 Gm.).

4. *Pulvis Acetanilidi Compositus*, *N.F.*, 10 p. c.

5. *Sal Pot. Brom. Eff. Co.*, *N.F.*, $\frac{4}{5}$ p. c.

Unoff. Prep.: *Effervescent Citrated Caffeine*, 1.9 p. c. of anhydrous caffeine, 5j–2 (4–8 Gm.).

PROPERTIES.—Tonic, stimulant, nervine, antiemetic, laxative, diuretic, antiperiodic, antiseptic. Caffeine in small doses stimulates appetite, digestion, secretion of bile, quickens heart action, respiration, increases arterial tension, urine; normal doses, cerebral stimulant, causing nervous restlessness, wakefulness, increased mental activity; large doses (gr. 5–10; .3–.6 Gm.) produce heaviness of head, insomnia, delirium, rapid, feeble pulse, cold extremities, elevated temperature, convulsions, paralyzes cardiac muscle, but death occurs from paralysis of respiration; valuable as a hydragogue diuretic; ordinary salts not suitable for hypodermic use as they decompose by the presence of water. Caffeine sodio-benzoate as a diuretic, cerebral and cardiac stimulant has the advantage of being moderately stable and non-irritating.

USES.—Caffeine in neuralgia or nervous headaches, diarrhea of cholera, phthisis, cardiac and renal dropsies, lithemia, gout, insomnia of chronic alcoholism, adynamic fevers. Coffee in intermittents, asthma paroxysms, opium narcosis, to antagonize general torpor of nervous centers; it is used mostly as a beverage, for which alone about 1,500,000,000 pounds (680,272 Kg.) are consumed annually, making 1 pound (.46 Kg.) to every living person; in the United States about 6–7 pounds (2.7–3 Kg.) per capita; in Holland 10 pounds (4.6 Kg.); an average cup contains 2.61 gr. (.2 Gm.) of caffeine.

Derivative Products:

1. *Coffea arabica* or *C. liber'ica*; *Coffea Tosta*, *Coffee*, *Roasted Coffee*, *N.F.*—The dried ripe seed, deprived of most of the seed-coat, and roasted until a dark brown color and characteristic aroma are developed yielding not less than 1 p. c. of caffeine, 3–5 p. c. of ash, and 10 p. c. of fat. Seed oval, variable size, one side convex, other flat with longitudinal groove showing papery seed-coat traces in cleft; characteristic aroma, pleasantly bitter taste. Powder, deep brown—many seed-coat fragments of parenchyma and stone cells, many endosperm cells with porous walls, oil and aleurone grains; starch grains few or wanting, no tracheæ. Dose, ʒss–1 (2–4 Gm.); 1. *Fluidextractum Coffeæ* (1st menstruum: glycerin 6.5 cc., alcohol 25, water 68.5; 2d: 25 p. c. alcohol q. s. 100), dose, ʒss–1 (2–4 cc.). Decoction, Infusion.

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2. *C. mauritia'na*, *Mauritus*, and *C. zanguebar'ia*, Zanzibar, Mozambique, furnish acceptable coffee, but only the *C. liber'ica* approaches, in importance and flavor, the long universally recognized *C. arabica*.

Substitute Products:

1. *Co'la ni'tida* (*acumina'ta*), *Cola Nut*.—Sterculiaceæ, W. Africa (page 407); seed contain caffeine 2 p. c., theobromine, tannin, volatile oil.

2. *Paullin'ia Cupa'na*, *Guarana*.—Sapindaceæ. Brazil (see page 389); seed contain caffeine (guaranine) 4–5 p. c., tannin 2.6 p. c., starch, mucilage, fat, saponin, resin, volatile oil.

IPECACUANHA. IPECAC, U.S.P.

Cephaëlis	$\left\{ \begin{array}{l} \textbf{Ipecacuanha}, \\ \textit{(Brotero) A. Richard}, \\ \textbf{acuminata}, \\ \textit{Karsten}. \end{array} \right.$	$\left\{ \begin{array}{l} \text{The dried rhizome and roots with not} \\ \text{more than 5 p. c. over ground stems} \\ \text{or 2 p. c. other foreign organic mat-} \\ \text{ter, yielding not less than 1.75 p. c.} \\ \text{ether-soluble alkaloids.} \end{array} \right.$
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Habitat. Brazil to Bolivia, Columbia, damp forests; cultivated in India.

Syn. Hippo, Poaya; Br. Ipecacuanha Radix; Fr. Ipécacuanha annelé (officinale), Racine brésilienne; Ger. Brechwurzel, Ruhrwurzel.

Ceph-a-ë'lis. L. fr. Gr. κεφαλή, a head, + εἶλω, to collect—*i. e.*, flowers collected into a capitulum.

Ip-e-cac-u-an'ha. L. fr. Braz. Indian name *ipecaaquen*, which means "smaller roadside sickmaking plant."

A-cu-mi-na'ta. L. *acuminatus*, pointed, acute—*i. e.*, apex of the leaves.

Ip'e-cac. An abbreviation of ipecacuanha.

PLANTS.—Shrubby perennials; stem .3–.5 M. (12–18') high, with often .3 M. (12') additional underground, decumbent or erect, woody, knotted with leaf-scars, smooth and gray at the base, quadrangular, pubescent and green above, simple or branched; leaves few, 6–8, somewhat crowded at the top, 7.5–10 Cm. (3–4') long, 2.5–5 Cm. (1–2') broad, stipulate, opposite, petiolate, obovate, entire, wavy margins, dark green, smooth above, paler, pubescent, prominent veined beneath; flowers Jan.–Feb., small white dense heads, 8–20 together, funnel-shape, hairy; fruit May, in clusters of dark purple berries 12 Mm. ($\frac{1}{2}$ ') long, each with 2 small, plano-convex, stony seed. **Roots** (*C. Ipecacuanha*): *Rio*, in cylindrical, curved, sharply flexuous, pieces, occasionally branched, 3–15 Cm. ($1\frac{1}{5}$ –6') long, 1–4 Mm. ($\frac{1}{25}$ – $\frac{1}{6}$ ') thick, grayish-black, smooth or closely annulate, with thickened, incomplete rings, usually transverse fissures with vertical sides; bark (smooth) thin, one-ninth diameter of root, or (annulated) two-thirds its diameter; fracture short, easily separable from tough, fibrous wood; odor distinctive, dust sternutatory; taste bitter, nauseous, acrid; rhizome cylindrical, 10 Cm. (4') long, 2 Mm. ($\frac{1}{12}$ ') thick, wrinkled, few elliptical scars, distinct pith, one-sixth the entire diameter: (*C. acuminata*: *Carthagera*, *Panama*, 4–6.5 Mm. ($\frac{1}{6}$ – $\frac{1}{4}$ ') thick, grayish-black, annulations less numerous, single starch grains larger in the medullary rays of wood. **POWDER**, light brown—cork cells, starch grains up to

.015 Mm. ($\frac{1}{1760}$ '—Rio)—.020 Mm. ($\frac{1}{2560}$ '—Carthagenæ) in diameter, raphides of calcium oxalate, porous tracheids. *Solvents*: alcohol; water (injured by boiling). Dose, emetic, gr. 20 (1.3 Gm.), or gr. 5–10 (.3–6 Gm.), repeated in 10-minute intervals, each followed by hot chamomile tea; nauseant, diaphoretic, expectorant, gr. 1–2 (.06–.13 Gm.).

ADULTERATIONS.—**ROOT:** Roots of allied species—striated, undulated (most important), *Cephaelis tomento'sa*, excessive portion of non-annulate woody stem; roots of *Triosteum perfoliatum* and *Heter-*



FIG. 393.—*Cephaelis Ipecacuanha*.



FIG. 394.—Ipecac root; normal size.

opteris pauciflora, both resembling somewhat the official, the latter containing an inulin-like body instead of starch; Johore and Matto Grosso ipecac—larger, but annulations not so deep as the official. **POWDER:** Starches, flour, almond-meal, etc., all being recognized easily under the microscope—the first two by the shape of granules, the last by scurvy testa, oil-cells, and yielding hydrocyanic acid when infused with water; ground olive stones 3–40 p. c.

Commercial.—Sound ipecac in quality is proportionate to the thick-

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ness of the bark (75–90 p. c.), and the thinness of the wood (10–25 p. c.), as most of the alkaloids reside in the former; that with very thick bark is designated as “bold” (fancy), that with thick woody center as “wiry;” the stem portion should not indicate having been leaf-bearing, as such parts exposed to light and air are always weaker in alkaloids. Ipecac was known first in Europe, 1762, as about this time Helvetius, a Dutch physician, became celebrated in Paris from its secret use; it was, however, in 1688, purchased from him by Louis XIV. for 1,000 louis d’or (\$4,600). It grows in rich loam of hot, moist forests, under trees in bunches, presenting two varieties according to its woody or herbaceous stems, the latter usually prostrate and covered with vegetable-débris, otherwise exactly alike. This growth-habit produces a great distinction between the upper and lower stem-portions, causing the latter to be collected often with the root, when the product is termed “stemmy.” The color of the roots of either kind is not uniform, both furnishing *brown*, *red*, and *gray*, which difference is only superficial, depending solely upon season of year collected, age, soil, climate, and mode of curing; the brown is least bitter and most abundant with us; the gray is most bitter and the larger. The root is collected at any time when the ground is soft (mainly Jan.–March), except in rainy weather, as then cannot dry properly, by *poayeros* (collectors, fr. *poaya*, Braz. name of the plant), who catch the stem, pull it backward as far as possible, and thrust deep into the ground a stick with broad, sharp end, thus cutting the ramifications, but leaving sufficient roots to produce, from adventitious buds, new plants the following year. The plant-juice is so irritating as to produce sores upon the hands and elsewhere, consequently collectors only accept such labor in the absence of rubber-gathering, and that otherwise more congenial, thus accounting largely for the drug’s high price. Roots are freed from adhering earth by shaking, put into bags, at night assorted, next day spread in the sun and carefully dried 3–4 days, being protected at night from heavy dews, then broken into small pieces, separated from any remaining earthy particles by sieves, and packed tightly in bags or hide-bound bales (seroons), which are stored carelessly awaiting sale—a condition, along with the incident exposure to damp weather and river-water in shipment, that renders three-fourths of the output considerably damaged by moldiness. There are two varieties: 1, *Rio, Brazilian, Para* (*C. Ipecacuanha*), distributed widely through Brazil, Bolivia, being collected chiefly in proximity to the Itenez River, and exported via Rio Janeiro or Para; 2, *Carthagena, Columbian* (*C. acuminata*), grown wild mostly in Columbia, being exported chiefly via Carthagena; contains an equal amount of total alkaloids, but more cephaëline and less emetine than Rio.

CONSTITUENTS.—Alkaloids 2.28–3.36 p. c.: Emetine 2–3.14 p. c., Cephaëline .6 p. c., psychotrine, ipecacuanhic acid (ipecacuanhin) 2.25 p. c., Emetidine (kryptonine), $C_{29}H_{40}O_9N_2$ (colloidal), ipecamine, hydroipecamine, o-methylpsychotrine, emetamine, choline, resin,

starch 40 p. c., wax, fat, volatile oil, erythrocephaëlin (coloring matter—deep purple with alkalies), sucrose, ash 1.8–4.5 p. c.

Emetine (Methyl-cephaëline), $C_{29}H_{40}O_4N_2$.—Obtained by adding basic lead acetate to alcoholic tincture, filtering, removing excess of lead with diluted sulphuric acid, neutralizing filtrate, distilling off alcohol, shaking out clear residual liquid with ether and ammonia, shaking out ether solution with weak sulphuric acid, and shaking repeatedly this acidulated solution with sodium hydroxide, in the presence of ether, until cephaëline (base soluble in caustic alkali) is separated completely; emetine (base insoluble in caustic alkali) is converted into hydrochloride, recrystallized from water, and finally precipitated with ammonia. It is amorphous, white, becoming yellow by exposure, soluble in alcohol, ether, benzene, chloroform; forms salts, most of which are crystalline. Dose, expectorant, gr. $\frac{1}{200}$ – $\frac{1}{60}$ (.0003–.001 Gm.); emetic, gr. $\frac{1}{16}$ – $\frac{1}{4}$ (.004–.016 Gm.). Poisonous in large quantities; impure emetine is 10 times weaker.

Emetinæ Hydrochloridum, Emetine Hydrochloride, $C_{30}H_{44}O_4N_2 \cdot 2HCl$, U.S.P.—(Syn., Emet. Hydrochl.; Fr. Chlorhydrate de Emetine; Ger. Emetinhydrochlorid, Salzsäures Emetin.) This hydrochloride of the alkaloid from ipecac, or prepared synthetically, is obtained by dissolving emetine in diluted hydrochloric acid, allowing to crystallize. It is a white, very slightly yellowish, crystalline, odorless powder, darker on exposure to light, soluble in water, alcohol; aqueous solution (1 in 20) slightly acid; contains variable amounts of water of crystallization. *Tests*: 1. Aqueous solution (1 in 100), + iodine T. S., mercuric potassium iodide T. S., or platinic chloride T. S.—precipitates. 2. With sulphuric acid containing in each cc. about .005 Gm. of molybdic acid—bright green. 3. Aqueous solution (1 in 2) + silver nitrate T. S.—white precipitate, insoluble in nitric acid; dry at constant weight—loses 19 p. c.; incinerate—ash negligible. *Impurities*: Cephaëline, water, readily carbonizable substances. Should be kept dark, in dark amber-colored vials. Dose, expectorant, gr. $\frac{1}{12}$ – $\frac{1}{6}$ (.005–.01 Gm.); emetic, gr. $\frac{1}{6}$ – $\frac{1}{3}$ (.01–.02 Gm.).

Cephaëline, $C_{28}H_{38}O_4N_2$.—This is 2–5 times stronger than emetine, the two representing the drug's activity, and relative proportion varying; it is crystalline, white, becoming yellow by exposure, distinguished from emetine by its solubility in caustic alkalies and by being less soluble in ether; forms uncrystallizable salts. Dose, same as emetine.

Psychotrine, $C_{28}H_{36}O_4N_2$.—This exists in ipecacuanha in small amount compared with the two preceding alkaloids, and unlike them is only slightly soluble in ether; obtained by extracting with chloroform the ammoniacal liquid, from which emetine and cephaëline have been separated by ether; occurs in crystals which separate from ether in lemon-yellow transparent prisms, melts at 138° C. (281° F.), soluble in alcohol, chloroform.

Ipecacuanhic Acid (Cephaëlic Acid), $C_{14}H_{18}O_7$.—An amorphous, bitter glucoside, once believed identical with gallic acid, but more

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closely resembles caffeeo-tannic acid; obtained by precipitating decoction with lead acetate, dissolving precipitate in acetic acid, then precipitating with lead subacetate; it is bitter, amorphous, brown, soluble in alcohol, green with ferric salts.

PREPARATIONS.—1. *Fluidextractum Ipecacuanhæ*. Fluidextract of Ipecac. (Syn., Fldext. Ipecac., Fluid Extract of Ipecac; Br. Extractum Ipecacuanhæ Liquidum; Fr. Extrait fluide d'Ipécacuanha; Ger. Ipecacuanhafluidextrakt.)

Manufacture: Similar to Fluidextractum Ergotæ, page 63; 1st menstruum: alcohol 30 cc., water 30, diluted hydrochloric acid 15; 2d menstruum: 40 p. c. alcohol; reserve first 80 cc., in which dissolve soft extract, assay, and add enough 2d menstruum for the 100 cc. to contain 1.35–1.65–1.5 Gm. of ether-soluble alkaloids. Dose, m̄j–20 (.06–1.3 cc.).

Prep.: 1. *Syrupus Ipecacuanhæ*. Syrup of Ipecac. (Syn., Syr. Ipecac.; Fr. Sirop d'Ipécacuanha; Ger. Brechwurzelsirup, Ipecacuanhasirup.)

Manufacture: 7 p. c. Mix thoroughly fluidextract of ipecac 7 cc., glycerin 10, syrup q. s. 100 cc. Dose, expectorant, m̄v–15 (.3–1 cc.); emetic, ʒss–4 (2–15 cc.). 2. *Tinctura Ipecacuanhæ*, N.F., 10 p. c., alcohol 20 cc., aq. dest. 60, then latter q. s. 100 cc. Dose, m̄xv–30 (1–2 cc.); substitute for the once official wine; 3. *Tinctura Ipecacuanhæ et Opīi*, Tincture of Dover's Powder, N.F., 10 p. c., + tincture of opium 100 cc. evaporated to 58, diluted alcohol q. s. 100 cc. Dose, m̄v–20 (.3–1.3 cc.).

Prep.: 1. *Syrupus Ipecacuanhæ et Opīi*, N.F., 8.5 p. c.—tr. ipecac. et opīi 8.5 cc., spirit of cinnamon $\frac{2}{3}$ cc., cinnamon water 3.2, syrup q. s. 100 cc. Dose, ʒss–2 (2–8 cc.).

4. *Mistura Rheī Composita*, N.F., $\frac{3}{10}$ p. c. 5. *Syrupus Asari Compositus*, N.F., $\frac{3}{10}$ p. c.

2. *Pulvis Ipecacuanhæ et Opīi*. Powder of Ipecac and Opium. (Syn., Pulv. Ipecac. et Opīi., Compound Powder of Ipecac, Dover's Powder; Br. Pulvis Ipecacuanhæ Compositus; Fr. Poudre d'Ipécacuanha opiacée—de Dover; Ger. Pulvis Ipecacuanhæ opiatas, Doversches Pulver, Pulvis Doveri.)

Manufacture: 10 p. c. Triturate together thoroughly, ipecac 10 Gm., powdered opium 10, lactose 80, until the mixture is reduced to a very fine uniform powder. It is grayish-white, light brown; microscopically—angular, cone-shaped fragments, slowly soluble in water or chloral hydrate T. S., strongly polarizing light with display of colors (fragments of lactose), tissues of ipecac and the capsules of opium poppy. Dose, gr. 5–10 (.3–6 Gm.).

3. *Pilula Laxativæ Compositæ*, N.F., $\frac{1}{16}$ gr. (.004 Gm.). 4. *Ampullæ Emetinæ Hydrochloridi*, N.F., $\frac{1}{2}$ gr.

Unoff. Preps.: *Decoction*, *Infusion*, each, 5 p. c., ʒss–1 (15–30 cc.). *Extract*, gr. $\frac{1}{20}$ – $\frac{1}{2}$ (.003–.03 Gm.). *Pilula Ipecacuanhæ cum Scilla* (Br.)—ipecac 6, opium 6, potassium sulphate 48, squill 20, ammonia-

cum 20, syrup of glucose q. s. for mass, gr. 4–8 (.26–.5 Gm.). *Wine*, 10 p. c., mj –60 (.06–4 cc.). *Trochiscus* (Br.), each, $\frac{1}{3}$ gr. (.02 Gm.).

PROPERTIES.—Emetic, nauseant, expectorant, diaphoretic, sternutatory (cholagogue, antiseptic, hemostatic, counter-irritant). Small doses (gr. $\frac{1}{8}$ – $\frac{1}{4}$; .008–.016 Gm.), stomachic, tonic, large doses (gr. 5–20; .3–1.3 Gm.), emetic in 30 minutes, not violent nor depressing; if doses repeated, have tolerance, catharsis; may cause irritation, hemorrhage. Emetine kills animals by cardiac paralysis. Vomiting due to local irritation of the stomach and a direct action upon vomiting center in the medulla; it increases, by stimulation, the secretion of bile, bronchial and intestinal mucus.

USES.—Acute indigestion, nauseating bilious headache, small doses for bronchitis, whooping-cough, asthmatic catarrh, spasmodic croup (here syrup given until vomiting occurs), spasmodic asthma, pneu-

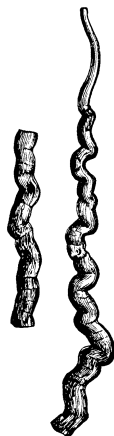


FIG. 395.—Undulated ipecacuanha.



FIG. 396.—Striated ipecacuanha.

monia, rigidity of os uteri, hemoptysis, hemorrhage, atonic dyspepsia, vomiting in pregnancy (hourly mj ; .06 cc. of tincture), catarrhal jaundice (gr. 20; 1.3 Gm. daily), pyorrhea (fldext., alcresta), chronic dysentery, diarrhea, hectic sweats, cholera, cholera morbus, remittent fever, urticaria, cases of poisoning; locally in ophthalmia (decoction). As diaphoretic and expectorant give at long intervals; the syrup always to infants. Its action is somewhat irregular, gr. 5 (.3 Gm.) sometimes being as effective as gr. 15 (1 Gm.). Emetine gr. $\frac{1}{10}$ (.006 Gm.) has induced vomiting, while gr. 12 (.8 Gm.) given in 24 hours have caused no unpleasant symptoms.

Poisoning: Usually have severe vomiting of stomach contents, mucus, blood, etc. Unless thoroughly vomited, wash out stomach with tannin solution, if necessary follow with opium, belladonna, cardiac stimulants.

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Incompatibles: Lead and mercury salts, vegetable acids, astringent infusions, bismuth compounds, phenol and hydrocyanic acid.

Synergists: Emetics, sedative expectorants, warm drinks.

Substitute Products:

1. *Psycho'tria emet'ica*, *Striated Ipecac*.—Root 6 Mm. ($\frac{1}{4}$ ') thick, longitudinally wrinkled, not annulate, transverse fissures through bark, purplish-brown, bark thick; contains little emetine, much sugar, no starch. There is a small striated ipecac (a species of *Richar'd(so'n)ia*) 3 Mm. ($\frac{1}{8}$ ') thick, otherwise same as the ordinary striated.

2. *Richar'd(so'n)ia sca'bra*, *Undulated (Farinaceous) Ipecac*.—Undulate wrinkled; annulate, transversely fissured, brownish-gray; bark white, mealy, not bitter, wood nearly as thick as the bark.

3. *Calceola'ria (Ionid'ium) Ipecacuanha*, *White Ipecac*.—Violaceæ. Branched, not annulate, longitudinally wrinkled, whitish-yellow; wood porous, thick, yellowish, no starch.

4. *Ascle'pias curassav'ica*, *Bastard Ipecac*.—C. and S. America; has short rootstock abruptly divided into many yellowish rootlets.

Allied Plants:

1. *Mitchel'la re'pens*, *Mitchella*, *Squaw Vine*, *Partridge-berry*, *N.F.*—The dried plant with not more than 5 p. c. of foreign organic matter; N. America. Creeping evergreen of the woods, reaching .3–.6 M. (1–2°) in length. Occurs in loosely matted masses of—branches, rhizomes, fine roots, stems and leaves; rhizomes brownish, filiform, roots fibrous; stems quadrangular; light green, striated; leaves opposite, dark green, smooth, coriaceous, ovate, entire, up to 2 Cm. ($\frac{4}{5}$ ') long, short petiole, lower surface shiny; flowers purplish, fragrant; fruit scarlet-red berry; odor faint; taste slightly bitter. Powder, grayish-green—numerous calcium oxalate raphides, epidermal cells, stomata, chlorenchyma cells, some with amorphous content, tracheæ, parenchyma, starch grains; solvent: diluted alcohol; contains saponin-like substance, resin, wax, gum, sugar. Tonic, astringent, diuretic; resembles chimaphila and viburnum, all at times being prescribed together. Dose, $\overline{5}$ ss–1 (2–4 Gm.); 1. *Fluidextractum Mitchellæ* (diluted alcohol): Preps.: 1. *Elixir Aletridis Compositum*, 6.55 p. c.; 2. *Elixir Heloniadis Compositum*, 12.5 p. c.

2. *Ru'bia tincto'rum*, *Madder*.—The root, U.S.P. 1820–1870; S. Europe, Asia. Perennial herb, square stem, covered with short prickles by which it climbs; leaves elliptical, 7.5 Cm. (3') long; flowers yellow; root creeping, 5 Mm. ($\frac{1}{5}$ ') thick, reddish, sweetish, bitter, acrid, astringent taste; contains rubian (yellow), alizarin (orange-red), ruberythrin (yellow needles, blood-red with alkalies), purpurin. Used as tonic, diuretic, emmenagogue; dropsy, amenorrhea, rachitis, dyeing. Dose, gr. 15–60 (1–4 Gm.).

3. *Sambu'cus canadensis* or *S. ni'gra*, *Sambucus*, *Elder Flowers*, *N.F.*—Caprifoliaceæ. The air-dried flower with not more than 2 p. c. of foreign organic matter; N. America (damp places). Semi-shrubby perennial, slightly woody, 1.5–3 M. (5–10°) high; stem branching,

covered with rough, pitted-gray bark, central pith large, branches smooth; fruit, ovoid drupe, 6 Mm. ($\frac{1}{4}$ ') long, red then purplish-black. Flowers, small 2-3 Mm. ($\frac{1}{12}$ – $\frac{1}{8}$ ') broad, shriveled; corolla cream-colored, brownish-yellow, rotate, campanulate, 5-lobed; stamens 5, anthers yellow, pollen with punctate markings; odor faintly sweet.

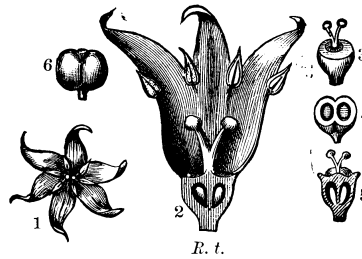


FIG. 397.—*Rubia tinctorum*: 1, open flower; 2, longitudinal section of flower enlarged; 3, ovary; 4, cross-section of ovary; 5, longitudinal section of ovary; 6, fruit.

aromatic; taste slightly bitter. Powder, brownish-yellow—soon becomes worm eaten unless a preservative (sodium chloride) is added; contains volatile oil .3–.5 p. c., resin, fat, wax, mucilage, tannin. Stimulant, carminative, diaphoretic, sudorific, diuretic, alterative, flavoring; used mostly externally in fomentation, poultice, and ointment; rheumatism, erysipelas, abscesses, etc.; the water for cooling application to the eyes. Dose, 5ss–1 (2–4 Gm.); 1. *Fluidextractum Stillingiae Compositum*, 12.5 p. c. 2. *Species Laxativæ*, 25 p. c. *S. nigra*.—Europe; tree, 4.5–6 M. (15–20°) high, 10–15 Cm. (4–6') thick, compound cymes smaller than the preceding. *S. Eb'ulus*, Dwarf Elder. All parts with strong, disagreeable odor, bitterish, acrid taste, the 4-seeded fruit, resembling elderberries; laxative; *S. madeiren'sis*, Madeira; less aromatic than *S. nigra*.

4. *Viburnum prunifolium*, *Viburnum*, Black Haw, N.F.—The dried root-bark, with not more than 7 p. c. of wood or other foreign organic matter, yielding not more than 3 p. c. of acid-insoluble ash: United States, New York to Florida. Handsome shrub, 3–6 M. (10–20°) high; leaves 2.5–5 Cm. (1–2') long, 12–16 Mm. ($\frac{1}{2}$ – $\frac{2}{3}$ ') broad, serrate; flowers white cymes; fruit oval, black drupe (berry), sweet, edible. Bark, in irregular, transversely curved, quilled pieces, 1.5–6 Cm. ($\frac{3}{5}$ – $2\frac{2}{5}$ ') long, .5–1.5 Mm. ($\frac{1}{80}$ – $\frac{1}{16}$ ') thick, grayish-brown, or, where outer cork has scaled off, brownish-red; wrinkled, inner surface reddish-



FIG. 398.—*Sambucus canadensis*.

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brown, striate; fracture short, uneven; odor strong, sourish; taste distinctly bitter, somewhat astringent. Powder, dark brown—many stone cells, calcium oxalate rosette aggregates, prisms, lignified cork tissue, parenchyma cells, starch grains, few bast-fibers; solvent: 67 p. c. alcohol; contains viburnin, valeric acid, resin (brown, bitter) 2.5 p. c., tannin, sugar, salts, ash 8–9 p. c. Diuretic, tonic, antispasmodic, nervine, astringent; in threatened abortion, nervous diseases of pregnancy, dysmenorrhea, menorrhagia, after-pains, asthma, hysteria. Dose, $\overline{3}$ ss–2 (2–8 Gm.); 1. *Fluidextractum Viburni Prunifolii* (67 p. c. alcohol): Prep.: 1. *Elixir Viburni Prunifolii*, 12.5 p. c., dose, $\overline{5}$ j–2 (4–8 cc.). Extract, gr. 3–10 (.2–.6 Gm.). Decoction, 5 p. c., Infusion, 5 p. c., each, $\overline{3}$ j–2 (30–60 cc.).

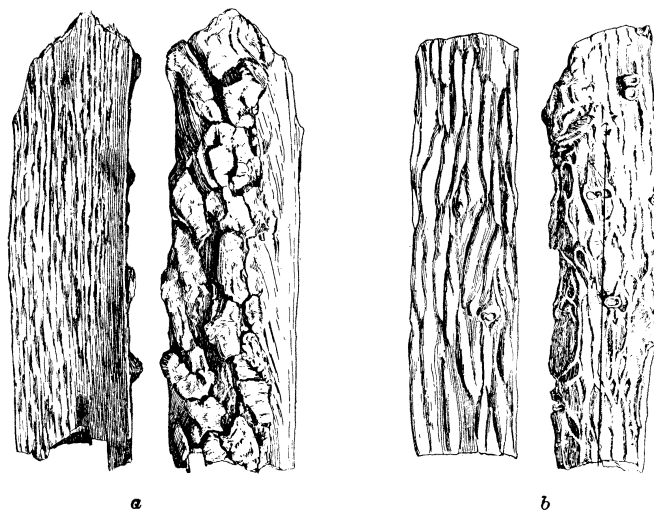


FIG. 399.—*Viburnum prunifolium*, a, trunk bark, b, root bark.

5. *Viburnum Op'ulus*, var. *americana'num*, *High Bush*, *Cranberry Bark*, *Cramp Bark*, *N.F.*—The dried bark of the stem with not more than 5 p. c. of adhering wood or other foreign organic matter; United States, low grounds, north and west. Handsome perennial shrub, 1.3–3.5 M. (4–12°) high; stem smooth, branched; leaves 3-lobed, dentate; flowers cymes, large, greenish-white; fruit 12 Mm. ($\frac{1}{2}$ ') long, ovoid, red (substitute for cranberries). Bark, in strips, 20–30 Cm. (8–12') long, 12–18 Mm. ($\frac{1}{2}$ – $\frac{3}{4}$ ') broad, .5–3 Mm. ($\frac{1}{50}$ – $\frac{1}{8}$ ') thick, quills, chip-like fragments, light gray, brownish stripes and lenticels, fissured or thinly scaly, inner surface yellowish-brown, short oblique striæ; fracture in 2 layers, short weak, whitish to brownish; odor slight, characteristic; taste mildly astringent, bitter. Powder, light grayish-

brown—cork cells, calcium oxalate rosettes, starch grains, parenchyma with amorphous substance, occasional tracheal fragments with wood-fibers, bast-fibers and stone cells; solvent: 67 p. c. alcohol; contains viburnin, valeric acid, resin 8 p. c., tannin, salts, ash 8–9 p. c. Diuretic, tonic, antispasmodic, nervine, astringent, weaker than *V. prunifolium*; nervous conditions of pregnancy, abortive preventive, dysmenorrhea, menorrhagia, ovarian irritation, asthma, hysteria. Dose, \mathfrak{ss} –2 (2–8 Gm.); 1. *Fluidextractum Viburni Opuli*, dose, \mathfrak{ss} –2 (2–8 cc.): Preps.: 1. *Elixir Viburni Opuli Compositum*, 7.5 p. c., + fldext. of trillium 15, fldext. of aletris 7.5, dose, \mathfrak{zj} –2 (4–8 cc.); 2. *Elixir Aletridis Compositum*, 3.275 p. c.; 3. *Elixir Heloniadis Compositum*, 3.2 p. c. 2. *Tinctura Viburni Opuli Composita*, 3.5 p. c., + dioscorea 3.5, scutellaria 1, clove 5, cinnamon 6.5; menstruum: glycerin 7.5 cc., alcohol 75, water 17.5, finishing with 75 p. c. alcohol q. s. 100, dose, \mathfrak{zj} –2 (4–8 cc.)—substitute for Hayden's Viburnum Compound. Decoction, Infusion, each, 5 p. c., \mathfrak{zj} –2 (30–60 cc.). *V. obovatum*, *Small Viburnum*, *Black Haw*; S. United States; shrub 2.4 M. (8°) high, fruit black, leaves broadly obovate, leathery, bitter, also used as antiperiodic.



FIG. 400.—*Viburnum Opulus*.

6. *Triosteum perfoliatum*, *Fever Root*, *Fever-wort*, *Horse-gentian*.—The root (rhizome), U.S.P. 1820–1870; United States. Perennial herb 1–1.3 M. (3–4°) high, hirsute; leaves pubescent beneath, 15 Cm. (6') long; flowers purplish, fruit dry yellow drupe, 12 Mm. ($\frac{1}{2}$ ') long. Root 15–20 Cm. (6–8') long, 15 Mm. ($\frac{3}{8}$ ') thick, knotty, brownish-yellow, bitter, nauseous; contains bitter principle, starch. Used as cathartic, emetic, diuretic, substitute for ipecac; in decoction, extract, infusion. Popular with Indians for fevers, amenorrhea. Dose, gr. 15–30 (1–2 Gm.).

64. VALERIANACEÆ. Valerian Family.

Va-le-ri-a-na'se-e. L. *Valerian-a* + aceæ, fr. *Valerianus* or *Valerius*, who first used it in medicine—*valere*, to be strong, healthful—*i. e.*, its odor and medicinal virtues. Herbs. Distinguished by possessing a strong-scented volatile oil; leaves opposite, exstipulate; calyx superior, tube adnate to ovary; corolla mostly 5-lobed, tubular, epigynous; stamens 1-4, inserted on corolla-tube; ovary, 1 fertile cell, 2 abortive or empty; fruit dry, often pappose; temperate climates; stimulant, antispasmodic, tonic, (vol. oil).

Genus: 1. **Valeriana.**

VALERIANA. VALERIAN, U.S.P.

Valeriana officinalis, { The dried rhizome and roots, with not more
Linné. { than 5 p. c. foreign organic matter, yielding
not more than 10 p. c. acid-insoluble ash.

Habitat. Europe, N. Asia, in moist as well as dry localities, banks of streams; naturalized in New England and New York; cultivated.

Syn. Valer., Wild, Great Wild, English, German, Common, Cat's, Vermont or American-English Valerian, Setwall, Vandal Root, All Heal, Radix Valerianæ Minoris; Br. Valerianæ Rhizoma; Fr. Valériane officinale, Racine de Valériane; Ger. Radix Valerianæ, Baldrian, (Wilde) Baldrianwurzel.

Va-le-ri-a'na. L. see etymology, above, of Valerianaceæ.

Of-fi-ci-na'-lis. L. see etymology of (*Smilax*) *officinalis*, page 122.

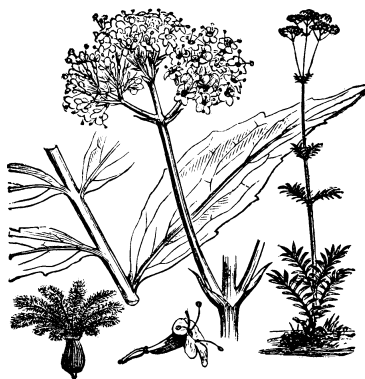


FIG. 401.—*Valeriana officinalis*.

PLANT.—Large perennial herb; stem .6-1.3 M. (2-4°) high, branched at top, cylindrical, hollow, fluted and channeled, often hairy; leaves imparipinnate with long clasping petioles; leaflets 4-10 pairs, 2.5-6.5 Cm. (1-2½') long, lanceolate, dentate; flowers small, white or rose color, agreeably odorous, terminal corymbs, corolla 5-lobed, stamens 3, sessile; fruit, capsule, 4 Mm. (¼') long, plano-convex, compressed,

4-ribbed, pale brown, 1-seeded, oblong-ovate. RHIZOME, upright, 2-4 Cm. ($\frac{4}{5}$ - $1\frac{3}{5}$ ') long, 1-2 Cm. ($\frac{2}{5}$ - $\frac{4}{5}$ ') thick, usually cut longitudinally into 2-4 pieces, yellowish-brown, upper portion with stem-bases, frequently, with a short, horizontal branch or stolon, from outer surface numerous, slender, brittle roots; fracture short, horny; internally light brown with a thick bark and narrow, central cylinder; odor of valeric acid, stronger upon aging; taste sweetish, camphoraceous, somewhat bitter. POWDER, grayish-brown—numerous starch grains, .003-.02 Mm. ($\frac{1}{8}$ $\frac{3}{32}$ $\frac{5}{5}$ - $\frac{1}{12}$ $\frac{5}{50}$ ') broad, tracheal fragments, walls with pores or thickenings, narrow fibers with walls thin, porous, lignified, occasional fragments of epidermis with root hairs and fragments of cork. *Solvents*: water; alcohol. Dose, gr. 15-60 (1-4 Gm.).

ADULTERATIONS.—Rhizome and roots of *V. Phu*, *V. dioica*, *Cynanchum Vincetoxicum*, *Veratrum album*, *Sium latifolium*, *Scabiosa succisa*, and *S. arvensis*, also several ranunculaceous roots.

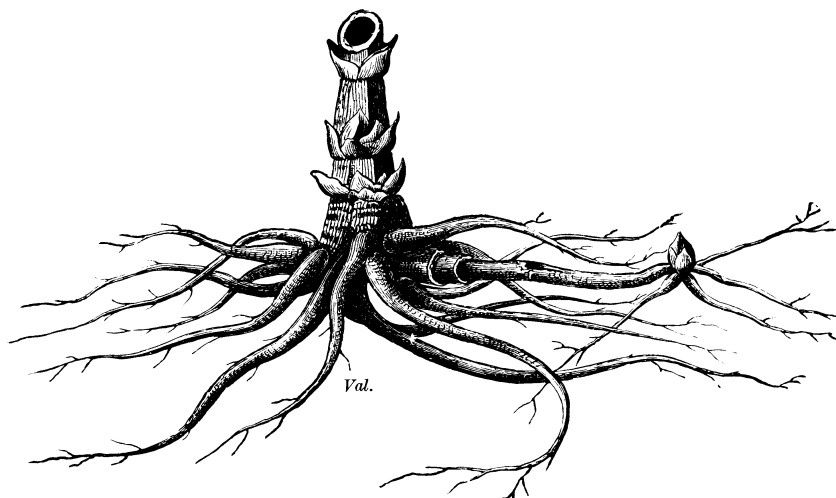


FIG. 402.—*Valeriana officinalis*: rhizome, roots, and rootlets.

Commercial.—Valerian flourishes equally well in damp woods, meadows, and dry places, affording a variability in characteristics that has suggested four varieties, all, however, being one and the same and yielding identical constituents; it is cultivated in England (best), Germany, Holland, United States (New Hampshire, Vermont, New York), very little of the wild grown, although stronger and smaller, being utilized. Rhizome is collected in the spring before stem begins to shoot, or preferably in autumn, when leaves decay, from dry soil plants, and at first is without specific odor; tops are cut off in the spring to prevent seeding and thereby strengthen the rhizome, which must

VALERIANACEÆ

be dug carefully, washed, dried (entire or split) in kilns, packed tightly, and kept dry to prevent deterioration.

CONSTITUENTS.—Volatile oil .5–3 p. c., Valeric acid, formic, acetic, malic acids, chatinine, tannin, resin, starch, mucilage, sugar, ash 15–20 p. c. (largely manganese).

Volatile Oil, (Oleum Valerianæ), U.S.P. 1860–1890.—This is obtained by distilling with water; it is a pale green liquid, pungent valerian odor, aromatic taste, sp. gr. 0.945, yellow and viscid on exposure, levorotatory; contains: 1, a terpene—borneene, $C_{10}H_{16}$, boiling at $157^{\circ} C.$ ($315^{\circ} F.$); 2, an alcohol—borneol (liquid, and solid crystalline compound), $C_{10}H_{18}O$, with the liquid portion chromic acid yields camphor along with formic, acetic, and valeric acids, these latter being likewise present in old rhizomes from slow oxidation of this $C_{10}H_{18}O$; 3, an ether—borneol, or borneol oxide, $(C_{10}H_{17})_2O$, greenish syrupy oil, but colorless when rectified, along with formic, acetic, and valeric esters, which, by oxidation, form their respective acids. Recent investigators claim these components to be pinene, camphene, borneol, and the formic, acetic, and isovaleric esters of borneol. Dose, $\text{m}\bar{j}$ –5 (.06–.3 cc.).

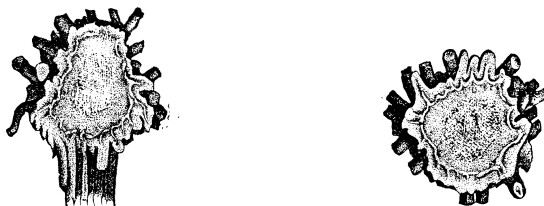


FIG. 403.—Valeriana: longitudinal and transverse sections.

Valeric (Valerianic) Acid, Acidum Valer(ian)icum, $C_5H_{10}O_2$, U.S.P. 1860–1870.—Not in fresh rhizome, but results from oxidation of the volatile oil on exposure—a change believed dependent largely upon presence of manganese; however, this is obtained mostly by oxidizing amyl alcohol with sulphuric acid and potassium dichromate. It is an oily liquid, volatile, with characteristic odor, salts sweet-tasted.

PREPARATIONS.—1. *Tinctura Valerianæ*. Tincture of Valerian. (Syn., Tr. Valer.; Fr. Teinture de Valériane; Ger. Baldriantinktur.)

Manufacture: 20 p. c. Similar to *Tinctura Veratri Viridis*, page 104; menstruum: 75 p. c. alcohol. Dose, $\bar{3}$ _{ss}–2 (2–8 cc.).

2. *Tinctura Valerianæ Ammoniata*. Ammoniated Tincture of Valerian. (Syn., Tr. Valer. Ammon., *Tinctura Valerianæ Composita*; Fr. Teinture de Valériane ammoniacale; Ger. Ammoniakalische Baldriantinktur.)

Manufacture: 20 p. c. Similar to *Tinctura Veratri Viridis*, page 104; menstruum: aromatic spirit of ammonia. Dose, $\bar{3}$ _{ss}–2 (2–8 cc.).

3. *Fluidextractum Valerianæ, N.F.* (80 p. c. alcohol). Dose, $\text{m}\bar{xv}$ –60 (1–4 cc.).

Unoff. Preps.: Abstract, gr. 5–20 (.3–1.3 Gm.). *Extract*, gr. 5–10 (.3–.6 Gm.). *Infusion*, 3j–2 (30–60 cc.). Syrup. Water (*Aqua*).

PROPERTIES.—Similar to other drugs having a volatile oil. Stimulant, anodyne, nervine, antispasmodic, vermifuge, no narcotic effect; increases heart action and temperature, causing exhilaration, stimulates circulation, secretion, and peristalsis of the stomach and intestines; it is eliminated by kidneys, bronchial and genito-urinary mucous membranes; if used continuously, may produce melancholia, hysteria. Large doses cause nausea, diarrhea, urination, delirium, lessen motility, sensibility, and reflex excitability; the oil paralyzes the brain, spine, slows pulse, lowers blood-pressure.

USES.—Hysteria, hypochondriasis, hemicrania, nervous coughs, whooping-cough, diabetes, delirium tremens, typhoid state, dysmenorrhea, vertigo, epilepsy, worm convulsions, flatulence, reflex neuralgia.

Allied Plants:

1. *Valeriana Walli'chii*, *Valerianæ Indicæ Rhizoma* (Br.); India; rhizome 5 Cm. (2') long, 10 Mm. ($\frac{2}{3}$ ') thick, brown, curved, many root-scars, few thick roots—equivalent to official. *V. Phu'*; W. Asia, S. Europe; tall perennial; rhizome (*Radix Valerianæ Majoris*) is 10–15 Cm. (4–6') long, 12 Mm. ($\frac{1}{2}$ ') thick, annulated, brown; *V. mexicana* and *V. tolucca'na*, Mexico. All three yield valeric acid; odor and taste weaker than official.

2. *V. celtica* (*Nardus Spica celtica*).—Alps, and *Nardos'tachys Jataman'si*, *Nar'dus in'dica* (*Spica nardi*) or true spikenard, India; the former has valerian odor, the latter that of serpentaria.

65. CUCURBITACEÆ. Gourd Family.

Ku-ker-bi-ta'se-e. L. *Cucurbit-a* + aceæ, a gourd, fr. *curvitas*, crookedness—*i. e.*, referring to the fruit's shape. Herbs. Distinguished by possessing acrid, bitter, purgative properties, succulent nature, prostrate or climbing, with tendrils; leaves and stem scabrous; flowers unisexual, calyx 5-toothed, tube adnate to the ovary; corolla 5's, perigynous; stamens mostly 3, usually united; ovary 1–3-celled; inferior; fruit succulent, pulpy, edible; seeds flat, many, exalbuminous; tropics; purgative (pulp), edible, poisonous.

Genera. 1. **Ecballium**. 2. **Citrullus**. 3. **Cucurbita**.

ECBALLIUM. SQUIRTING CUCUMBER.

Elaterinum. **Elaterin**, $C_{20}H_{28}O_6$, *U.S.P.*

Ecballium Elaterium, { A substance obtained from the juice of the
(*Linné*) *A. Richard*. { fruit.

Habitat. W. Asia, N. Africa, S. Europe—Mediterranean Basin, dry waste places; cultivated.

CUCURBITACEÆ

Syn. Squirting or Wild Cucumber, Wild Balsam Apple; Fr. Concombre sauvage, Elatérine, Elatine; Ger. Eselsgurke, Springgurke, Elaterin.

Ec-bal'li-um. L. fr. Gr. ἐκ, out, + βάλλειν, to throw—*i. e.*, the fruit expelling its contents when fully ripe.

El-a-te'ri-um. L. fr. Gr. ἐλατήριον, driving out, purging—*i. e.*, its medicinal property. **El-a-te-ri'num**, **E-lat'er-in**—both simply derivative names.

PLANT.—Common perennial, squash-like vine; stem trailing, tendril-bearing, succulent, bristly, .6–1.3 M. (2–4°) long; leaves cordate, 7.5–12.5 Cm. (3–5') long, lobed, hispid, pale green; flowers monœcious, yellow; fruit 5 Cm. (2') long, 2.5 Cm. (1') broad, oblong, pale yellowish-green, beset with fleshy prickles, 3-celled, containing bitter, watery, mucilaginous juice in which are many light brown seed.

CONSTITUENTS.—Elaterin 44 p. c., green resin 17 p. c., starch 6 p. c.; prophetin, ecballin (elateric acid), hydroelaterin, elaterid.

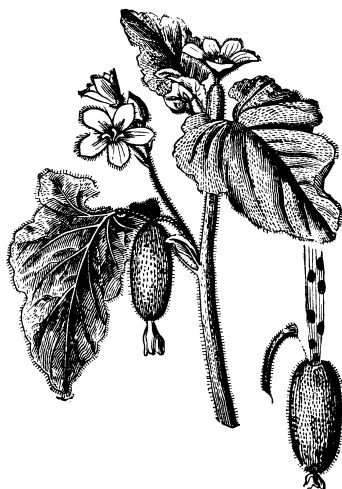


FIG. 404 —*Ecballium Elaterium*.

Elaterinum. Elaterin.—Obtained by exhausting elaterium (a substance deposited by the juice of the fruit) with hot alcohol and precipitating with water, or treating with hot chloroform and precipitating with ether, washing with ether and recrystallizing from alcohol or chloroform. It is in minute, white, hexagonal scales, prismatic crystals; odorless; slightly acrid, bitter taste, permanent, soluble in alcohol (325), boiling alcohol (100), chloroform (15.5), ether (450), benzene (310); insoluble in water; alcoholic solution neutral. *Tests:* 1. Solution of .01 Gm. in 5 cc. of melted phenol, + a few drops of sulphuric acid—crimson, rapidly changing to scarlet; incinerate—ash negligible. 2. Shake .1 Gm. with distilled water 9 cc. + diluted hydrochloric acid 1 cc.; to separate portions of filtrate add .5 cc.

mercuric potassium iodide T. S., or iodine T. S.—no turbidity (abs. of alkaloids). *Impurities*: Alkaloids, readily carbonizable substances. Dose, gr. $\frac{1}{20}$ – $\frac{1}{10}$ (.003–.006 Gm.).

ADULTERATIONS.—ELATERIUM: Starch, calcium carbonate, various minerals colored green. Owing to this adulteration and the irregular treatment in collecting and curing, it becomes a very uncertain product, hence the official Elaterin is much to be preferred, which as a rule is pure.

Commercial.—Fruit when ripe is yellow and falls to the ground from its attachment, and at the instant of separation the entire contents are expelled violently (hence called squirting cucumber), through the socket or peduncle orifice—due to osmosis from pericarp to central pulp, causing engorgement, therefore tension and rupture at weakest point. Elaterium should be prepared from the fruit collected with the stalk, just before ripe, cutting fruit lengthwise, lightly pressing (best without pressure), straining the juice, setting aside to deposit, and putting this (sediment) on porous tiles to dry by gentle heat, avoiding exposure to the sun. Forty cucumbers without pressure yield 6 gr. (.4 Gm.), and 40 pounds (18 Kg.) yield only 240 gr. (15.5 Gm.). Elaterium occurs in grayish fragments or scales, odor tea-like, taste bitter, acid; should not effervesce with hydrochloric acid. Dr. Clutterbuck's is considered best.

PREPARATIONS.—(*Unoff.*) ELATERIN: *Trituration*, 10 p. c., gr. $\frac{1}{2}$ – $\frac{3}{4}$ (.03–.05 Gm.). *Pulvis Elaterini Compositus*, 2.5 p. c., gr. 1–4 (.06–.26 Gm.). ELATERIUM, dose, gr. $\frac{1}{8}$ – $\frac{1}{4}$ (.008–.016 Gm.). *Solution of Elaterium*, $\frac{1}{4}$ p. c., in alcohol + $\frac{1}{2}$ p. c. nitric acid, dose, ℥xxx (2 cc.).

PROPERTIES.—Hydragogue cathartic (most powerful known), producing profuse watery evacuations with griping and much prostration; large doses nauseate, vomit, inflame stomach and bowels, increase flow of urine, and may kill. Does not vomit nor purge dogs, rabbits, but kills them by convulsions. Those working in it often have ulcerated fingers, eyes, etc.

USES.—The fruit was employed by the ancients, being recommended by Dioscorides in mania, melancholia. Sydenham used it in dropsy, but it fell into disfavor through its severity, until brought forward again by Dr. Ferriar. Useful in dropsy, Bright's disease with dropsy (as it is believed to eliminate more urea through the bowels than any other cathartic), brain and lung congestion, uremia, but never in heart disease.

Poisoning.: Same as for aloe, etc. Evacuate stomach, give demulcents, opium, stimulants.

Allied Plants:

1. *Bryo'nia al'ba* or *B. dioi'ca*, *Bryonia*, *Bryony*, *N.F.*—The dried root with not more than 2 p. c. of foreign organic matter; C. and S. Europe. Perennial climbers, the former monœcious, the latter diœcious; leaves heart-shaped, 5-lobed; flowers small, greenish-white or yellowish; fruit, berries, size of a pea, the former black, the latter red (hence

CUCURBITACEÆ

names black and red bryony). Root, spindle-shaped, .3-.6 M. ($1-2^{\circ}$) long, lactescent, fleshy, usually in circular slices 1.5-10 Cm. ($\frac{3}{8}-4'$) broad, 3-15 Mm. ($\frac{1}{8}-\frac{3}{8}'$) thick, yellowish, whitish, rough, striate, thin cortex, wood with projecting fibro-vascular bundles in concentric zones; fracture short, mealy, whitish; odor faint, distinct, characteristic, taste bitter, nauseous. Powder, light yellow—starch grains, central cleft, tracheal pores, large yellow cork cells; with sulphuric acid—reddish-brown, then brownish-purple; contains alkaloid (amorphous), bryonol (dihydric alcohol)—both purgative, volatile oil; resin, glucoside (inactive), enzyme, sugar, phytosterol; solvents: alcohol, hot water. Hydragogue cathartic, emmenagogue, vesicant, emetic (large doses). Used in dropsy, epilepsy, hysteria, bronchitis, whooping-cough, rheumatism, swollen glands, scabies; large doses poisonous. Dose, gr. 10-60 (.6-4 Gm.); 1. *Tinctura Bryoniae*, 10 p. c. (alcohol), dose, mxv -60 (1-4 cc.). Infusion, 5 p. c., $\mathfrak{z}\text{j}$ -2 (30-60 cc.). Mother Tincture (Homeopathic), mv -40 (.3-2.6 cc.); Bryonin, gr. $\frac{1}{6}-\frac{1}{3}$ (.01-.02 Gm.).

FIG. 405.—*Bryonia dioica*.

2. *Cayapo'nia america'na* (*Bryonia americana*); W. Indies, *Bryonia Kedros'tis na'na (africa'na)*; S. Africa.—Both in their respective countries are used like bryonia, especially for dropsy; *B. epigæ'a*; India—used natively as an alterative in syphilis, and as a remedy for snake-bites.

3. *Momor'dica Balsam'ina*, *Balsam Apple*, E. India.—Climbing plant, also cultivated in gardens throughout the United States for its yellow cucumber-like fruit. This is soaked in whisky and used domestically as a vulnerary.

4. *Luffa Luffa (ægypti'aca)*, Egypt, and *L. opercula'ta*, Brazil. *Vegetable Sponge*, *Wash-rag Sponge*, *Gourd Towel*. *Cucumis myriocar'pus*; S. Africa.—These produce analogous fruits, which have similar action to colocynth, while the derma of *Luffa* serves as sponge.

COLOCYNTHIS. COLOCYNTH, *U.S.P.*

Citrullus Colocynthis,
(*Linné*) *Schrader.* { The dried pulp of unripe but fully-grown fruit with
not more than 5 p. c. seed nor 2 p. c. epicarp,
yielding not more than 2 p. c. extractive (purified
petroleum benzin) nor 6 p. c. acid-insoluble ash.

Habitat. S. and W. Asia, N. and S. Africa, in arid places, deserts; Arabia, Syria, Egypt, Morocco, Cape of Good Hope, Greece, Spain, Japan; cultivated.

Syn. Colocyn., Colocynth Pulp, Bitter Apple, Colocynth Apple (Fruit), Cucumber, or Gourd; Br. Colocynthisdis Pulpa, Colocynth Pulp, Poma Colocynthisdis; Fr. Coloquinte; Ger. Fructus Colocynthisdis, Koloquinthen, Coloquinthenapfel.

Ci-trul'lus. L. *citrus*, an orange, Gr. *κίτρον*, citron, Ar. origin—*i. e.*, named after color of the fruit when cut—orange-red.

Col-o-cyn'this. L. fr. Gr. *κολοκύνθις*, the classic name of the plant.

PLANT.—Perennial tendril-bearing vine; stem angular, hispid, herbaceous; leaves many-lobed, hairy, 2.5–10 Cm. (1–4') long, sub-palmately cleft on long hispid petioles; tendrils, with which it climbs, short, branching; flowers large, monœcious, both kinds similar, solitary, yellow. **FRUIT**, before removing seed, nearly globular, 4–7 Cm. (1½–3') broad, size of a small orange, usually more or less crushed and in broken pieces, with occasional patches of nearly smooth epicarp; yellowish-white; light, spongy; separable longitudinally when entire into 3 carpels, each containing, near the outer surface, the ovoid, compressed, yellowish seed; odor slight; taste intensely bitter. **POWDER** yellowish-white, buff and characteristically flaky—fragments of parenchyma and vascular bundles, stone cells, aleurone grains, globules of fixed oil. *Solvents*: alcohol; diluted alcohol; water. Dose, gr. 2–10 (.13–.6 Gm.); laxative, gr. 2–5 (.13–.3 Gm.); drastic purgative, gr. 5–10 (.3–.6 Gm.), repeated in 8–12 hours if necessary.

Commercial.—Plant resembles closely the watermelon (*C. Citrullus*—an annual with larger, smoothish leaves, and much larger sweetish fruit), and has been cultivated in English gardens since 1551. It is a very old medicine, the pulp, constituting 24.5 p. c. of the peeled fruit, being the portion that alone should be used; the separated and rejected seed possess slight bitterness, but also a fixed oil, 12.72 p. c., that, upon removal of testa, renders the kernels (one-half oil) somewhat prized in Africa for food, bread, etc. There are two varieties: 1, *Peeled (Turkey)*, the smaller, best, usually from the maritime plain between the mountains of Palestine and the Mediterranean; shipped chiefly from Jaffa, Trieste, that from Spain being smaller, darker, more compact, less pulp, blackish seed; 2, *Unpeeled (Mogador)*, the larger, inferior, covered with smooth, yellowish-brown firm rind. Fruit is gathered in autumn when turning yellow, peeled (or this, if to be done, may be deferred until after drying) and dried quickly by sun or fire; not known or used by native physicians as a cathartic, but simply as a protection against moths.

CUCURBITACEÆ

CONSTITUENTS.—Pulp 24.5 p. c., Seed 75.5 p. c. Pulp contains colocynthin 2 p. c., Colocynthinin, pectin, gum (no starch), ash 15 p. c.; seed contain alkaloid (trace), fixed oil 12.72 p. c., albuminoids 6 p. c., ash 2-4 p. c. (whole fruit 4-5 p. c.).

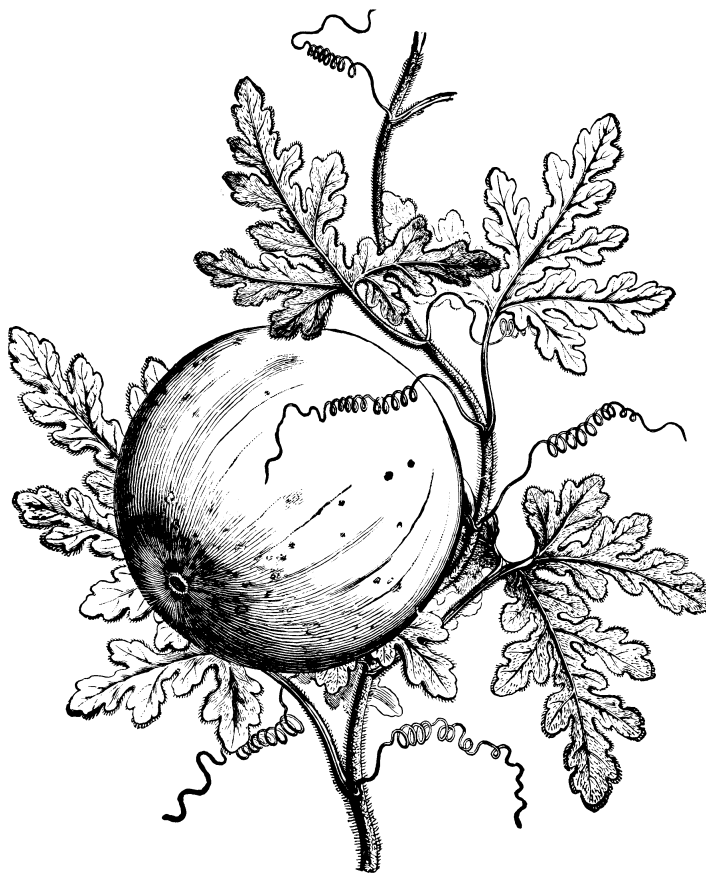


FIG. 406.—*Citrullus Colocynthis*.

Colocynthin, $C_{56}H_{84}O_{24}$.—The chief cathartic principle; an amorphous glucoside (bitter principle), obtained by exhausting with water the alcoholic extract, precipitating filtrate with lead acetate and subacetate; the yellow filtered liquid is treated with H_2S to remove lead. filtered, then precipitated with tannin. This tannate of colocynthin is dissolved in alcohol, the tannin thrown down by lead subacetate, filtered liquid digested with animal charcoal, filtered, evaporated. It

is a yellow powder, soluble in water, alcohol, boiled with diluted acids splits into sugar and resinous colocynthein. Dose, gr. $\frac{1}{2}$ –1 (.03–.06 Gm.)—hypodermically, gr. $\frac{1}{6}$ – $\frac{1}{3}$ (.01–.02 Gm.), by which method it is painful, and should be associated with cocaine. The “Eclectic” resinoid, *colocynthin*. Dose, gr. $\frac{1}{4}$ –1 (.016–.06 Gm.).

Colocynthitin (*citrullin*).—A resin left after treating alcoholic extract with cold water in preparing colocynthin; occurs in white, tasteless microscopic prisms, soluble in ether, hot alcohol.

PREPARATIONS.—1. *Extractum Colocynthis*. Extract of Colocynth. (Syn., Ext. Colocyn., Powdered Extract of Colocynth, Extractum Colocynthis Alcoholicum; Fr. Extrait de Coloquinte; Ger. Koloquintenextrakt.)

Manufacture: Macerate, percolate 100 Gm. with diluted alcohol until exhausted (500 cc.), reclaim alcohol, evaporate residue to dryness, pulverize, add dried starch q. s. 25 Gm.; mix thoroughly, pass through fine sieve; 1 Gm. represents 4 Gm. of the drug. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. $\frac{1}{2}$ –2 (.03–.13 Gm.).

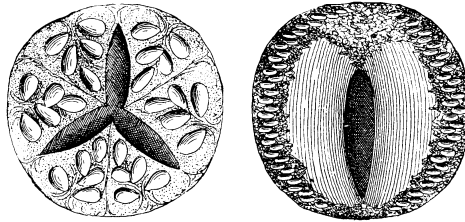


FIG. 407.—Peeled colocynth: transverse and longitudinal sections.

Prep.: 1. *Extractum Colocynthis Compositum*. Compound Extract of Colocynth. (Syn., Ext. Colocyn. Co., Powdered Compound Extract of Colocynth; Fr. Extrait de Coloquinte composé; Ger. Zusammengesetztes Koloquintenextrakt.)

Manufacture: Triturate together until No. 60 powder, extract of colocynth 16 Gm., aloe 50, cardamom seed 5, resin of ipomœa 14, soap (dried powder) 15, pass through fine sieve. Should be kept in small, wide-mouthed, tightly-stoppered bottles. Dose, gr. 5–15 (.3–1 Gm.).

Preps.: 1. *Pilulæ Hydrargyri Chloridi Mitis Compositæ*, $1\frac{1}{4}$ gr. (.075 Gm.). 2. *Pilulæ Catharticæ Vegetabiles*, *N.F.*, 1 gr. (.06 Gm.)—ext. colocyn. co. 6 Gm., ext. hyosc. 3, res. jalap 2, ext. leptand., res. podoph. $\bar{a}\bar{a}$ 1.5, ol. menth. pip. .8, alcohol dil. q. s. 100 pills, Dose, 1.3 pills.

Unoff. Preps.: *Fluidextract*, dose, mij–10 (.13–.6 cc.). *Tincture*, 10 p. c. (alcohol), $\bar{3}$ ss–1 (2–4 cc.).

CUCURBITACEÆ

PROPERTIES.—Drastic and hydragogue cathartic, hepatic stimulant, diuretic; small doses bitter, stomachic; large doses emetic, irritant poison, causing violent griping, dangerous bowel inflammations—gr. 90 (6 Gm.) have killed.

USES.—The Greeks and Arabians were unacquainted with its drastic effect, but prescribed it for its other properties. Now used as an evacuant, dropsy, melancholia, coma, apoplexy, paralysis, but never in pregnancy, nor where gastric or intestinal inflammation is present. It is very harsh and seldom used alone.

Poisoning: Same as for aloe, etc. Evacuate stomach, give demulcents, opium, stimulants.

PEPO. PEPO, U.S.P.

Cucurbita Pepo, *Linné*. { The dried ripe seed of cultivated varieties with not more than 5 p. c. broken or defective seeds, or other foreign organic matter.

Habitat. Tropical Asia, America; cultivated.

Syn. Pumpkin Seed, Pumpkin, Pompion, Cold Seeds, Semen Peponis, Semina Cucurbitæ; Br. Cucurbitæ Semina Preparata; Fr. Semences de Petirons; Ger. Kürbissamen.

Cu-cur'bi-ta. L. see etymology, page 597, of Cucurbitaceæ.

Pe'po. L. fr. Gr. *πέπων*, pumpkin, old form, pompon, lit. cooked by the sun, ripe, mellow—*i. e.*, not eaten until ripe.

PLANT.—Trailing annual; stem rough, hollow, hairy, 3–9 M. (10–30°) long, tendrils branched; leaves large, .25–.5 M. (10–20') long, 15–30 Cm. (6–12') wide, obtusely cordate, hispid, palmately 5-lobed, serrate, petioles 7.5–20 Cm. (3–8') long; flowers July, large, 5–12.5 Cm. (2–5') wide, yellow, bell-shaped, monœcious, axillary; anthers 3, syngenesious; fruit Oct., large, round, oblong, smooth, fleshy, yellow, furrowed, .25–.5 M. (10–20') in diameter. SEED, broadly elliptical, ovate, 15–23 Mm. ($\frac{3}{8}$ – $\frac{5}{8}$ ') long, 6–9 Mm. ($\frac{1}{4}$ – $\frac{3}{8}$ ') broad, 2–3 Mm. ($\frac{1}{12}$ – $\frac{1}{8}$ ') thick; yellowish-white, smooth, occasionally with thin transparent fragments of adhering pulp, shallow groove parallel to and within 1 Mm. ($\frac{1}{25}$ ') of the margin; fracture short, seed-coat consisting of a white coriaceous outer layer and a membranous inner layer (sometimes dark green); embryo whitish, straight with small conical hypocotyl and 2 plano-convex cotyledons; slightly odorous when contused; taste bland, oily. POWDER, yellowish-white,—epidermal cells, stone cells, parenchyma cells, endosperm cells with aleurone grains, cotyledons with cells containing fixed oil and many small aleurone grains; integuments 21 p. c., kernel 79 p. c. *Solvent*: alcohol. Dose, $\mathfrak{z}\text{j}$ –2 (30–60 Gm.).

CONSTITUENTS.—Resin (yielding phytosterin, etc.) .5 p. c. Fixed oil .30 p. c., proteins (myosin, vitellin), cucurbitine (?), salicylic acid, sugar, ash 3–4 p. c.

Resin.—Probably the active principle, residing in the tegmen or embryo, obtained by treating the seed, after the removal of fixed oil, with alcohol, ether, chloroform; it is soft, greenish-brown, acrid, bitter. Dose, gr. 15 (1 Gm.).

Fixed Oil.—Claimed to possess (℥iv; 15 cc.) the medicinal power of the drug, due no doubt to the presence of some resin, and is obtained by expression, or by treating seed with benzin; consists of the glycerides of oleic, myristic, and palmitic acids. The seed-infusion saturated with sodium chloride precipitates myosin, and when CO₂ is added vitellin separates, which behaves like egg-yolk (due to its contained vitellin); the protein is possibly its emulsionizing principle.

PREPARATIONS.—(Unoff.): *Fluidextract*, dose, ℥ss–1 (15–30 cc.). *Emulsion* (℥ij–4; 60–120 Gm. fresh seed, deprived of testa, should be beaten into a paste with sucrose + water or milk Oj; .5 L.), dose, ℥v (150 cc.) at 2-hour intervals beginning at 10 o'clock A.M. Patients should remain quietly in bed all day; on the night before, and also before breakfast, give saline purgative to remove mucus, and about 3–4 hours after the pint (.5 L.) has been taken administer castor oil ℥j–2 (30–60 cc.). Should fast the day previous to taking the medicine.

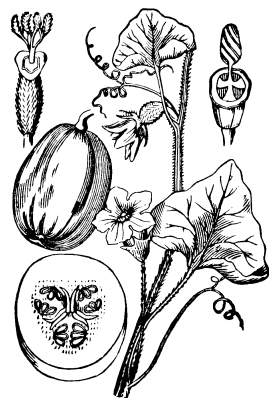


Fig. 408.—*Cucurbita Pepo*.

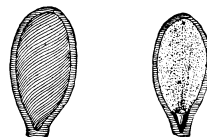


FIG. 409.—Pumpkin seed; entire and longitudinally divided, showing embryo.

PROPERTIES AND USES.—Tenifuge, vermifuge, diuretic, valuable because of its freedom from taste and harshness of action, but has the disadvantage of uncertainty. Same treatment applies to tape- and lumbricoid worms.

Allied Plant:

1. *Citrullus Citrullus* (*vulgaris*)—*Cucurbita* (*Cucumis*) *Citrullus*, *Watermelon Seed*.—S. Asia; cultivated. Fruit edible, very large; seed flat, ovate, 12 Mm. ($\frac{1}{2}$ ') long, blackish, marbled, or orange-brown, ungrooved, blunt on the edge, otherwise like pumpkin seed. Kernels contain fixed oil 7.4 p. c., petroleum benzin extract 19 p. c., proteins, sugar, resin (cucurbitol—closely related to grindelol and ipurganol); diuretic, tenifuge, anthelmintic. Dose, ℥ij–16 (8–60 Gm.).

66. CAMPANULACEÆ. Bell-flower Family.

Kam-pan-u-la'se-e. L. *Campanul-a* + aceæ. dim. of *campana*, a bell—i. e., from the resemblance of the corolla. Herbs, shrubs. Dis-

CAMPANULACEÆ

tinguished by alternate exstipulate leaves; acrid and usually milky juice; solitary perfect flowers, calyx 5-lobed, corolla gamopetalous, campanulate or rotate, limb 5-lobed, stamens separate or synegenesious; ovary 2-5-celled, inferior; fruit capsule or berry; temperate climates; emetic, diaphoretic, narcotic.

Genus: 1. **Lobelia.**

LOBELIA. LOBELIA, *U.S.P.*

Lobelia inflata, { The dried leaves and tops with not more than 10
Linné. { p. c. stems, nor 2 p. c. other foreign organic matter,
 yielding not more than 5 p. c. acid-insoluble ash.

Habitat. N. America (Canada, United States), in fields and open places.

Syn. Lobel., Indian Tobacco, Wild Tobacco, Green, Brown, Bladder-podded Lobelia, Emetic Herb (Weed), Asthma (Puke) Weed, Gag Root, Vomit Wort, Low Belia, Eyebright; Fr. Lobélie enflée; Ger. Herba Lobelia, Lobelienkraut.

Lo-be'li-a. L. after Matthias de Lobel, Flemish botanist, physician, and author of several botanical works, 1538-1616, native of Lille, became physician and botanist to James I., died in London.

In-fla'ta. L. *inflatus*, inflated, swollen—*i. e.*, seed are borne in egg-shaped inflated pod.

PLANT.—Annual herb, .3-.6 M. (1-2°) high, erect, paniculately branched; stem cylindrical, coarsely and irregularly furrowed, yellowish green, occasionally purplish, pubescent with numerous spreading hairs; root fibrous. **LEAVES**, alternate, ovate, oblong, 2-9 Cm. ($\frac{4}{5}$ -3 $\frac{3}{5}$ ') long, sessile or narrowing into a short petiole, obtusely toothed, irregularly serrate-denticulate, each tooth with a yellowish-brown, gland-like apex; pale green with scattered, bristly hairs; flowers blue, long, loose racemes with short pedicles, calyx tube ovoid with 5 subulate teeth, corolla tubular, 3-4 Mm. ($\frac{1}{5}$ - $\frac{1}{6}$ ') long, 5-parted, the upper 2-lobed portion cleft nearly to the base; stamens with anthers united above into a curved tube enclosing the bifid stigma; capsules inflated, ovoid, ellipsoidal, 5-8 Mm. ($\frac{1}{5}$ - $\frac{1}{3}$ ') long, light brown, inferior, enclosing numerous coarsely reticulate seed; odor slight, irritating; taste strongly acrid. **POWDER**, dark green, odor irritating—fragments of seed-coat composed of polygonal cells with thick yellowish walls; occasional elongated-conical, non-glandular hairs; fragments of stem with tracheæ having thickenings, pores, narrow wood-fibers with thin, lignified porous walls; fragments of leaf epidermis with elliptical stomata, pollen grains nearly spherical. Loses on drying 75 p. c. *Solvents*: diluted alcohol; boiling water. Dose, expectorant, gr. 1-5 (.06-.3 Gm.); emetic, gr. 10-20 (.6-1.3 Gm.).

ADULTERATIONS.—Rare—except its own stems and roots.

Commercial.—Lobelia was popular with the North American Indians, but Dr. Cutler, of Massachusetts, introduced it into our medical practice. It should be collected Aug.-Sept., carefully dried, and sold loosely or in various-sized compressed packages; powder keeps well.

CONSTITUENTS.—Lobeline, Lobelacrin, Lobelic acid, Inflatin, a second alkaloid (?), resin, wax, volatile oil (lobelianin), fixed oil (seed) 30 p. c., gum, ash 8 p. c.

Lobeline.—Obtained by evaporating to syrup the acetic-alcoholic tincture (preferably of seed), triturating this with magnesium oxide in excess, agitating filtrate with ether, evaporating, getting impure alkaloid. It is a yellow, aromatic liquid, acrid taste, convertible into amorphous powder and non-crystalline salts (hydrobromide, sulphate, etc.) soluble in water. Dose (sulphate), gr. $\frac{1}{6}$ –1 (.01–.06 Gm.).

Lobelacrin.—Obtained by concentrating tincture in the presence of charcoal, washing with water, exhausting with boiling alcohol; it is the acrid principle—possibly lobelate of lobeline, brown, soluble in ether or chloroform, splitting with dilute acids or alkalies into sugar and lobelic acid.

Lobelic Acid.—Obtained by precipitating decoction of leaves with copper sulphate, and decomposing with hydrogen sulphide; it is colored olive-brown by ferric salts.

Inflatin.—Neutral principle (wax), tasteless crystals, no medicinal value.



FIG. 410.—*Lobelia inflata*.

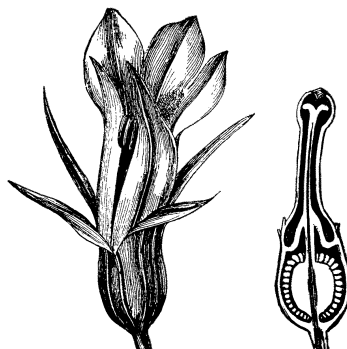


FIG. 411.—*Lobelia* flower and section: magnified 5 diam.

PREPARATIONS.—1. *Tinctura Lobeliae*. Tincture of Lobelia. (Syn., Tr. Lobel.; P. I. Lobeliae tinctura; Fr. Teinture de Lobélie; Ger. Lobelientinktur.)

Manufacture: 10 p. c. Similar to Tinctura Veratri Viridis, page 104; menstruum: diluted alcohol. Dose, $\text{m}\nu$ –30–60 (.3–2–4 cc.).

2. *Fluidextractum Lobeliae*, N.F. (1st menstruum:—acetic acid 5 cc., alcohol 50, water 45; 2d—diluted alcohol), Dose, mj –5–20 (.06–.3–1.3 cc.).

COMPOSITÆ

Unoff. Preps.: *Acetum*, 10 p. c., m̄v-60 (.3-4 cc.). *Extract*, gr. $\frac{1}{2}$ -2 (.03-.13 Gm.). *Infusion*, 5 p. c., ℥ss-1 (15-30 cc.). *Tinctura Lobeliae Ætherea* (Br.), 20 p. c. (spirit of ether), m̄v-15 (.3-1 cc.). The "Eclectic" *lobelin*, made in the usual way, is an impure resinoid, gr. $\frac{1}{2}$ -1 (.03-.06 Gm.).

PROPERTIES.—Expectorant, emetic, nervine, purgative, narcotic, diuretic, diaphoretic; similar to ipecac, but causes more distressing nausea and intense prostration; it paralyzes the motor nerves, vaso-motor center, and peripheral vagi. Leaves chewed a short time cause giddiness, headache, tremors, nausea, vomiting; full doses give speedy and severe vomiting, general relaxation, cold skin with sweating; resembles tobacco, is dangerous, having caused many deaths.

USES.—Spasmodic asthma, catarrh, croup, bronchial spasms, whooping-cough, in enema for intussusception, strangulated hernia, constipation—when feces hard and dry; externally for poison-ivy (oak) eczema. Should not be given as an emetic, and is too depressing for children.

Poisoning: Have burning pain in fauces, esophagus, motor weakness, great depression, feeble pulse, low temperature, anxious, livid countenance, contracted pupils, vertigo, tremors, cold sweat, pale skin, sometimes violent purging, collapse, stupor, coma, death from respiratory failure. Place in recumbent position, empty stomach if vomiting has not been free, give tannin, cardiac and respiratory stimulants, strychnine, picrotoxin, thebaine, alcohol, digitalis, atropine or belladonna, digitalis, morphine, artificial heat, ergot, castor oil.

Incompatibles: Strychnine, picrotoxin; caustic alkalies decompose lobeline, making preparations inert.

Synergists: Emetics, motor depressants.

Allied Plants:

1. *Lobelia syphilitica*, *Great Lobelia*.—Stem .6-1 M. (2-3°) high; flowers large, 2.5 Cm. (1') long, beautiful blue; diaphoretic. Used by the aborigines for syphilis.

2. *L. cardinalis*, *Cardinal-flower*.—Stem .6-1.3 M. (2-4°) high; flowers large, showy, intense cardinal or scarlet-red. Used by Indians as anthelmintic; similar to *L. syphilitica*, but milder.

67. COMPOSITÆ. Composite (Thistle) Family.

Kom-poz'i-te. L. *Composit-us* + æ, pp. of *componere*, compounded —i. e., referring to the two kinds of florets (ray and disk) composing each flower-head. Herbs, shrubs. Distinguished by being the largest family, by possessing bitter principles, watery or resinous (rarely milky) sap; flowers (florets) 5's, in compound heads surrounded by involucre; calyx superior, tube adnate to ovary, limb often pappose or membranous; corolla epigynous, usually 5-lobed, stamens 5, epipetalous, syngenesious; ovary inferior, 1-celled; ovule 1, erect; fruit achene; universal; tonic, laxative, anthelmintic (bitter principle). aromatic, carminative, diaphoretic, stimulant (volatile oil).

Genus: 1. *Artemisia*.

SANTONICA. SANTONICA.

Santoninum. Santonin, $C_{15}H_{18}O_8$, *U.S.P.*

Artemisia pauciflora, } The inner anhydride (lactone) of santoninic
(*Ledebour*) *Weber.* } acid, obtained from the dried unexpanded
flower-heads (santonica).

Habitat. N. Turkestan, Russia, on the vast plains of Kirghiz.

Syn. Levant Wormseed, Aleppo, Alexandria or European Wormseed, Tartarian Southern Wood, Semen Santonici—Cinae—Sanctum—Contra; Anhydrous Santonic Acid; Fr. Semen-contre d'Alep, Barbotine; Santonine, Lactone santonique; Ger. Flores Cinae, Zitwerblüten(samen), Wurmsamen; Santonin.

Ar-te-mis'i-a. L. fr. Gr. Ἀρτεμις, the goddess; Roman Diana, to whom *Artemisia Absinthium* was dedicated, owing to its use in hastening puberty.

Pau-ci-flō'ra. L. *paucus*, few, + *florus*, flower—*i. e.*, has few blooms, mostly only buds.

San-ton'i-ca. L. *santonicus*, pertaining to the Santoni, people of Aquitania (Gr. σάντονικόν, their wormwood), named in commemoration, which name survives to the place Saintes, in France.

PLANT.—Small, semi-shrubby, perennial, with knotty, fibrous root-stocks, branching from crown, from which many erect, flowering stems arise, .3 M. (1°) high; stems 6–8, woolly or glabrous, at first leafy; leaves bipinnatisect, 12 Mm. ($\frac{1}{2}$ ') long, woolly when young, afterward grayish. Flowers, 2–4 Mm. ($\frac{1}{2}$ – $\frac{1}{6}$ ') long, 1 Mm. ($\frac{1}{5}$ ') wide, oblong-ovoid, slightly flattened, obtuse, smooth, glossy, grayish-green, after exposure to light—brownish-green, consisting of an involucre of 12–18 closely imbricated, glandular scales, with broad midribs, enclosing 4–5 rudimentary florets; odor strong, peculiar, camphoraceous; taste aromatic, bitter. *Solvents:* diluted alcohol; hot water partially. Dose, gr. 15–60 (1–4 Gm.).

CONSTITUENTS.—Santonin 2.5–3.5 p. c., Volatile oil 2–3 p. c., artemisin, $C_{15}H_{18}O_4$ (in santonin mother-liquor, recrystallizing pure from chloroform), resin, gum, ash 7 p. c.

Santoninum. **Santonin.**—Discovered in 1830, and may be obtained by mixing powdered santonica (5) with slaked lime (1), exhausting with hot water, concentrating filtered solution containing calcium santonate, decomposing with hydrochloric acid, giving calcium chloride in solution, and santonin precipitated along with resinous matter, from which freedom may be obtained by washing with dilute ammonia water, or recrystallizing from hot alcohol. It is in colorless, shining, flattened rhombic prisms, crystalline powder, odorless, nearly tasteless at first, afterward developing bitterness, permanent; yellow on exposure to light, which may be converted into colorless crystals by recrystallization from alcohol, soluble in alcohol (43), boiling alcohol (6.5), chloroform (1.7), ether (110), slightly in water or boiling water; solutions levorotatory, melts at 170° C. (338° F.). *Tests:* 1. Heat .2 Gm. with 2 cc. of alcoholic potassium hydroxide T. S.—red color; inciner-

COMPOSITÆ

ate—ash .1 p. c. 2. Shake .01 Gm. with a cooled mixture of sulphuric acid and distilled water, each 1 cc., heat to boiling, add 1 drop of dilute ferric chloride solution (1 in 10)—violet color. *Impurities*: Alkaloids,

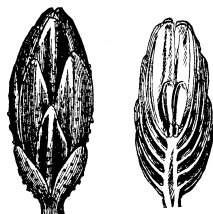


FIG. 412. — Santonica: head and longitudinal section, magnified 10 diam.

readily carbonizable organic substances. Should be kept dark, in well-closed containers. Dose, gr. 1–4 (.06–.26 Gm.); child, gr. $\frac{1}{4}$ –1 (.016–.06 Gm.).

Volatile Oil.—Obtained by distilling with water or steam; yellowish, disagreeable odor; consists mainly of cineol, $C_{10}H_{18}O$, some dipentene, sp. gr. 0.930, when shaken with iodine get greenish crystals.

ADULTERATIONS.—SANTONICA: Mustard hulls (large brown fragments recognized by microscope), exhausted birch bark. SANTONIN: Salicin, boric acid, strychnine, picric acid. With sulphuric acid at first colorless (abs. of salicin, which turns red). Boric acid insoluble in chloroform, non-volatile—green color to alcohol flame, and heated upon foil—glassy mass, the solution of which turns turmeric paper brown. Picric acid—explodes by heat or percussion; forms yellow salts and precipitates gelatin in aqueous solution.

Commercial.—The source *Artemisia maritima* var. *pauciflora* is preferred by some writers, although it has escaped far from its original maritime habitat. Flowers exposed to light and air soon become brown and inactive, hence should be preserved in tight containers. There are two varieties: 1, *Aleppo*, *Alexandria*, *Levant*, collected July–August, forwarded to the great fair of Nizhnee-Novgorod, and thence to market via Moscow, Leningrad (Petrograd, St. Petersburg), W. Europe; 2, *Barbary* (*A. Siebe'ri*, + *A. ramo'sa*), rarely met here, as it (flowerheads) does not contain santonin.

PREPARATIONS.—1. *Tabellæ Santonini*, N.F., gr. $\frac{1}{2}$ (.03 Gm.) each—santonin 3 Gm., gluside .06, cocoa 6, sucrose 21, tr. vanill. 1.5 cc.: compress 100 tablets, dose, 1–2 tablets. 2. *Tabellæ Santonini Compositæ*, N.F., $\frac{1}{2}$ gr. (.03 Gm.) each—santonin 3 Gm., mild mercurous chloride 3, gluside .06, cocoa 6, sucrose 18, tr. vanill. 1.5 cc.: compress 100 tablets, dose, 1–2 tablets. As both tablets suggest candy, physicians should not order more than 3, since 2 gr. (.13 Gm.) has caused the death of a 5-year-old child.

Unoff. Preps.: FLOWER-HEADS: Electuary. Extract. Infusion. SANTONIN: *Trochiscus Santonini* (Br.) 1 gr. (.06 Gm.). *Sodium Santoninas*, U.S.P. 1880, gr. 2–10 (.13–.6 Gm.). *Trochisci Sodii Santoninatis*, U.S.P. 1880, 1 gr. (.06 Gm.), 1–4 troches. *Santoninic Acid*, gr. 1–4 (.06–.26 Gm.).

PROPERTIES.—Anthelmintic, stimulant, emmenagogue. The Crusaders introduced santonica into Europe, and it has been used there ever since, mostly now as santonin. It is absorbed as sodium santoninate, and eliminated by the kidneys; large doses dilate pupils, cause

gastric oppression, nausea, vomiting, diarrhea, thirst, cold, clammy skin, giddiness, cerebral congestion, yellow vision (xanthopsia) changing to purplish-red, convulsions, death. Santonin in gr. 5 (.3 Gm.) doses is a strong diuretic, imparting to normal acid urine a saffron color (as does rhubarb), which, by age, hence alkalinity, becomes violet-purple.

USES.—For round worms (*Ascaris lumbricoides*), sometimes for thread-worms (*Oxyuris vermicularis*), but never for tape-worm. Santonin kills the round worms that inhabit the small intestine; therefore, purgatives having specific action here should be selected. Give the powder in honey, molasses, to which calomel or jalap has been added, at bedtime, having fasted that day; follow this next morning, before food, with a draught of senna (infusion) or a dose of castor oil; a suppository is serviceable for thread-worms; may reserve entire cathartic until next morning if desirable. Useful in incontinence of urine, eye affections due to inflammatory changes of optic nerve and retina. Never give to children with fever nor while constipated, owing to possible toxic results, which are combatted by ammonia, strychnine, eliminants, artificial respiration. *A. ramo'sa*, *Barbary Wormseed*, N. W. Africa—unexpanded flower-heads rounder than those of *A. pauciflora*, and covered with whitish down, by which they may readily be recognized; *Indian Wormseed*, Europe, are only half the size of santonica, hairy and more yellow; *American Wormseed* (*Chenopodium*), in spite of slight resemblance, are often substituted for santonica.

Allied Plants:

1. *Artemisia Absin'thium*, *Absinthium*, *Wormwood*.—The dried leaves and flowering tops with not more than 5 p. c. of foreign matter, U.S.P. 1830–1890; Europe, N. Asia, N. Africa. Perennial herb; stem .6–1 M. (2–3°) high. Leaves, 2.5–7.5 Cm. (1–3') long, hoary, grayish-green; flowers, in heads, racemose, subglobose, with involucre, receptacle convex, hairy; florets yellow; fruit achene, obovoid without pappus; odor aromatic; taste very bitter. Powder, brownish, yellowish-green; solvents: diluted alcohol, water partially; contains volatile oil 1 p. c., absinthin, anabsinthin, tannin, resin, absinthic (succinic) acid, salts, ash 7–10 p. c. Tonic, stomachic, stimulant, febrifuge, anthelmintic; used for atonic dyspepsia, lumbricoid worms; oil in form of *absinthe liqueur* (oil + anise oil + alcohol) as a narcotic, stimulant in cerebral exhaustion, alone locally as an anesthetic for rheumatism, neuralgia. Dose, gr. 15–60 (1–4 Gm.); infusion, 5 p. c., 3j–2 (30–60 cc.; tincture, 20 p. c. (diluted alcohol), 5j–2 (4–8 cc.).

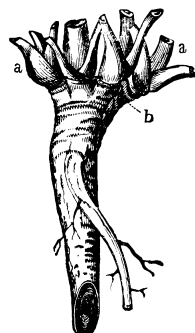
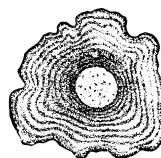


FIG. 413.—*Artemisia Absinthium*.

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2. *A. Abrot'anum*, Southern-wood, Old Man.—Asia, Europe; hairy, segments of the pinnatifid leaves capillaceous, lemon odor. *A. vulga'ris*, Mugwort, Africa, Europe, spontaneous in United States; stem purple; epilepsy, amenorrhea. *A. gnaphalo'des* (*A. Ludovic'iana* var. *gnaphalo'des*), Western Mugwort, Mich. to Oregon; febrifuge. *A. abyssin'ica*, Abyssinia; has woolly involucre, whitish florets; aromatic odor.

3. *Leontodon Tarax'acum*, *Taraxacum*, Dandelion, N.F.—The dried rhizome and roots with not more than 2 p. c. of foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; Europe, naturalized in N. America. Perennial acaulescent herb; leaves radical, 15–22.5 Cm. (6–9') long, 5–7.5 Cm. (2–3') broad, toothed (runcinate), 5–6 teeth on a side, sessile; flowers golden-yellow, closing at night, terminal upon hollow scape; fruit achene, compressed; spreading pappus on stalk—for dissemination. Rhizome, cylindrical, somewhat flattened, gradually tapering, usually in broken pieces, 6–15 Cm. (2½–6') long, 5–15 Mm.

FIG. 414.—*Leontodon Taraxacum*.FIG. 415.—*Leontodon Taraxacum*: rhizome revealing at head the remnants of flower stalks and leaf stalks.FIG. 416.—*Taraxacum*: transverse section of root.

($\frac{1}{5}$ – $\frac{3}{5}$ ') thick, brownish, longitudinally wrinkled, numerous root- and rootlet-scars; crown simple, branched, with many leaf-bases showing annulate markings; bark 2–6 Mm. ($\frac{1}{12}$ – $\frac{1}{4}$ ') thick, composed of concentric layers of laticiferous vessels and sieve tissues, alternating with whitish inulin-bearing parenchyma; odor slight, inodorous, taste bitter. Powder, light brown—parenchyma cells large, thin-walled containing irregular masses of inulin; fragments with yellowish-brown laticiferous vessels, tracheæ reticulate, intermediate fibers non-lignified. with pores, no starch; solvents: diluted alcohol, boiling water; contains milk juice (taraxacin, taraxacerin, 2 resins, glutinous body), reducing

sugars, levulin, inulin (yellow with iodine) 24 p. c., pectin, ash 5-10 p. c. Diuretic, tonic, stomachic, aperient, deobstruent; congestion of liver, spleen, dyspepsia, constipation, skin affections, dropsies. *Adulterations*: Chiefly chicory, *Cichorium Intybus*, which, however, is paler and with milk vessels in radiating lines—not concentric. Subject to insect attack, and should be kept in tightly closed containers. Dose, \mathfrak{ss} -2 (2-8 Gm.); 1. *Extractum Taraxaci* (12.5 p. c. alcohol), dose, \mathfrak{r} . 5-30 (.3-2 Gm.); 2. *Fluidextractum Taraxaci* (glycerin 10, alcohol 50, water 40, + diluted alcohol), dose, \mathfrak{ss} -2 (2-8 cc.).

Preps.: 1. *Elixir Taraxaci Compositum*, 3.5 p. c. + fldext. prun. virg. 2, fldext. glycyrrh., tr. aurant. dulc. $\bar{a}\bar{a}$ 6, +, dose, \mathfrak{ss} j-2 (4-8 cc.).

Preps.: 1. *Elixir Eriodict. Arom.*, 44 p. c. 2. *Elixir Guaranæ*, 60 p. c. 3. *Elixir Viburni Opuli Compositum*, 70 p. c.

2. *Elixir Gentianæ Glycerinatum*, 15 p. c. Decoction 5 p. c., \mathfrak{ss} j-2 (30-60 cc.). *Succus Taraxaci* (Br.), expressed juice 3, alcohol 1. \mathfrak{ss} j-2 (4-8 cc.).

4. *Cichorium Intybus*, *Chicory*.—Europe, naturalized in United States. Root with laticiferous vessels radiate, also is whiter, more woody, and has thinner bark than taraxacum. July collection contains 36 p. c. of inulin, bitter principle, etc., and has properties similar to taraxacum root, with which it often is mixed as an adulterant. Roasted



FIG. 417.—*Cichorium Intybus*.

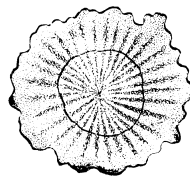


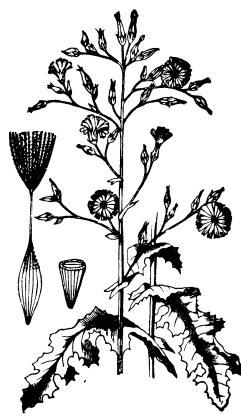
FIG. 418.—*Cichorium*: transverse section.

root is used frequently to adulterate coffee. *C. Endivia*, *Endive*; Levant; cultivated for its bitter leaves.

5. *Lactuca viro'sa*, *Lactucarium*, *Wild Lettuce*.—The dried milk-juice, U.S.P. 1820-1910; C. and S. Europe. Biennial herb .6-2 M. (2-6°) high, glabrous, green, often purple spotted; leaves runcinate, radical and cauline, spinous apex and margin, auriculate, glaucous-green, flowers yellowish, milk-juice (lactucarium) usually in quarter sections, angular pieces, brownish, fracture tough, waxy; internally light brown, porous; odor distinctive, opium-like; taste bitter. Powder, brownish—irregular fragments without cellular structure. It is

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obtained by cutting off the head of each stalk and scraping the exuding juice into small vessels, repeating the process 6-7 times daily for several weeks, each cut being made a little lower down the stalk; by night, having become a viscid mass, it is divided into suitable pieces and dried by gentle artificial heat for 5 days, losing 75 p. c. in weight; solvents: water (51 p. c.), diluted alcohol (36-44 p. c.), spirit of chloroform (55-60 p. c.), being mostly lactucerin; contains lactucerin (lactucan) 50-60 p. c., lactucin, lactueic acid, lactucopicrin, caoutchouc, resin, volatile oil, ash 10 p. c. With water—turbid mixture; + iodine T. S.—not colored blue (abs. of starch); + ferric chloride T. S.—only faint green (abs. of tannin). There are three varieties: 1, English; 2, German; 3, French (Aubergier's). The juice of *L. sati'va*, obtained like lactucarium, yields *Lactucarium Gallicum*, and when expressed from the stalks, clarified by coagulation, expressed and inspissated—

FIG. 419.—*Lactuca virosa*.

Thridace. Anodyne, sedative, hypnotic, diuretic, expectorant, very unreliable; milder than opium, and, unlike it, does not derange the digestive organs; where opium is objectionable—to procure sleep, allay cough, dropsy, palpitation of heart, nervousness. Dose, gr. 1-8-15 (.06-.5-1 Gm.); *Tincture*, 50 p. c., dose, ʒss-1 (2-4 cc.); *Syrup*, 5 p. c., dose, ʒj-4 (4-15 cc.); *Fluidextract*, dose, mj-30 (.06-2 cc.); *Lozenge*. *L. canadensis (elongata)*, *Wild Lettuce*, U.S.P. 1820-1840. The herb; N. America, rich damp soil, fields, thickets; herb 1.3-3 M. (4-10°) high, hollow, purple, leafy, glaucous; leaves 15-30 Cm. (6-12') long, pinnatifid; flowers yellow to purple, heads 20-flowered, panicles. Juice from plants in flower make good lactucarium, that collected in early season being without bitterness.

L. sati'va, *Garden Lettuce*, yields a juice that is medicinal and more abundant in wild than cultivated plants; highly valued as salad and as such is a feeble hypnotic. *L. sagitta'ta (altissima)*, large Caucasian plant 2.5-3 M. (8-10°) high, chiefly cultivated in France.

6. *Grindelia campo'rum*, or *G. cuneifo'lia*, *G. squarro'sa*, *Grindelia*, *Gum-plant*, N.F.—The dried leaves and flowering tops with not more than 10 p. c. of stems over 2 Mm. ($\frac{1}{12}$ ') thick, or 2 p. c. of other foreign organic matter; N. America, west of Rocky mountains. Plants—small perennial, woody herbs, .3-1 M. (1-3°) high, bushy; stems and branches cylindrical, yellowish, pinkish, alternate leaf-scars and basal portions of leaves, sometimes flexuous and coated with resin, terminating in resinous flower-heads; leaves usually separate and broken, oblong, oblong-spatulate, 1-7 Cm. ($\frac{2}{3}$ -3') long, sessile, or amplexicaul, serrate, yellowish-green, resinous, coriaceous, brittle; flower-heads 5-20 Mm.

($\frac{1}{5}$ – $\frac{4}{5}$) broad, urceolate, resinous, involucre bracts numerous, imbricated with recurved tips; ray-florets yellowish-brown, ligulate and pistillate; disk-florets yellow, perfect, pappus of 2–3 linear awns; disk achenes ovoid, oblong, angled, irregular summit; odor balsamic; taste aromatic, bitter, resinous. Powder, yellowish-brown—numerous fibrous fragments bearing tracheae with thickenings or pores, lignified wood-fibers, pith cells with protoplasm bearing spheroidal granules; fragments of leaf epidermis with polygonal areas, chloroplastids, glandular hairs, spherical pollen grains; solvent: alcohol; contains resin (activity), bitter principle 1–2 p. c., volatile oil, grindeline, fixed oil, tannin 1.5 p. c., ash 7–8 p. c. Cardiac tonic (slows heart action), expectorant, antispasmodic, diuretic; asthma, bronchitis, whooping-cough, catarrh of bladder and uterus, poisoning by rhus toxicodendron—in solution or poultice. Dose, gr. 15–60 (1–4 Gm.); 1. *Fluidextractum Grindeliae* (75 p. c. alcohol), dose, ℥xv–60 (1–4 cc.). Extract, gr. 5–15 (.3–1 Gm.). Infusion. Tincture. *G. glutinosum*, stem often purplish, tomentose, and *G. hirsutula*, W. United States, being very similar, are often collected and mixed with commercial drug.



FIG. 420.—*Eupatorium perfoliatum*: flowering top.

7. *Eupatorium perfoliatum*. *Eupatorium*, *Thoroughwort*, *Boneset*, *N.F.*—The dried leaves and flowering tops with not more than 10 p. c. of stems nor 2 p. c. of foreign organic matter; N. America, swamps, meadows, banks. Hairy perennial, .6–1.2 M. (2–4°) high, branched at summit; usually more or less broken. Leaves opposite, the pair united at the base, 8–20 Cm. (3–8') long, 1.5–5 Cm. ($\frac{3}{8}$ –2') broad, tapering from base to apex, crenate-serrate, rugosely-veined, green,

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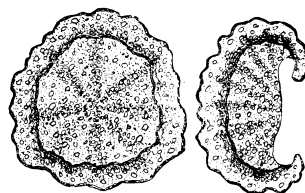
gray-green, tomentose, resinous-dotted beneath; flower-heads corymbed, campanulate involucre of imbricated scales, flowers 10–15, tubular, yellowish-white florets, bristly pappus; odor faintly aromatic; taste strongly bitter. Powder, dark green—multicellular non-glandular hairs, glandular hairs short-stalked, ellipsoidal pollen grains, hairs of pappus branched, tracheæ spiral, fragments of leaf epidermis with elliptical stomata; fragments of achene pericarp having cells with brownish walls; fragments of stem tissue showing epidermal cells, parenchyma, non-lignified fibers, tracheæ and pith parenchyma; numerous fragments of corolla tissue; solvents: diluted alcohol, water partially; contains eupatorin, volatile oil, resin, tannin, gum, sugar, yellow coloring matter, ash 10 p. c. Stimulant, tonic, diaphoretic (diuretic); large doses emetic, aperient, antispasmodic, similar to chamomile; intermittents, rheumatism, influenza, bronchitis. Dose, \mathfrak{z}_{ss} –1 (2–4 Gm.); 1. *Fluidextractum Eupatorii* (diluted alcohol), dose, \mathfrak{m}_{xv} –60 (1–4 cc.). Infusion, 5 p. c., \mathfrak{z}_{j-2} (30–60 cc.); when cold—tonic, when warm—emetic, diaphoretic. *E. purpureum*, *Gravel Root*, *Queen of the Meadow*. The root, U.S.P. 1820–1830; N. America, dry woods, meadows. Perennial herb, 1–2 M. (3–6°) high, stem green, purplish, purple band at joints, 2.5 Cm. (1') broad; leaves petiolate, 3–6 in whorl, 20–25 Cm. (8–10') long, 10–12.5 Cm. (4–5') broad, downy beneath; flowers purple, whitish, corymbs; contains euparin; taste bitter, aromatic; astringent. *E. verbenafolium* (*teucrifolium*), *Wild Horehound*, *Rough Boneset*. The herb, U.S.P. 1820–1830. Perennial hairy herb .6–2.5 M. (2–8°) high—low grounds; leaves ovate, oblong, truncate at base, toothed; flowers August, white, paniced corymb; considered by some only a variety of *E. perfoliatum*—all three possess similar properties. *E. capillifolium* (*faniculaecum*), *Dog-fennel*, *Hog-weed*; Virginia-Florida. Plant smooth, 1–3 M. (3–10°) high; juice relieves pain from insect-bites.

8. *Inula Helenium*, *Inula*, *Elecampane*, *N.F.*—The dried rhizome and roots with not more than 5 p. c. of stem-bases nor 2 p. c. of other foreign organic matter; C. and S. Europe, C. Asia. Perennial herb 1–2 M. (3–6°) high; stem thick, solid, striate, villous; leaves large, .3–.5 M. (10–18') long, 10–20 Cm. (4–8') broad, ovate, serrate, pubescent beneath, long-petioled, fleshy midrib; flowers large, 6 Cm. (2½') broad, single, golden-yellow. Rhizome, dug in autumn of second year, usually split into longitudinal, oblique pieces having one or more roots; up to 8 Cm. (3') long, 4 Cm. (1½') thick, grayish-brown, longitudinally wrinkled with occasional buds or stem-scars, surmounted at crown by portion of over-ground stem; inner (cut) surface concave, edges incurved with the overlapping bark, yellowish-brown, striate, fibrous near cambium zone; fracture short, horny; internally light brown, with many oleoresin canals; roots cylindrical, tapering, curved, curled, up to 13 Cm. (5½') long, 1.5 Cm. (¾') thick; odor aromatic; taste acrid, bitter, pungent. Powder, light brown—fragments of parenchyma having inulin and small separate masses of inulin; tracheæ with pores,

thickenings, occasional lignified wood-fibers and brownish fragments of walls of oleoresin canals; solvents: alcohol, water partially; contains volatile oil, acrid resin, bitter principle, inulin, helenin, wax, ash 10 p. c. Stimulant, diaphoretic, diuretic, expectorant, emmenagogue, tonic; lung diseases, bronchitis, vesical catarrh, amenorrhea, dyspepsia, skin affections, dropsy, whooping-cough, diphtheria. Dose, $\bar{5}$ ss-1 (2-4 Gm.);

FIG. 421.—*Inula Helenium*.

1. *Pilula Antiperiodica*, gr. $\frac{1}{4}$ (.016 Gm.);
2. *Tinctura Antiperiodica*, $\frac{2}{3}$ p. c. Decoc-
tion, 5 p. c., $\bar{3}$ j-2 (30-60 cc.); Fluidextract,
 $\bar{5}$ ss-1 (2-4 cc.); Infusion, 5 p. c., $\bar{3}$ j-2
(30-60 cc.). *I. squarro'sa*; S. Europe.
Leaves tomentose, rugose, ray-florets 3-
cleft, tubular; emmenagogue, diuretic;
powder burned to repel insects. *Pulica'rea*

FIG. 422.—*Inula*: transverse section, natural size.

(*Inula*) *dysenter'ica*, *Fleawort*, and *Carli'na acau'lis*, *Carlina Thistle*, *Radix Carlina*; Europe—both have constituents and properties similar to elecampane; diaphoretic, diuretic, large doses purgative; typhoid condition, impotence, amenorrhea, paralysis of the tongue. Dose, gr. 10-20 (.6-1.3 Gm.).

9. *Brauner'ia pallida*, or *B. angustifo'lia*, *Echinacea*, *Pale purple Cone-flower*, *N.F.*—The dried rhizome and roots with not more than 3 p. c. of foreign organic matter; S. United States—Kansas. Perennial herb; stem simple, naked above, single large head; leaves alternate, 3-5-nerved. Rhizome, with circular or angular pith, nearly entire; cylindrical, tapering, twisted, 10-20 Cm. (4-8') long, 4-15 Mm. ($\frac{1}{6}$ - $\frac{3}{8}$)' thick, brownish, annulate, occasional stem-scars, wrinkled, furrowed, fracture short, fibrous; bark 1 Mm. ($\frac{1}{25}$)' thick; yellowish and black wood-wedges; odor faint, aromatic; taste sweetish, then tingling, as in aconite, but without its persistent, benumbing effect—must not be used after it has lost its characteristic odor and taste. Powder, grayish—many strongly lignified stone cells carrying characteristic carbon-like deposits, tracheæ with pores and markings, inulin-bearing parenchyma tissue with oil or resin canals filled with brownish content, cork fibers; solvent: alcohol; contains acrid resin (activity) 1 p. c., alkaloid, ash 6 p. c. Diaphoretic, sialagogue, alterative; syphilitic and strumous conditions, eczema, chronic ulcers; Sioux Indians used fresh scraped root for hydrophobia, snake-bites, septicemia. Dose, gr. 15-30 (1-2

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Gm.); 1. *Fluidextractum Echinaceæ* (80 p. c. alcohol), dose, m̄xv–30 (1–2 cc.).

10. *Matricaria Chamomilla*, *Matricaria*, *German Chamomile*, *N.F.*—The dried flower-head with not more than 5 p. c. of stems or other

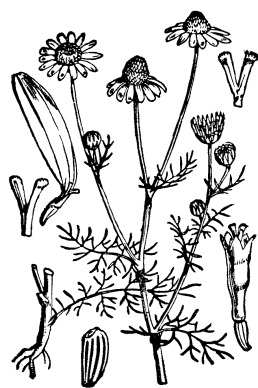


FIG. 423.—*Matricaria Chamomilla*.

foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; Europe, W. Asia, cultivated in United States. Annual herb .3–.6 M. (1–2°) high, branched, smooth, solid, striate, greenish; leaves 5 Cm. (2') long, bi-, tri-pinnate, green, smooth; leaflets linear, small. Flower-heads, May–Aug., few white ray-florets and numerous yellow disk-florets on conical hollow receptacles, 3–10 Mm. ($\frac{1}{8}$ – $\frac{2}{5}$ ') broad; disk-florets tubular, perfect, without pappus; ray-florets 10–20, pistillate, corolla white, 3-toothed, 4-veined, usually reflexed, involucre 20–30 pubescent scales; peduncles greenish, furrowed, twisted; achenes 3–5-ribbed; pappus none; odor pleasant, aromatic; taste aromatic, bitter—should be preserved in tightly-

closed containers. Powder, yellowish-brown—many spinose pollen grains with 3 pores, fragments of ray-florets, glandular hairs, achene tissue with markings, parenchyma with calcium oxalate rosette aggregates, anthers, stigmas, vascular bundle with tracheæ, involucreal scales bearing porous fibers, tracheæ and elliptical stomata; solvents: boiling water, alcohol; contains volatile oil .25 p. c., anthemidic acid, anthemidin, tannin, ash 13 p. c.

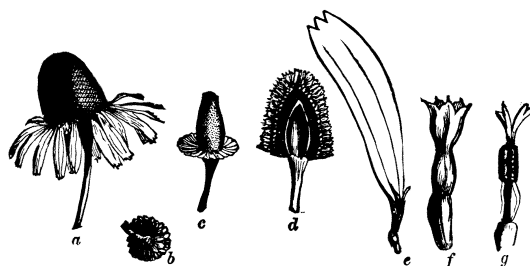


FIG. 424.—*Matricaria*: *a*, flower-head; *b*, involucre; *c*, receptacle and involucre; *d*, longitudinal section of receptacle, with disk-florets; *e*, ray-floret; *f*, disk-floret; *g*, stamens and style of disk-floret.

Stimulant (volatile oil), tonic (anthemic acid), carminative, diaphoretic, nervine, emmenagogue; aid to digestion in convalescence, general debility, intermittents, delirium tremens, flatulent-colic—externally: local pains, colic, toothache, earache, abscesses, sprains, rheumatism. Dose, gr.

15–60 (1–4 Gm.); 1. *Species Emollientes*, 20 p. c. Infusion, 5 p. c.; when cold—tonic, when warm—emetic, dose, *ad libitum*. Oleum Chamomillæ Infusum (flowers 10, olive oil 100, digested 2 hours)—locally. Syrup (flowers 3, water for infusion 10, sucrose 18). Poultice.

11. *Tussila'go Far'fara, Farfara, Colts-foot (Leaves), Tussilago Leaves, Cough-wort, N.F.*—The dried leaf with not more than 3 p. c. of foreign organic matter, yielding not more than 4 p. c. of acid-insoluble ash; Europe, N. Asia, naturalized in N. United States. Low succulent perennial, creeping annulate rhizome, scaly scapes in spring, bearing a single head; flowers yellow. Leaves, petioled, pubescent (young—white, floccose beneath, old—dark green above, glabrous below), orbicular, 8–15 Cm. (3–6') long and broad, cordate, dentate, red-brown teeth, palmately 5–9-nerved, glabrous above, wrinkled, greenish; odor indistinct; taste mucilaginous, faintly herbaceous, bitter. Powder, yellowish-green—many hairs twisted together, elliptical stomata and striated epidermal cells with wavy vertical walls; few non-porous fibers and tracheæ, parenchyma cells with chloroplastids; solvents: water, diluted alcohol; contains glucoside (bitter), resin, tannin, volatile oil, gum, wax, caoutchouc, ash 20 p. c. Demulcent, toxic; bronchitis, pulmonary affections, coughs. Dose, gr. 30–60 (2–4 Gm.); 1. *Species Pectorales*, 20 p. c. Decoction, Infusion, each 5 p. c., 3 ss–1 (15–30 cc.); Expressed juice; dried root, as well as leaves smoked for cough—popular domestic remedy.

12. *Ar'nica monta'na, Arnica (Flowers), Leopards-bane, N.F.*—The dried flower-head with not more than 3 p. c. of foreign organic matter; Europe—Germany, N. Asia, N. America. Perennial herb .3 M. (1°) high, hairy, striate; leaves bright green, pubescent—radical oblong-ovate, entire—cauline lanceolate; rhizome 5 Cm. (2') long, 2–4 Mm. ($\frac{1}{2}$ – $\frac{1}{6}$ ') thick, brown wrinkled under surface with numerous fragile roots; achenes with hairy pappus. Flower-heads, chiefly tubular, ligulate with involucre and receptacle (convex, pitted, short-hairy); ray-flowers yellow, 3-toothed, pistillate; disk-flowers tubular, perfect, reddish-yellow, stamens without tail-like appendage (dist. from *Inula Helenium*—with 2 bristles or long tails at the base); achenes fusiform, striate, glandular-pubescent, surmounted by long pappus of barbellate bristles; odor characteristic, agreeable; taste bitter, acrid. Powder, yellowish-brown—many pollen grains, 3 kinds of non-glandular hairs, 3 kinds of glandular hairs, pappus with multicellular axis and unicellular branches; solvents: diluted alcohol, hot water; contains arnicin (soluble in alcohol, alkalies) 4 p. c., volatile oil .04–.07 p. c., resin, fat, salt, arnidol (phytosterol), ash 6–9 p. c. Stimulant, tonic, carminative, diuretic, irritant, sternutatory, vulnerary—slows the heart, increases arterial tension; large doses (poisonous) emetic, cathartic, causing abdominal pains, headache, increased pulse and respiration, finally dilated pupils, muscular spasms (rare), cold extremities, infrequent pulse, death—resembling aconite—best antidote: atropine; typhoid condition, brain concussion, intermittents, diarrhea, gout, nephritis,

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rheumatism, dropsy, chronic catarrh, nervous affections—locally: paralysis, sprains, bruises, abrasions. Dose, gr. 5–20 (.3–1.3 Gm.); 1. *Fluidextractum Arnicæ* (67 p. c. alcohol), dose, ℥v–10 (.3–.6 cc.). 2. *Tinctura Arnicæ*, 20 p. c. (diluted alcohol), dose, ℥xv–45 (1–3 cc.).



FIG. 425.—*Arnica montana*: 1, rhizome and stem; 2, flowering stem; 3, vertical section of disk-flower; 4, ray-floret.

Infusion, 5 p. c., ℥ss–1 (15–30 cc.). Fomentation. Rhizome—Decoction. Extract—Plaster; Fluidextract, Tincture, all having same strength and doses as those from flower-heads. *A. folio'sa*, *A. alpi'na*, and *A. Chamisso'nis*, California to Maine, produce closely resembling flower-heads.

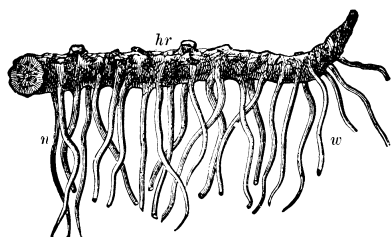


FIG. 426.—*Arnica montana*: hr, rhizome; n-w, roots.

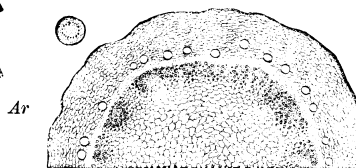


FIG. 427.—*Arnica*: transverse section of rhizome, natural size, and magnified 12 diam.

13. *Senec'io au'reus*, *Senecio*, *Life Root Plant*, *Ragwort*, *Squaw-weed*, *N.F.*—The dried plant with not more than 10 p. c. of foreign organic matter; Eastern N. America. Perennial herb .3–.6 M. (1–2°) high,

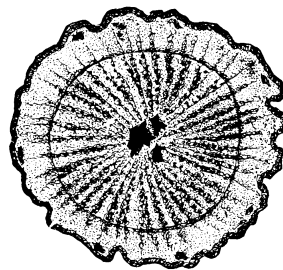
nearly smooth, fluted, sparingly clothed with small leaves, also a basal rosette, and several yellow heads (corymb) at summit, white floccose when young, then glabrous; radical leaves petiolate, rounded, 5-7 Cm. (2-3') broad, crenate-dentate, cordate; stem-leaves lyrate-pinnate, then pinnatifid, sessile; heads slender, 12-25 Mm. ($\frac{1}{2}$ -1') broad, involueral scales in 2 series closely appressed; rays 10, bright yellow, disk flowers many, small, bearing a glabrous achene, white pappus; odor characteristically aromatic; taste bitter, astringent, acrid, pungent. Powder, dark green—many twisted non-glandular hairs with thin walls and oily content; leaf tissue composed of chlorenchyma, epidermal cells, elliptical stomata; solvent: diluted alcohol; contains volatile oil, resin, bitter principle (senecionin), tannin, ash 10 p. c. Stimulant, diuretic, emmenagogue, vulnerary; atonic conditions, amenorrhea, dysmenorrhea; popular with "Eclectics," Homeopaths, and American Indians. Dose, $\overline{5}$ ss-1 (2-4 Gm.); 1. *Fluidextractum Senecionis* (67 p. c. alcohol), dose, $\overline{5}$ ss-1 (2-4 cc.). Decoction, Infusion, each 5 p. c., $\overline{3}$ j-2 (30-60 cc.).

14. *Calen'dula officina'lis*, *Calendula*, *Marigold*, *N.F.*—The dried ligulate-florets with not more than 2 p. c. of foreign organic matter; S. Europe, Levant, cultivated as ornament (flowers). Annual herb .3-.6 M. (1-2°) high, roughish-hairy; leaves toothed, oblanceolate; flower-heads terminal, 5 Cm. (2') broad, involucre hemispherical, 2-rowed; disk-florets tubular, 5-cleft, yellow. Ligulate (ray) florets 15-25 Mm. ($\frac{3}{8}$ -1') long, 3-6 Mm. ($\frac{1}{8}$ - $\frac{1}{4}$ ') broad, yellowish, 1-3-toothed, short-hairy tube occasionally enclosing remnant of filiform style and bifid stigma; odor slight, somewhat heavy; taste slightly bitter, faintly saline. Powder, yellowish—few non-glandular hairs, double row of thin-walled cells; elongated epidermal wavy-walled cells with chromoplasts and oil-like globules; pollen grains with spinose projections, 3-pored; tracheæ; calcium oxalate rosettes or prisms; solvents: alcohol, boiling water partially; contains volatile oil, bitter principle, calendulin (analogous to bassorin), fat, resin, sugar, gum, ash 8-11 p. c. Stimulant, tonic, febrifuge, anthelmintic, resolvent; jaundice, amenorrhea, scrofula, low fevers, vomiting; cancer, ulcers, wounds, otitis—Homeopathic remedy instead of tincture of arnica or myrrh. Dose, gr. 15-60 (1-4 Gm.); 1. *Fluidextractum Calendulae* (67 p. c. alcohol), dose, \overline{m} xv-60 (1-4 cc.); 2. *Tinctura Calendulae*, 20 p. c. (alcohol), dose, $\overline{3}$ ss-2 (2-8 cc.).

15. *Ar'e'tium Lap'pa*, *Lappa*, *Burdock Root*, *Clothur*, *N.F.*—The dried first year root with not more than 5 p. c. of leaf-bases nor 2 p. c. of other foreign organic matter; Europe, N. Asia, naturalized in N. America—rich waste places. Coarse biennial weed .6-2 M. (2-6°) high, branched; leaves cordate-oblong, dentate, rough, petiolate; flowers purple, calyx of imbricated scales with hooked extremities for adhering to objects; achenes (burs) 12-25 Mm. ($\frac{1}{2}$ -1') broad, globoidal, 3-angled; seed quadrangular; *A. mi'nus*, heads small, involucre at first cottony, finally smooth; leaves unequally rounded at base. Root .25-.8 M. (10-30') long, 5-20 Mm. ($\frac{1}{3}$ - $\frac{1}{2}$ ') thick, nearly simple, fusiform, fre-

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quently split or broken, grayish-brown, longitudinally wrinkled, crown annulate, sometimes surmounted by woolly tuft of leaf remains; fracture somewhat horny; dark cambium separating thick brownish bark from yellowish, porous radiate wood, centrally hollow or with white pith-like tissue; odor slight, pyroligneous on milling; taste mucilaginous, sweetish, slightly bitter. Powder, light brown—parenchyma cells of cortex, medullary ray cells and wood parenchyma of young roots; few wood-fibers, no starch or calcium oxalate; solvents: diluted alcohol, boiling water partially; contains inulin, bitter extractive, resin, fat 9 p. c., mucilage, sugar, wax, tannin (phlobaphene), lappin, ash 6 p. c. Diaphoretic, diuretic, alterative, aperient, depurative; rheumatism, gout, pulmonary catarrh, psoriasis, acne, syphilis, scrofula, urinary deposits, burns, wounds, eruptions, swellings. Dose, $\overline{5}$ ss-2 (2-8 Gm.); 1. *Fluidextractum Lappæ* (diluted alcohol), dose,

FIG. 428.—*Aretium Lappa*.FIG. 429.—*Lappa*: transverse section, magnified 2 diam.

$\overline{5}$ ss-2 (2-8 cc.). Tincture, 10 p. c. (diluted alcohol, whisky), dose, $\overline{5}$ ij-3 (8-12 cc.), after meals. *Fructus Lappæ*, *Semen Bardanæ*, U.S.P. 1830; the seed about 6 Mm. ($\frac{1}{4}$ ') long, obovate-oblong, slightly curved, angular, flattened, roughish, brown-gray, mottled with black; inodorous taste oily, bitter; contains drying oil 15.4 p. c., resins 5.5 p. c., lappin; tincture 25 p. c. (75 p. c. alcohol), $\overline{5}$ ss-2 (2-8 cc.); fluidextract, \overline{m} xv-30 (1-2 cc.—tonic); $\overline{5}$ ss-1 (2-4 cc.—alterative). *Fructus Silybi* (*Sil'ybum Maria'num*), *Mary Thistle*; S. Europe; achenes 5 Mm. ($\frac{1}{5}$ ') long, not curved, obovate, flattened, smooth, glossy, light brown, with blackish striae, brownish; taste oily, bitter. *Bi'dens bipinna'ta*, *Spanish Needles*, *Beggar-lice*; stem square, achenes triangular, barbed; stimulant, aromatic (vol. oil), antispasmodic, expectorant, diaphoretic; hay fever, amenorrhea (hot infusion), asthma, bronchitis. *Rudbeck'ia hir'ta*, *Yellow Daisy*, *Black-eyed Susan*, *Nigger-head*; stimulating diuretic ("Eclectic's").

16. *Xanthium Strumarium*, *Broad Cocklebur*; N. America. Achenes 2.5 Cm. (1') long, flat, oblong, without pappus, enclosed in the involuere, which is densely beset with hooked prickles. *X. spinosum*, *Spiny* or *Thorny Clobur*; N. America, S. Europe; leaves with spines at base 2.5 Cm. (1') long; fertile axillary burs (achenes) crowned with 1 inconspicuous beak. *X. canadense*, and its var. *echinatum*; achenes, with 2 stout beaks, hooked, 2.5 Cm. (1') long, densely prickly, hispid; river banks, waste places; var. *echinatum*, smaller plant—possibly unworthy of variety distinction.

17. *Solidago odora*, *Sweet* or *Anise-scented Golden-rod*.—The leaves and tops, U.S.P. 1820–1870; N. America. Perennial herb, .6–1 M. (2–3') high, greenish-yellow, pubescent; leaves lanceolate, pellucid-dotted, 2.5–5 Cm. (1–2') long, 12 Mm. ($\frac{1}{2}$ ') wide; flowers yellow, racemes; fruit achenes; odor and taste sweet, anise-like, more pronounced when bruised; contains volatile oil. Stimulant, rubefacient, anodyne, carminative, diaphoretic, aromatic; hemorrhages, colic, neuralgia, amenorrhea, rheumatism; infusion, oil. Dose, $\frac{3}{4}$ ss–2 (2–8 Gm.); oil, mj–5 (.06–.3 cc.).

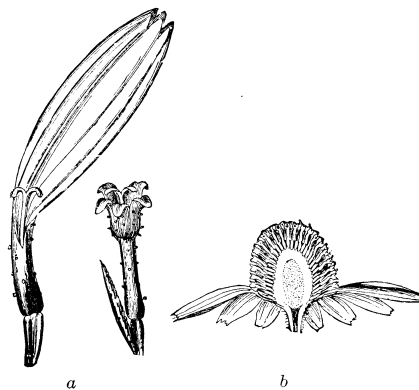
18. *Erigeron canadensis*, *Canada Fleabane*, *Horseweed*, *Fireweed*.—The herb, U.S.P. 1820–1870; the volatile oil distilled from the fresh flowering herb, U.S.P. 1860–1900; N. America, fields, waste places; naturalized in other countries. Annual herb, .3–2.5 M. (1–8') high; stem branching, hairy, furrowed; leaves linear-lanceolate, entire, dentate; flowers small, numerous, white, terminal panicles; contains volatile oil .2–.4 p. c., bitter principle (amaroid), tannin, gallic acid. Oil is a pale yellow liquid, darker and thicker with age and exposure; odor peculiar, aromatic, persistent; taste aromatic, pungent, sp. gr. 0.850; contains *d*-limonene, $C_{10}H_{16}$, terpinol, a substance easily decomposed or polymerized by heat making distillation difficult at ordinary pressure. *Test*: 1. Soluble in equal volume of alcohol (dist. from oil of fireweed, *Erechthites hieracifolia*, and oil of turpentine), also in equal volume of glacial acetic acid, which solution with bromine yields crystals of $C_{10}H_{16}Br_4$. Stimulant, tonic, diuretic, diaphoretic, styptic; diarrhea, dysentery, gravel, dropsy, hemorrhages of uterus and bowels; similar to oil of turpentine, but less irritating and stimulating. First employed by the "Eclectics." Should be kept cool, dark, in well-stoppered, amber-colored bottles. Dose, gr. 15–60 (1–4 Gm.); decoction, 5 p. c., $\frac{3}{4}$ ss–1 (15–30 cc.); oil, mv–10 (.3–.6 cc.). *E. annuus* (*heterophyllus*), *Various-leaved Fleabane*, *Sweet Scabious*; the herb, U.S.P. 1830–1860. Biennial herb, 1–1.5 M. (3–5') high, branched, hairy, leaves sharply, coarsely toothed; flowers Aug., corymbs, rays white tinged with purple, disk yellow; in fields, waste places. *E. philadelphicus*, *Philadelphia Fleabane*; the herb, U.S.P. 1820–1850. Perennial herb, .3–1 M. (1–3') high, pubescent, slender, leafy; leaves 5–10 Cm. (2–4') long, 12–18 Mm. ($\frac{1}{2}$ – $\frac{3}{4}$ ') wide, midrib broad, flowers June–Aug., numerous, panicled corymbs, rays 150–200, filiform purplish, disk yellow. Both have same constituents and properties as *E. canadensis*.

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19. *Achille'a Millefo'lium*, Yarrow, Milfoil.—The leaves and flowering tops, U.S.P. 1860–1870; N. America. Perennial herb, .3–.6 M. (1–2°) high, hairy; leaves lanceolate, glandular beneath, 5–25 Cm. (2–10') long, twice pinnatifid, segments toothed; flowers Aug., corymbs, receptacle flat, chaffy, ray-florets white, pistillate; disk white, perfect; fruit achenes, chamomile odor, taste bitter, aromatic; contains volatile oil, achilleine, resin, tannin. Stimulant, tonic, emmenagogue; amenorrhea, menorrhagia, piles, leucorrhea, colic, relaxed throat, sore nipples, intermittents; infusion, expressed juice. Dose, ʒss–1 (2–4 Gm.); oil, m̄v–15 (.3–1 cc.).

FIG. 430.—*Achillea Millefolium*.

20. *An'themis no'bilis*, Roman Chamomile.—The dried flower-heads of cultivated plants, U.S.P. 1820–1900; S. and W. Europe. Perennial herb, 15–30 Cm. (6–12') high, hairy; leaves bipinnatisect, hairy. Flowers, 18 Mm. ($\frac{3}{4}$ ') broad, subglobular, consisting of imbricated involucre, many white, 3-toothed ray-florets and a few tubular disk-florets inserted upon chaffy, conical, solid receptacle; odor agreeable; taste aromatic, bitter; solvents: alcohol, hot water; contains volatile oil 1 p. c., anthemiac acid (bitter principle), anthemene (anthemidin),

FIG. 431.—*Anthemis nobilis*: wild.FIG. 432.—*Anthemis*: a, ray- and disk-floret, magnified 4 diam.; b, section through single flower-head, natural size.

resin 5.25 p. c., tannin, fixed oil. Stimulant (volatile oil), tonic (anthemiac acid), carminative, nervine emmenagogue; warm infusion—emetic; cold infusion—tonic; large doses emetic, cathartic; intermit-

tents, torpid liver, delirium tremens, dyspepsia (masticatory); externally—colic, toothache, earache, rheumatism, ulcers, sprains (poultice with vinegar, laudanum); oil—rheumatism, flatulent colic. Dose, gr. 15–60 (1–4 Gm.); fluidextract, \mathfrak{z} ss–1 (2–4 cc.); infusion (best form), 5 p. c., \mathfrak{z} j–2 (30–60 cc.); oil, m \mathfrak{j} –5 (.06–.3 cc.). *A. (Maru'ta) Cot'ula*, *Mayweed*; the herb, U.S.P. 1820–1870; N. America. Annual plant in fields, roadsides, .3–.6 M. (1–2°) high, greenish, furrowed, leaves thrice pinnatifid; flowers, June–Sept., receptacle solid, conical, chaffy, ray-florets white, disk yellow; contains volatile oil, valeric acid, fat, tannin, anthemidine (?), anthemic acid. Stimulant, antispasmodic, sudorific, emmenagogue, vesicant for hysteria, colic, dysmenorrhea; in infusion. Dose, \mathfrak{z} ss–2 (2–8 Gm.).



FIG. 433.—*Anacyclus Pyrethrum*: A, expanded flower; B, involucre seen from below; C, dried flower.

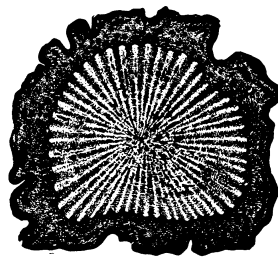


FIG. 434.—*Pyrethrum*: transverse section magnified 3 diam.

21. *Anacyclus Pyrethrum*, *Pyrethrum*, *Pellitory (Root)*.—The dried root, U.S.P. 1820–1910; N. Africa, Algeria—high lands, cultivated in gardens. Procumbent perennial, resembling chamomile, .3 M. (1°) high, with 1 large terminal flower; leaves doubly pinnate, pale green; flowers, April–June, 2.5–4 Cm. (1–1 $\frac{3}{5}$ °) broad, rays white above, reddish-purple below, disk yellow; fruit obovate achene. Root, tapering, in pieces 2.5–10 Cm. (1–4') long, 5–20 Mm. ($\frac{1}{5}$ – $\frac{4}{5}$ °) thick, dark brown, furrowed, wrinkled; fracture short; bark with 1–2 circles of resin ducts, closely adhering to yellowish radiate porous wood in which occur 1–3 rows of resin ducts; odor distinct; taste sweetish, pungent, very acrid, tingling, sialagogue effect. Powder, brownish—masses of inulin, fragments of woody tissue, stone cells, cork, tracheæ, parenchyma; should be kept in tightly closed containers; solvents: alcohol, boiling water partially; contains pyrethrine (activity), brown acrid resin (containing pellitorin), 2 potassa-soluble acrid fixed oils, inulin 50 p. c., tannin, volatile oil, gum, ash 3–5 p. c. Irritant, rubefacient, sialagogue (prickling sensation to tongue and fauces with heat, pun-

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gency), sternutatory—poisonous; masticatory—headache, rheumatism, neuralgia, toothache (tincture or extract as an anesthetic in carious teeth), paralysis of tongue or throat, relaxed uvula, chronic catarrh. Dose, $\bar{5}$ ss–1 (2–4 Gm.). Tincture, 20 p. c., $\bar{5}$ ss–2 (2–8 cc.); Fluidextract, $\bar{5}$ ss–1 (2–4 cc.); Decoction, Extract (alcohol), Gargle. *A. officina'rum*, German *Pellitory*—annual variety, cultivated in Saxony, Bohemia, Prussia, near Magdeburg, having root 6 Mm. ($\frac{1}{4}$ ') thick; bark with 1 circle of resin-cells, medullary rays without resin-cells.



FIG. 435.—*Tanacetum vulgare*: flower; a, single flower.

22. *Tanace'tum vulga're*, *Tanacetum*, *Tansy*.—The leaves and tops, U.S.P. 1820–1890; Europe, Asia. Perennial herb, .6–1 M. (2–3°) high; stem obscurely hexagonal, striated, often reddish; root fibrous, many-headed; flowers yellowish discoid, dense, terminal corymbs; fruit achene, small, oblong, 5–6 ribs, crowned with pappus. Leaves, 15 Cm. (6') long, bipinnatifid, segments obtuse, oblong, serrate, glandular, receptacle convex, naked, florets tubular; odor strong, aromatic;



FIG. 436.—*Carthamus tinctorius*.

taste pungent, bitter; contains volatile oil .25 p. c., tanacetin, fat, resin, tannin, mucilage; solvents: alcohol, water. Stimulant, tonic, emmenagogue, anthelmintic, diuretic, narcotic; large doses cause vomiting, convulsions, coma, mydriasis, feeble respiration and pulse, death from paralytic asphyxia. Used in intermittents, hysteria, amenorrhea, colic, abortifacient; locally for bruises, sprains, rheumatism, ulcers. Dose, gr. 15–60 (1–4 Gm.); fluidextract, \mathfrak{m} xv–60 (1–4 cc.);

infusion, 5 p. c., 3j-2 (30-60 cc.); oil, mj-5 (.06-.3 cc.). *T. vulgare* var. *crispum*, *Double Tansy*.—Leaves twice pinnatifid, curled. *T. Balsamita* (*Pyrethrum Tanacetum*), S. Europe; odor strong, taste bitter. Both often cultivated and used similar to *T. vulgare*.

23. *Carthamus tinctorius*, *Safflower*.—The dried florets, U.S.P. 1820-1870, India, cultivated, in America, etc. Annual herb, .3-.6 M. (1-2°) high, branched; leaves spinose; flowers orange-red, corolla tubular, 2.5 Cm. (1') long, 5-lobed; odor slight, taste bitter; contains volatile oil, carthamin (red) .5 p. c., saffron yellow 24-30 p. c. Diaphoretic (hot infusion), tonic, laxative; measles, scarlatina (to promote eruption), catarrh, rheumatism; in infusion. Dose, gr. 5-15 (.3-1 Gm.).

24. *Gnaphalium obtusifolium* (*polycephalum*), *Common, Sweet, or Fragrant Life Everlasting*.—Annual erect herb, .3-1 M. (1-3°) high, woolly, fragrant; leaves lanceolate, undulate, sessile, flowers in heads, clustered at summit of corymbose branches, obovate, whitish involucre, yellow, tubular, odor pleasant, bitter; contains volatile oil and bitter principle. Used for diarrhea, hemorrhages, externally in fomentation and as a vulnerary to bruises, ulcers, etc. Dose, 5ss-1 (2-4 Gm.).

25. *Chrysanthemum* (*Pyrethrum*) *roseum* and *C. carneum*, *Persian Pellitory*—*Persian (Caucasian) Insect Powder*; W. Asia, Persia. Perennial plants, resembling chamomile; flower-heads 4 Cm. (1½') broad; ray-florets rose-color with anthers included (*roseum*), or purple with anthers projecting (*carneum*); powder grayish-yellow, brownish (best), bright yellow (weakest), tea odor, bitter—used only for killing insects, the toxicity being due to pyrethron (pyrethrotoxic acid—cardiac depressant like veratrine), a neutral, amber-yellow syrupy ester (pyretol) soluble in alcohol, ether, splitting into pyrethrol, C₂₁H₃₄O, and several acids, pyrethresin.

26. *C. cinerariaefolium*, *Dalmatian Insect Powder*; Dalmatia. These flowers are most valuable when collected immediately after expansion, and yield a more or less inferior insect powder—greenish-yellow. Plant cultivated in Algeria, Japan, Montenegro, and largely in California, where flowers are dried carefully (to preserve color and volatile oil)—furnishing a superior powder, called "buhach." Should not contain more than 5 p. c. flower-stems or 2 p. c. acid-insoluble ash. *Tests*: 1. Put 4 gr. (.25 Gm.) of the powder upon a fly in a vial—it should be stupefied in 1 minute and dead in 2 or 3 minutes. 2. With microscope can recognize scarcity of pollen and abundance of collenchymatous tissue when much stem and few flowers are used. Powder often adulterated with turmeric (chloroform test), chrome alum (ash not more than 6 p. c.), and other compositous plant flowers, as *Chrysanthemum Leucanthemum* (*Leucanthemum vulgare*), white-weed, oxeye or field daisy, and *C. seg'etum*. Neither of these is an insecticide, but will produce dermatitis in some persons.

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