Echinacea

Brauner'ia pal'lida, 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. ($\frac{1}{6}$–$\frac{3}{5}$)′ 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 Gm.); 1. *Fluidextractum Echinaceæ* (80 p. c. alcohol), dose, ♏xv–30 (1–2 cc.).

Elettaria 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°) high, tapering, shining, covered with leaf-sheaths; leaves .3–.8 M. (1–2½°) long, 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-white; rhizome tuberous, woody, fibrous roots below, scars above; fruit capsule, ellipsoidal, triangular, 10–20 Mm. ($\frac{2}{5}$–$\frac{4}{5}$′) 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. ($\frac{1}{2500}$–$\frac{1}{6250}$′) 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.).

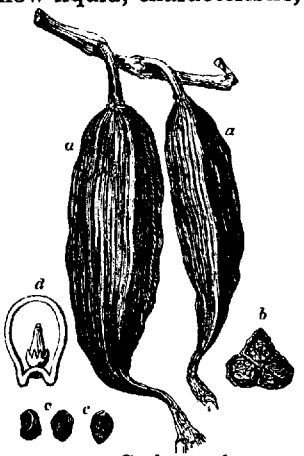
Elettaria Cardamomum: A, leaf with ligule, *b; B*, bracts; C_1 flower, natural size; *D*, flower with calyx and corolla-tube partially removed; *E, F, G*, capsule form; *H*, seed with arillus, *a; J*, cross-section of seed 8 times enlarged; *K*, longitudinal section 5 times enlarged; *p*, perisperm; *em*, embryo; *e*, endosperm.

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.

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.

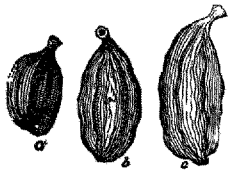
Oleum Cardamomi, *N.F.*—This volatile oil (mostly in the testa) distilled from the seed, is a colorless, pale yellow liquid, characteristic, aromatic, penetrating, somewhat camphoraceous odor of cardamom, and persistent, pungent, strongly aromatic taste; soluble in alcohol, 70 p. c. alcohol (4), sp. 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.

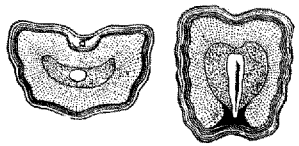


Ceylon cardamom: *a*, capsules; *b*, transverse section of capsule; *c*, seed; *d*, section of seed with embryo; magnified.

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, ʒj–2 (4–8 cc.).


Malabar cardamom: *a*, short; *b*, medium; *c*, long.


Cardamom seed: transverse and longitudinal section, magnified 5 diam.

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, ʒj–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 Colocynthidis Compositum*, 5 p. c. 4. *Tinctura Gentianæ Composita*, 1 p. c. 5. *Tinctura Rhei*, 3 p. c. 6. *Pulvis Aromaticus, 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., ʒj–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'num-paradi'si, Grain of Paradise.* Fruit resemble cardamom seed, several varieties, used for ginger.

Empleurum

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.

Ergot

ERGOTA. ERGOT, *U.S.P.*

Claviceps purpurea, *(Fries) Tulasne.* { The dried sclerotium, developed on rye plants 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.

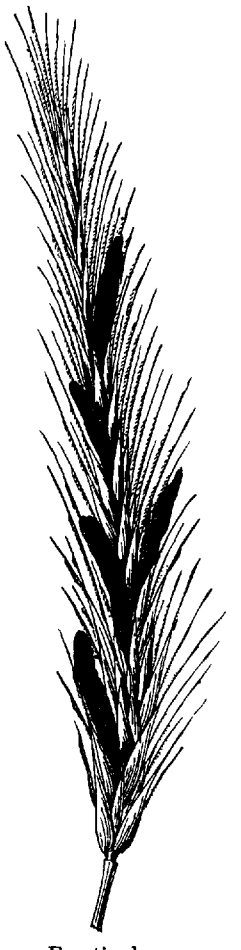
Pur-pu're-a. L. *purpureus,* purple colored—*i. e.*, the purple claviceps—color of the sclerotium.

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.).

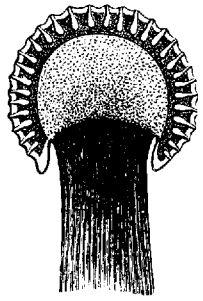
Commercial.—Rye is to Russia what corn is to America, its bread approximating nearer that of wheat than any other grain. The origin of the sclerotium is the biennial thallophyte (fungus) *Claviceps purpurea,* parasitic during moist seasons on the ovary of grains, grasses, sedges—Carex, Cyperus species, 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.



Ergotized rye.

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 ofttimes will 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.

Ergot, with fruit heads.



Longitudinal section of fruiting head, showing conceptacles.

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, ♏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., ℥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. ¼–5 (0.16–.3 Gm.).

PROPERTIES.—Emmenagogue, ecbolic, 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 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 (fluidextract ℥j (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.

Erigeron

Erig'eron canaden'sis, 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, *Erechthi'tes hieracifo'lia*, 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., ℥ss–1 (15–30 cc.); oil, ♏v–10 (.3–.6 cc.). *E. an'nuus (heterophyl'lus), 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. philadel'phicus, 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.*

Eriodictyon californicum, (*Hooker et Arnott*) *Bentham et Torrey.* { The dried leaf with not more than 5 p. c. stems nor 2 p. c. other foreign organic matter.

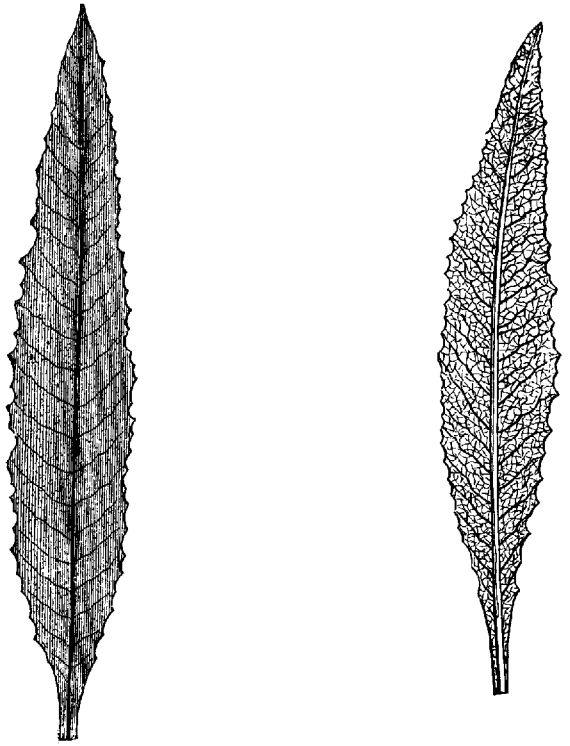
Habitat. California, Northern Mexico; dry hills, mountains.

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, + δίκτυον, 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,



a *b*

Eriodictyon leaves, natural size; *a*, upper surface; *b*, under surface.

racemes. LEAVES (LEAF), lanceolate, 5–15 Cm. (2–6′) long, 1–3 Cm. ($\frac{2}{5}$–1$\frac{1}{5}$′) 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.).

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, $C_{35}H_{41}O_6$, .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, ♏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, ʒj–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, $\frac{1}{20}$, ol. caryoph. $\frac{1}{10}$, alcohol 3.2, sucrose 80, mag. carb. $\frac{1}{2}$, water q. s. 100. Dose, ʒj–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. tomento'sum* 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.

Eryngium *Eryn'gium aquat'icum* (*yuccæfo'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, ʒss–1 (2–4 Gm.).

Erythraea *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.

Erythronium

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.

Erythroxylon COCA. COCA.

Cocaina. Cocaine, *U.S.P.*

Erythroxylon Coca, *Lamarck,* and other species. } An alkaloid obtained from the leaves.

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.

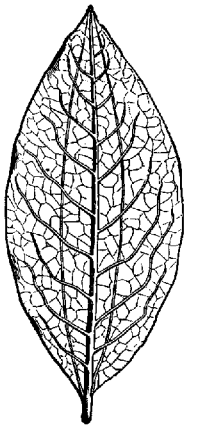
Er-y-throx'y-lon. L. see Etymology, above, of Erythroxylaceæ.

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.).

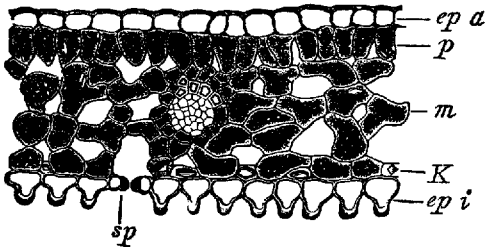
ADULTERATIONS.—Leaves that are smudgy brown or with dull surface, also small jaborandi leaves, sometimes 40–50 p. c.; Inga and Pacay flowers by accident.

Erythroxylon Coca.



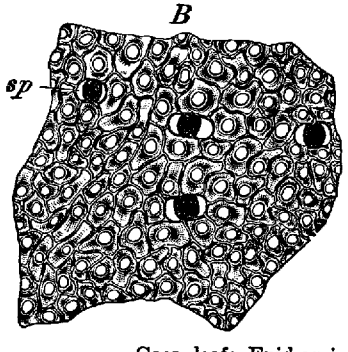
Coca leaf: under side, usual size.

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, 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,



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 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 isatropyl-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-oblanceolate, 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.



Coca leaf: Epidermis of lower side with the papillæ and stomata seen from above, magnified 160 diam.

CONSTITUENTS.—Cocaine (1860) .5–1 p. c., cinnamyl-cocaine, truxilline (truxil-cocaine, isatropyl-cocaine, cocamine), $C_{19}H_{23}O_4N$—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° C. (207° 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° C. (362–376° 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 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. + $\frac{N}{1}$ 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), ʒss–2 (2–8 cc.). *Infusion*, 5 p. c., ʒj–2 (30–60 cc.). *Tincture*, 20 p. c. (diluted alcohol), ʒj–4 (4–15 cc.). *Wine*, 6.5 p. c., ʒij–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., ♏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 (ʒj; 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, spermatorrhea, 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, 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 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.

Eucalyptus

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.

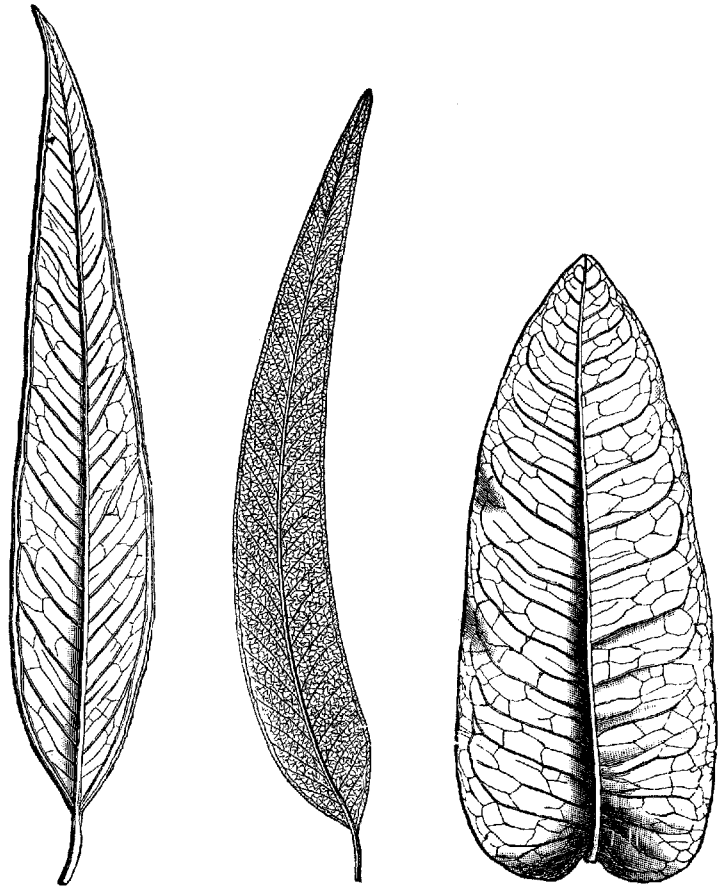
Habitat. Australia (Tasmania, Victoria); cultivated in subtropics, Europe, N. Africa, S. United States (California, Florida, etc.); rich valleys, moist slopes of wooded hills.

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. *εὖ*, 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, con-



a *b* *c*

Eucalyptus globulus: a, b, leaves from old twig; *c,* from young twig.

sisting of calyx-tube covered by conical lid (operculum) of calyx-limb and united petals, fruit capsules, 18 Mm. (¾′) 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. (⅘–3′) broad, acute, base unequal, rounded; petiole twisted, 5–35 Mm. (⅕–1⅖′) 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 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, 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), $C_{10}H_{18}O$, 20 p. c. of cymene, $C_{10}H_{14}$, eudesmol, $C_{10}H_{16}O$, phellandrene, $C_{10}H_{16}$, eucalyptene, $C_{10}H_{18}$, terpene—*d*-pinene (small amount), $C_{10}H_{14}$, also a little valeric, butyric and capronic aldehydes; with hydrochloric acid yields eucalypteol (eucalyptene hydrochloride), $C_{10}H_{16}.2HCl$, 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, ♏v–15 (.3–1 cc.).

Eucalyptol. Eucalyptol, $C_{10}H_{18}O$, *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, ℥v–15 (.3–1 cc.).

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, ℥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.,* ½ 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.,* ⅕ p. c. 7. *Nebula Mentholis Composita, N.F.,* ⅕ 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,* ℥j–2 (30–60 cc.). *Tincture,* 15 p. c., ℥ss–2 (2–8 cc.). OIL: *Unguentum Eucalypti* (Br.), 10 p. c. *Water (Aqua),* ℥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 $\frac{1}{20}$ ℥., fldext. rose ½ ℥.

Eugenia

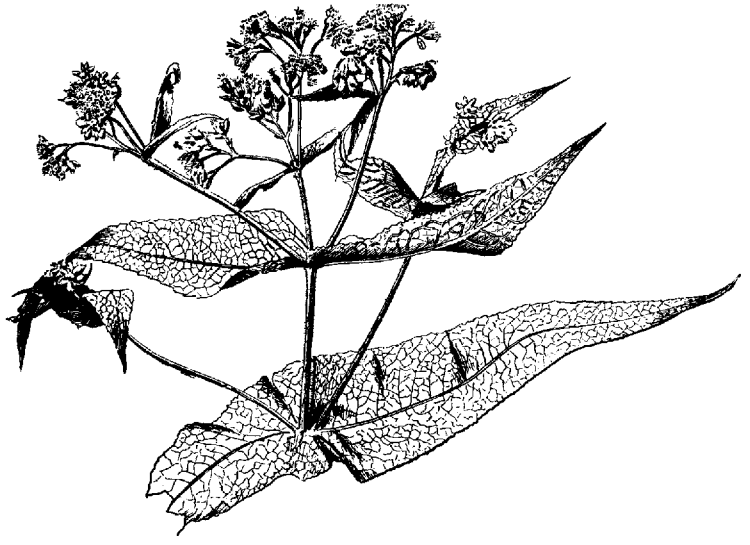
Eugenia Jambola'na, Jambul, Java Plum.—E. Indies. Large tree producing edible fruit; all parts astringent, but seed and bark also arrest formation of sugar in diabetes; seed 1.2 Cm. (½′) long, a third as thick, oval, one end truncate, blackish-gray, hard, heavy, little odor and taste; capsules, fluidextract. Dose, gr. 5–10 (.3–.6 Gm.).

Euonymus

Euon'ymus atropurpu'reus, 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. (⅘–3′) 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, ʒss–1 (2–4 Gm.); 1. *Extractum Euonymi* (diluted alcohol), dose, gr. 1–6 (.06–.4 Gm.); 2. *Fluidextractum Euonymi* (diluted alcohol), dose, ʒss–1 (2–4 cc.). Decoction, 5 p. c., Infusion, 5 p. c. each, ℥j–2 (30–60 cc.); *euonymin* ("Eclectic"), root-bark—brownish; stem-bark—greenish, gr. ½–3–6 (.03–.2–.4 Gm.). *E. america'nus, Strawberry Bush*, low or trailing, with crimson capsules. *E. europæ'us*, 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.

Euonymus atropurpureus: a, outer surface of root-bark; *b*, inner surface of root-bark, nat. size.



Eupatorium perfoliatum: flowering top.

Eupatorium

Eupato'rium perfolia'tum, 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. (⅗–2′) broad, tapering from base to apex, crenate-serrate, rugosely-veined, green, 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, ʒss–1 (2–4 Gm.); 1. *Fluidextractum Eupatorii* (diluted alcohol), dose, ♏xv–60 (1–4 cc.). Infusion, 5 p. c., ℥j–2 (30–60 cc.); when cold—tonic, when warm—emetic, diaphoretic. *E. purpu'reum, 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. verbenæfo'lium (teucrifo'lium), 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, panicled corymb; considered by some only a variety of *E. perfoliatum*—all three possess similar properties. *E. capillifo'lium (fœnicula'ceum), Dog-fennel, Hog-weed;* Virginia-Florida. Plant smooth, 1–3 M. (3–10°) high; juice relieves pain from insect-bites.

Euphorbia

Euphor'bia hir'ta, Euphorbia, Euphorbia Pilulif'era, 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, ℥ss–1 (2–4 Gm.); 1. *Fluidextractum Euphorbiæ* (diluted alcohol): Prep.: 1. *Elixir Euphorbiæ 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, ℥j–2 (4–8 cc.).

Euphorbia

Euphor'bia corolla'ta, 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. (⅕–1′) 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.

Euphorbia ipecacuanhae

E. Ipecacuan'hæ, 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. (⅖′) thick, branched, brown, wrinkled, bark thick, white inside, sweet, bitter, acrid; constituents, properties, and uses similar to preceding.

Fabiana

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.).

Fagus

Fa'gus 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.

Ferula asafoetida ASAFŒTIDA. ASAFETIDA, *U.S.P.*

Ferula { **Asafœtida,** *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 extractive, and not more than 15 p. c. acid-insoluble ash.

Habitat. Persia, Turkestan, Afghanistan; mountain slopes, barren desolate wastes, sandy deserts.

Syn. Asafœt., Gum Asafetida, Devil's Dung (Stercus Diaboli), Food of the Gods (Cibus Deorum), Gummi-resina Asafœtida; 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.

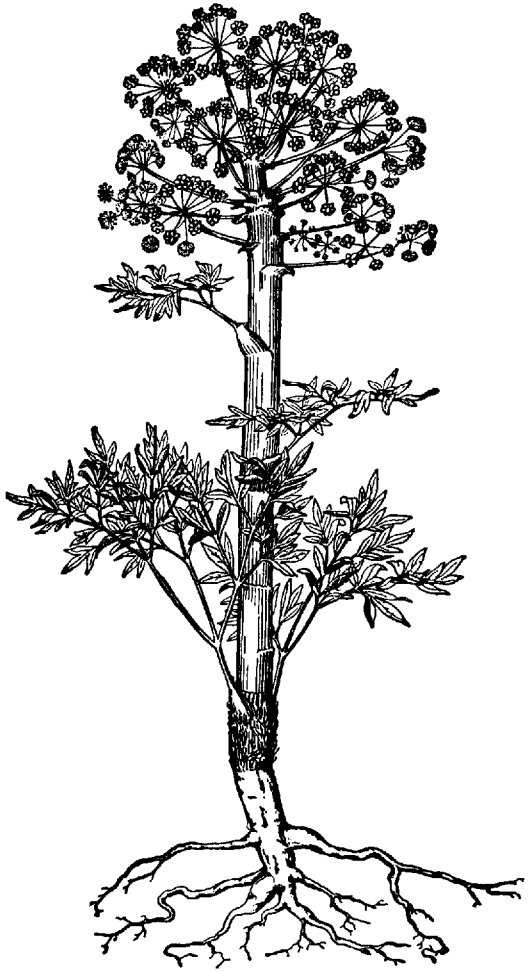
Fœt'i-da. L. *fœtidus,* fetid, stinking—*i. e.,* the odor of the plant, and its secretion.

As'a-fœt'i-da. L. fr. Pers. *aza, asa,* mastic, + L. *fœtida,* 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. (⅖–1⅗′) 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.



Ferula fœtida.

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 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 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 ½–32 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 Asafœtidæ*. 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, ʒss–1 (15–30 cc.).

2. *Pilulæ Asafœtidæ*. Pills of Asafetida. (Syn., Pil. Asafœt.; Fr. Pilules d'Asafétide; Ger. Asafœtidapillen.)

Manufacture: Incorporate intimately asafetida 20 Gm., soap 6 Gm., using water q. s. 100 pills. Dose, 2–5 pills.

3. *Tinctura Asafœtidæ*. Tincture of Asafetida. (Syn., Tr. Asafœt.; Fr. Teinture d'Asefétide; Ger. Tinctura Asæ-fœtidæ, Stinkasanttinktur.)

Manufacture: 20 p. c. Similar to Tinctura Cardamomi Composita, page 137; menstruum: alcohol. Dose, ʒss–1 (2–4 cc.).

Prep.: 1. *Mistura Magnesiæ, Asafœtidæ et Opii*, Dewees' Carminative, *N.F.*, 7.5 p.c. Dose, ʒss–4 (2–15 cc.).

4. *Pilulæ Aloes et Asafœtidæ, N.F.*, 1.5 gr. (.09 Gm.).

Unoff. Preps.: Asafœtida 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).

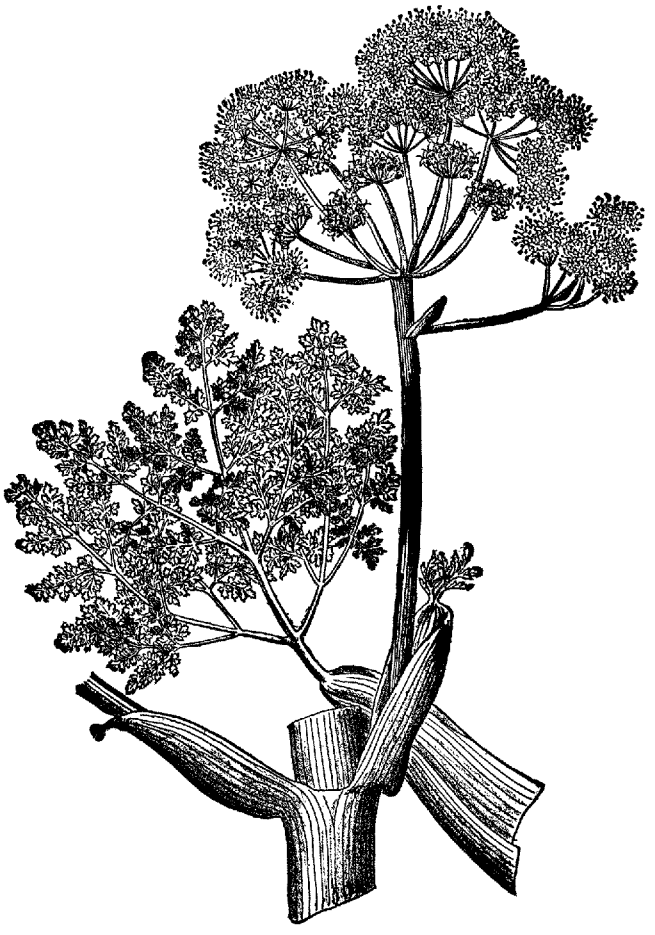
USES.—Hysteria, hypochondriasis, convulsions, spasms, whooping-cough, measles, asthma, coughs, catarrhs, flatulent constipation, chorea, nervous apoplexy, consumption. Used in India, Persia, etc., as a condiment, for flavoring food, etc., like garlic and onions; acts here as a stimulant to the bowels 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. Nar'thex* (*Narthex Asafœtida*), U.S.P. 1820–1870, is a plant almost identical with *F. fœtida.* 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.

Ferula galbaniflua

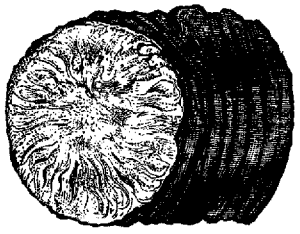
F. galbanif'lua, Galbanum.—The gum-resin, U.S.P. 1820–1880; N. Persia. Plant 1.3–1.6 M. (4–5°) high, 2.5 Cm. (1′) thick, solid, striate, leaves radical and cauline; flowers yellow; fruit 12 Mm. (½′) long, winged near face of mericarps. Gum-resin in tears size of pin-head to that of a pea, brownish-yellow, 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.



Ferula galbaniflua.

Ferula sumbul

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. (1⅗′) 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. (1–2⅘′) thick, 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,

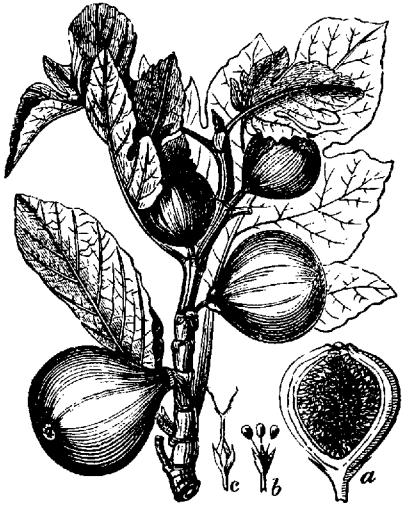


Sumbul root: section.

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.

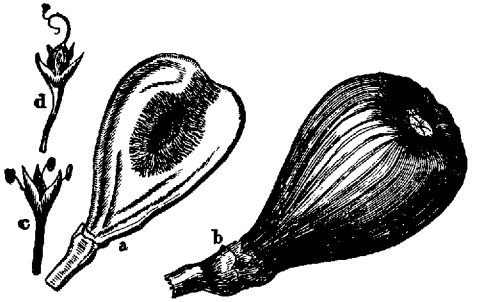
Ficus

Fi'cus 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



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



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 mechanically; 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.

Flemingia

Flemin'gia rhodocar'pa, Wars, Wurrus (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.

Foeniculum

FŒNICULUM. FENNEL, *N.F.*

Oleum Fœniculi. Oil of Fennel, *U.S.P.*

Fœniculum vulgare, *Miller.* { The volatile oil distilled from the dried ripe 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. ($\frac{1}{12}$–$\frac{2}{5}$′) long, dorsal surface convex, yellowish-green, 5 prominent ribs and short stylopodium at summit. Powder, yellowish-brown—endo-

sperm 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.

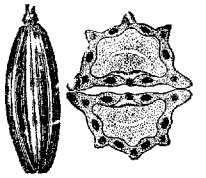
Oleum Fœniculi. Oil of Fennel.—This volatile oil distilled with water or steam, from the dried ripe fruit of cultivated varieties, is a colorless, pale yellow liquid, characteristic odor and taste of fennel, soluble in 8 vols. of 80 p. c. alcohol, 1 vol. of 90 p. c. alcohol, forming neutral solution, sp. gr. 0.963, dextrorotatory, congeals at 3° C. (37° F.); contains (about the same as oil of anise) pinene, phellandrene ($C_{10}H_{16}$—substances isomeric with oil of turpentine), dipentene (sometimes limonene), fenchone (bitter camphor), $C_{10}H_{16}O$, anethol, $C_{10}H_{12}O$, 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

a *b*

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, ♏ij–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.



Fœniculum fruit: 3 diam.; transverse section, 8 diam.

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 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, ℥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 Cascaræ 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 Catharticæ, 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,* ♏x–30 (.6–2 cc.); *Infusion,* 5 p. c., ℥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.

Frasera

Frase'ra carolinen'sis (*Walte'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.).

Fraxinus americana

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., ℥ss–1 (15–30 cc.).

Fraxinus ornus

MANNA. MANNA, *U.S.P.*

Fraxinus Ornus, *Linné.* { 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. ορεινος—*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, ℥j–8 (4–30 Gm.).

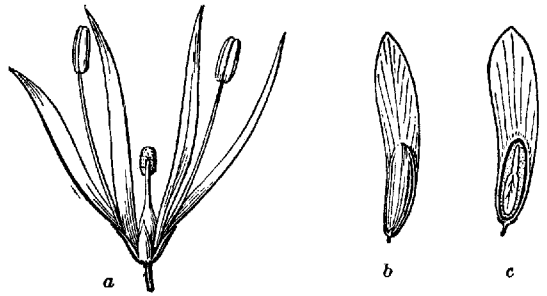
ADULTERATIONS.—Products of allied species, bread crumbs, starch, glucose, wood, bark, etc.

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

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 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.



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° C. (392° 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, ʒj–2 (4–8 cc.). 2. *Infusum Sennæ Compositum, N.F.*, 12 p. c.

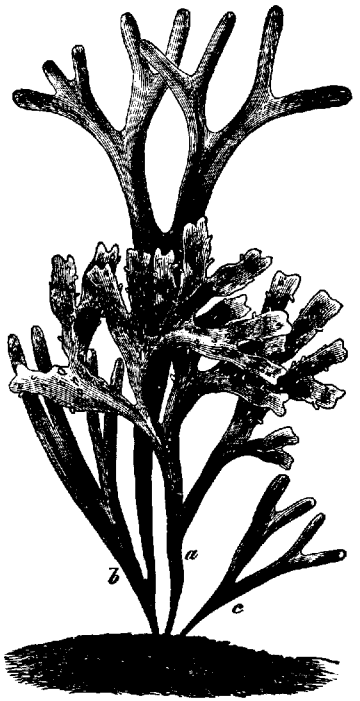
PROPERTIES.—Laxative, demulcent, expectorant, cholagogue, may cause flatulence and colic; action slow and constringes secondarily.

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.

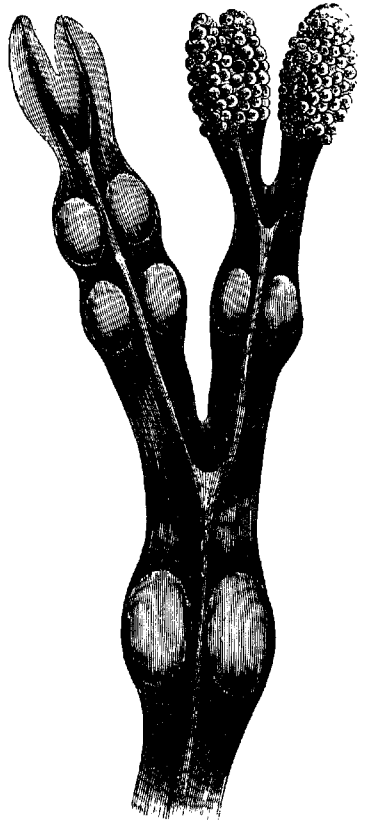
1. *Fraxinus excel'sior, European Ash.*—S. Europe. Produces manna identical with the official.

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, $C_{12}H_{22}O_{11}3H_2O$, or melitose, $C_{12}H_{28}O_{14}$, 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.

Fu'cus vesiculo'sus, F. serra'tus, F. nodo'sus, or *F. siliquo'sus, 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. ($\frac{1}{5}$–$1\frac{2}{5}$′) 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. Alterative; obesity, enlarged glands, goiter. Dose, ʒss–2 (2–8 Gm.); 1. *Fluidextractum Fuci* (75 p. c. alcohol), dose, ʒss–2 (2–8 cc.); Decoction, 5 p. c., ℥j–2 (30–60 cc.); Extract (alcoholic), gr. 5–10 (.3–.6 Gm.)



Gigartina mamillosa: a, narrow form, with fruit; *b*, large form; *c*, small form.



Fucus vesiculosus: fruiting branch, natural size.

Galega

Gale'ga officina'lis, Galega, European Goat's Rue, N.F.—The dried flowering herb with no stems over 4 Mm. ($\frac{1}{6}$′) 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, ʒss–1 (2–4 Gm.); 1. *Fluidextractum Galegæ* (diluted alcohol).

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., dicœcious, small, yellow, in 4's, staminate ones on pedicels (*pedicula'ta*) 6 Mm. ($\frac{1}{4}$′) long; fruit May–June, size 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 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.).

Garcinia Hanburyi.

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. ($1\frac{3}{5}$′) 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.

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.

GAULTHERIA. GAULTHERIA.

Methylis Salicylas. Methyl Salicylate, *U.S.P.*

Gaultheria procumbens, *Linné*, or **Betula lenta,** *Linné.* — An ester (compound ether) obtained by distilling leaves of the former, or bark of the latter, and produced synthetically.

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° C. (430° F.); optically inactive (synthetic and 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,