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**FALSE AND TRUE SENEGA.**

**BY GEO. GOEBEL, JR.**

*From an Inaugural Essay.*

A root designated as "Southern Senega" has been lately introduced and sold in place of true senega.<sup>1</sup> As *Polygala senega* is one of the most valuable American drugs, it is of great importance that it should not be displaced by a new variety without a knowledge of its medicinal properties and constituents, as compared with the true senega; therefore the writer has undertaken a comparative microscopic and physical examination of the two varieties, with a chemical analysis of the medicinal constituent.

The false senega as met with in commerce is a root varying from a yellow to a lightish brown color, surmounted by a knotty head or crown of from a half to three-fourths of an inch in diameter, the knotty crown displaying numerous stem scars. Below this crown is found the root proper, which is from three to six inches in length irregularly branched, cylindrical, tapering, longitudinally wrinkled, and breaks with a short fracture, displaying a brittle and readily removable bark, which constitutes about one-fifth of the bulk of the root. It is difficult to reduce to a fine powder on account of the hardness of the woody portion, the powder being sternutatory and of a very light straw color. The drug when masticated causes coughing; and a painful sensation in the fauces.

All efforts to trace its exact habitat, or procure a plant, so far, have proven fruitless; the only information that could be elicited was that it came from the Southern States.

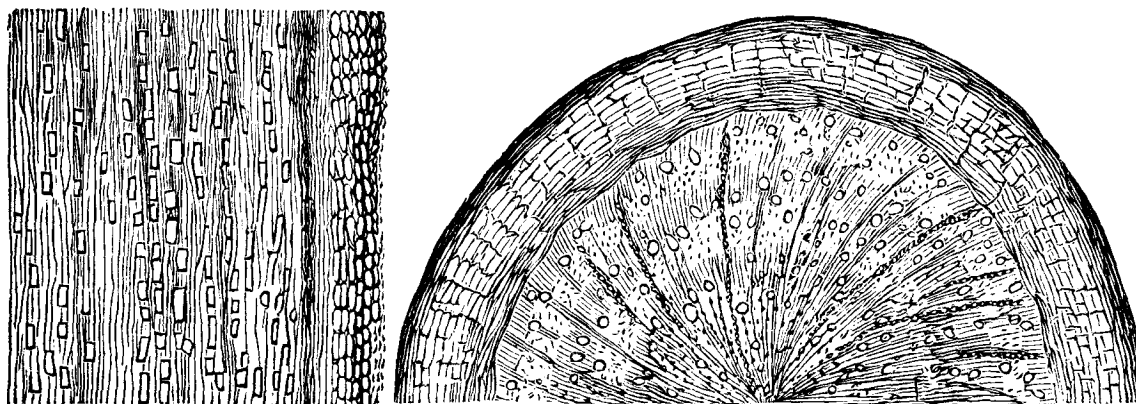
Greenish, in 1878, described a *Polygala* which corresponds with this false senega, and, after having made a histological examination,

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<sup>1</sup> This has since be identified as *Polygala alba*...weaker than the official plant, but quite serviceable. I have been using it for years.—MM

pronounced it true senega, but young and immature. This statement of Greenish is erroneous, as all true senega, whether young or old, has the characteristic keel-like projection and the irregularly formed woody tissue.

The true senega is of from a light to a dark brown color, surmounted by a very knotty head or crown of from a half to one and a quarter inch in diameter. The root proper is of from one-eighth to three-eighths inch in diameter at the upper part, is branched and tapering, of from two to five inches in length, and very much contorted, with a projecting, keel-like ridge, running the entire length of the root and rootlets in a spiral form. It is both longitudinally and transversely wrinkled, breaks with a short fracture, and exhibits a somewhat porous, rather firmly adhering bark, which varies in thickness of from one-third to one-fifth of the thickness of the root. The projecting keel disappears upon being boiled with water, and reappears when the root is dried. The woody portion is from a light yellow to almost a white color, and is in different places very irregular in shape, owing to a non-formation of portions of the woody tissue. The root is capable of being reduced to fine powder with greater ease than the false variety, the dust being very sternutatory; when chewed it produces a painful sensation in the throat and excites coughing.



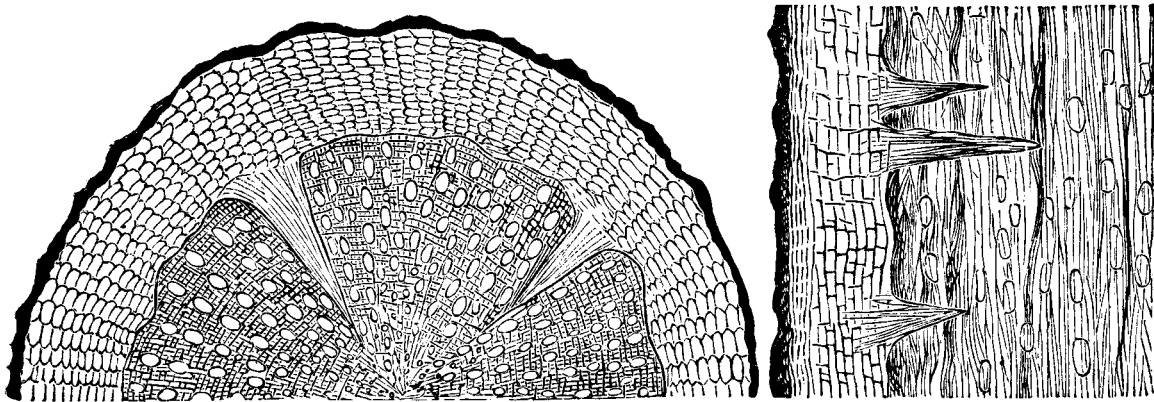
FALSE SENEGA ROOT:—Transverse and longitudinal section to center.

The false senega, when cut transversely, exhibits an outer layer of cells, rather irregular, very compact, thin and corky; the inner bark is about five or six times as thick, its cells are very regular and appear in distinct circles, varying in size; the outer circle is formed of very small, flattened cells; the second, broader layer, consists of oval cells, and is followed by a zone of smaller slightly flattened cells, and by an inner circle of cells, nearly similar to the preceding. A very thin cambium layer separates

the bark from the wood, which is rather compact, with slightly curved numerous medullary rays, composed of small flat parenchyma cells; the woody cells are small, somewhat oval shaped, intermixed with larger ducts, of the same shape, arranged in three distinct circles.

In longitudinal section, the corky layer of the bark is rather irregular; in the next layer the cells are long and flattened, followed by somewhat larger oval cells, and then by long, flattened, very compact liber cells, and finally by shred-like, very compact cells, and by the thin cambium. The wood is composed of prosenchyma tissue, with large ducts.

The true senega, when transversely cut, exhibits a bark with a very thin corky layer, and consists of hexagonal cells, forming three layers, the cells of the inner layer being much smaller in size. Inside of the thin cambium layer is the radiating woody portion, composed of wood cells and hexagonal ducts, arranged in straight lines, occasionally in pairs, and about four times as large as the adjoining cells.



SENEGA ROOT.—Transverse and longitudinal section to center.

In the longitudinal section are seen the thin corky layer, the somewhat loose-celled middle bark, the dense inner bark containing elongated cells, the thin cambium, and the compact wood with large ducts.

Polygalic acid, being the active constituent in senega, the writer's experiments have been chiefly directed to the elimination of that principle in the two drugs.

Ten troyounces of the false senega were treated as directed by Procter, in the "American Journal of Pharmacy," 1860, page 150. The powder

was exhausted by percolation with a mixture of two parts of alcohol and one of water until the percolate was free from taste and ceased to give a precipitate with basic acetate of lead. This percolate was evaporated by a water-bath to three fluidounces. During the evaporation, when the liquid reached the temperature of 158°F., it became opaque, and at 167°F. a flocculent precipitate was produced, which was filtered off, and it appeared to be albuminoid. The evaporated liquid was repeatedly shaken with fresh portions of ether, until the latter ceased to acquire color. This required fourteen fluidounces. The syrupy liquid remaining was mixed with twelve fluidounces of alcohol, and four fluidounces of ether to precipitate the polygalic acid, which is insoluble in this menstruum. The precipitate so formed was filtered off, and proven when treated with Fehling's solution to be glucose, the polygalic acid remaining in solution.

Another portion of the drug was treated by a modification of Quevenne's process; it was exhausted, first with stronger alcohol, the percolate evaporated to three fluidounces, and mixed with an equal bulk of distilled water; a light yellow precipitate of a resinous character was produced, which when filtered from the solution was found to be soluble in ether, stronger alcohol and solution of potassa. The remaining liquid was treated with solution of basic acetate of lead until a precipitate ceased to be produced; the precipitate so formed was filtered off, suspended in distilled water, and decomposed by hydro-sulphuric acid; the filtered liquid was evaporated by means of a water-bath, when the polygalic acid remained as a brownish powder; it was then well shaken with ether, to remove adhering coloring matter; the ether was decanted, leaving the polygalic acid as an amorphous light yellowish powder. The amount of acid thus obtained was two per cent.

The remaining drug was now treated with dilute alcohol until two pints had passed; this was evaporated to four fluidounces, precipitated with solution of basic acetate of lead, the precipitate filtered off, suspended in water and decomposed by sulphuretted hydrogen,<sup>2</sup> and the filtered liquid evaporated to dryness, leaving polygalic acid to the extent of one per cent., making a total of three per cent. of polygalic-acid in this false senega.

Procter's process, when applied to true senega, yielded five per cent. of acid, while Quevenne's process gave five and a quarter per cent.

<sup>2</sup> The sulphide of lead is stated by Quevenne to retain a portion of the polygalic acid, and on that account requires to be treated with hot alcohols —EDITOR.

Procter's process, being less complicated, is preferable for the manufacture of polygalic acid from true senega.

Polygalic acid so obtained is somewhat contaminated with glucose, from which it is very difficult to separate on account of their similar solubilities. Polygalic acid is insoluble in ether, chloroform, slightly soluble in alcohol, soluble in dilute alcohol and water, also in boiling alcohol, but separates to some extent upon cooling. Besides the acid, both drugs were found to contain, in varied quantities, tannin, glucose, pectin compounds and resin.

The pharmaceutical preparations made from the two roots were as follows:

Preparation.	From false senega.	From true senega.
Decoction, U. S. P.	Light straw color; weak senega odor; nearly insipid.	Deep straw color; strong odor and taste of senega.
Infusion, Br. P.	Like preceding.	Similar to preceding.
Fluid extract, U. S. P.	Transparent, dark sherry color; senega odor, somewhat modified.	Dark brown; odor nauseous; taste sweetish, then strongly acrid; excites coughing.
Syrup, U. S. P.	Yellowish-brown; slight odor and taste of senega.	Deep brown or wine color; senega odor and taste prominent.
Comp. Syrup, U. S. P.	Light yellowish-brown; slight odor and taste of senega.	Reddish-brown; odor and taste of senega well marked.
Tincture, Br. P.	Light golden-yellow; odor and taste of senega prominent.	Dark golden-yellow; strong senega odor, and characteristic taste.

The preparations of the true senega required the following amounts of diluents to obtain a color corresponding with that of the same preparation of the false root: decoction, 36 per cent. water; infusion, 40 per cent. water; fluid extract, 40 per cent. alcohol; syrup and compound syrup, 34 per cent. syrup; tincture, 30 per cent. alcohol and water.

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**Phytolacca Decandra.**—A. Terreil has found in the alcoholic extract of the berries the potassium salt of a new acid, *phytolaccic acid*; the aqueous solution of this salt is not changed by hydrochloric acid in the cold, but when heated a stiff jelly is produced which is soluble in strong alcohol. The isolated acid is amorphous, yellowish-brown, transparent,

non-deliquescent, very soluble in alcohol and water, does not precipitate salts of the earths, but on boiling reduces silver salts. Its aqueous solution is converted into a jelly by strong acids; its alkaline salts are not crystallizable.—*Compt. rend.*, xci, pp. 856-858.

## GLEANINGS IN MATERIA MEDICA.

### BY THE EDITOR.

**Myroxylon peruiferum**, Lin. F.—From this tree of tropical America a balsam, similar to balsam of Peru, and by a similar treatment, may be obtained, as was ascertained by Th. Peckolt. Its specific gravity at 17°C. was 1.031; its odor was pleasant, between that of benzoin and vanilla. When compared with true balsam of Peru, the balsam obtained from *M. peruiferum* exhibits the following differences:

<i>M. Pereiræ.</i>	<i>M. peruiferum.</i>
Taste warming to the tongue; then burning the throat; bitter and aromatic; odor agreeable, like vanilla.	Taste slightly pungent, but not warming; aromatic and astringent; odor aromatic.
Yields a volatile oil when distilled with water.	Gives only traces of a volatile oil.
Mixes with chloroform in all proportions.	Acts in the same manner, but deposits a powdery precipitate on standing.
Dissolves in six parts of 90 per cent. alcohol, and gives, after a time, a fawn-colored deposit.	Soluble in 90 per cent. alcohol in all proportions, and forms no deposit.
Ether, benzin and petroleum spirit dissolve only the yellow oil (cinnamein).	Insoluble in these three liquids.
Bisulphide of carbon only partially dissolves it, giving a yellow solution.	Bisulphide of carbon partially dissolves it, forming a clear light brown solution.
Castor oil takes up 15 per cent.	Mixes with castor oil in all proportions.
Equal volumes of balsam and concentrated sulphuric acid mixed give a stiff mixture which, kneaded with water, yields a brittle resin, which is not sticky when pressed between the fingers.	The same treatment causes the formation in twelve hours of a gelatinous mass of a reddish-black color which, kneaded with water, colors it dirty green; the mass, after washing, is sticky, and of greasy consistence.

In many points the balsam from the wood of *M. peruiferum* agrees with balsam of Peru, and the author thinks it could for many medicinal purposes replace that more expensive drug, and might be distinguished in commerce as Brazilian balsam. He states that he has used it with remarkable success as a balsam for wounds and in the treatment of scabies.<sup>3</sup> —*Phar. Jour. and Trans.*, April 2, 1881.

**Erythrina corallodendron**, Lin., a medium sized spiny leguminous tree of tropical America, is employed in asthma and cutaneous diseases as a mild laxative, diuretic, etc.; the bark and leaves, also the flowers are used. In Brazil the tree is known as “mulungu.” Rochefontaine (“Compt. Rend.,” xciii, p. 733) obtained some reactions rendering the presence of an alkaloid probable, for which the inappropriate name erythrina is suggested; the aqueous extract employed hypodermically was found to decrease the functions of the central nervous system, and the bark seems to possess sedative properties.

**Poisonous Staranise** has been observed in various parts of Europe. It is derived from *Illicium religiosum*, Siebold, which by most botanists has been regarded as identical with *Ill. anisatum*, Lour. The latter is a native of the high mountains of Yunnan in southwestern China and to the west of Canton. The former was introduced into Japan from China or the Corea in ancient times by the Buddhist priests and planted around the Japanese temples, being used when in blossom for adorning the altars and tombs. In Japan it is known as *somo*, *sicimi* or *fauna skimi* and in China as *ao-woo-soo*, while *Ill. anisatum* is *hwai hiang*. The fruit of *Ill. religiosum*, which is not used in Japan, is described by E..M. Holmes as being about one-third less in diameter than the Chinese drug; the number of carpels is 8 and a few only are generally developed to maturity. The curve or depression of the ventral suture near the apex is deeper and shorter, and hence the very short beak appears more erect than in the Chinese drug. Neither the pericarp nor seed has any taste of anise, but possesses a very faint taste and odor like the oil of *Laurus nobilis*, or distantly resembling the odor of cubebs. The seeds vary in thickness according to the degree of ripeness. The fruit when wetted and laid on a piece of blue paper reddens it immediately and strongly, while Chinese staranise causes only a very faint red coloration, and the fruits of *I. Griffithii* and *I. majus* produce no such reaction.

From Holmes' description of the fruits of other species, the following is

<sup>3</sup> The fact of its mixing readily with castor oil in all proportions would give it an advantage over the balsam of Peru for use in stimulating pomades.

extracted:

*Ill. parviflorum*, Mich., indigenous to Georgia and Carolina; carpels 8; short-beaked; taste resembles sassafras.

*Ill. floridanum*, Ellis, indigenous to the coast of Florida; carpels 13; taste like anise. In Alabama the leaves are reputed to be poisonous, and the plant has hence acquired the name of poison bay.

*Ill. Griffithii*, Hook fil. et Thorns., native of East Bengal; carpels 13; resemble in color staranise, but are darker at the ventral and dorsal sutures; on the sides with scars; beak short, incurved; terminal depression well marked; taste at first none, but shortly bitter, with some acidity, and a flavor between that of cubebs and bay leaves.

*Ill. majus*, Hook fil. et Thorns., native of the Thoug Gain range in Tenasserim, at an altitude of 5,500 feet; carpels 11 to 13; terminal depression longer and shallower and beak short and less incurved than in the preceding; taste strongly resembling mace, not bitter.—*Phar. Jour. and Trans.*, 1880, Dec. 18, pp. 489 to 491.

**Thalictrum macrocarpum.**—The root contains, according to Hanriot and Doassans, a neutral principle, *macrocarpin*, and an alkaloid, *thalictrina*. The alcoholic tincture is concentrated in a vacuum, then treated with ether and finally precipitated by water. Macrocarpin crystallizes in yellow needles, is insoluble in ether, but soluble in water, alcohol, and more so in amyl alcohol; it dissolves also in ammonia and is precipitated by acids. By exhausting crude macrocarpin with ether, thalictrina is obtained in colorless crystals, insoluble in water, and soluble, in ether and alcohol. Its nitrate is crystalline and in its properties and reactions it resembles aconitina.—*Bull. Soc. Chim.*, 2d ser., xxiv, pp. 33, 34.

**Lawsonia alba**, Lam.—“Henna al henna,” a cosmetic used by the Persians, Arabs and Egyptians, is a greenish-brown, tolerably uniform powder, feeling somewhat sandy between the fingers; by long exposure the surface acquires a reddish tint. It is a powder of Lawsonia leaves rendered somewhat impure by forameniferous sand. Dr. H. Paschki has examined three specimens of henna and two samples of Lawsonia leaves, one coming from Persia, the other from the French colony of Senegal; the latter are only distinguishable from the former by being 1 or 2 centimeters longer. The Persian leaves attain a length of 2 cm. and



a greatest breadth of 1 cm.; they are ovate, acute, mucronate, short-petiolate, entire and slightly revolute at the margin, coriaceous, shining and greenish-brown on the upper surface, lighter beneath; the lateral nerves are anastomosing near the margin. In the epidermis of the upper side are irregularly distributed numerous large mucilage cells, and both the upper and lower surfaces contain numerous stomata. The mesophyll consists of a double palisade layer and of the cells containing chlorophyll, among the latter numerous rosettes of calcium oxalate.

Lawsonia leaves contain tannin, turning green with iron salts, and yield with water a bitter extract, dissolving in ammonia with a beautiful Malaga-brown color. Alcohol now extracts wax, chlorophyll and resins, two of which are soluble in ether, one being soft and acrid, the other hard and in microscopic turmeric-yellow scales. Digested with potassa, a volatile alkaloid is given off, probably trimethylamina.

In Oriental countries, henna is used for ulcers and against all possible diseases. Its principal use is as a dye. Mixed with water, or perhaps with a little alkali, it is used for coloring orange-red the finger nails, the soles of the feet, the palms of the hands, also the points of the beard and the hair; for dyeing the hair black, the henna is used in combination with indigo.—*Zeitsch. Oest. Apoth. Ver.; Phar. Jour. and Trans.*, April 16, pp. 855-857.

**Commercial Patchouli leaves** have been examined by Dr. Henry Paschkis and compared with leaves of *Pogostemon Patchouli* from the Vienna Botanical Gardens. True patchouly leaves are from 6 to 10 centimeters (2 to 4 inches) long, ovate or rhombic ovate, narrowed at the entire base into a long petiole, above with an irregularly doubly crenate margin, light brown, moderately thin, not very abundantly hairy on both sides, with one principal nerve and the secondary nerves forming curves running towards the margin. The microscopic examination reveals in the epidermis of the upper and under side deeply indented, mostly elongated flat cells; among them, in greater number below and fewer above, are stomata with a single contiguous cell. The epidermal cells of the upper side are coarsely papillose, here and there brownish-colored. The hairs are simple throughout, several-celled (up to 6), with a warty cuticle, especially in the younger hairs. On both sides of the leaf are numerous glands, the smaller ones being stalked, the larger ones stalkless and deeply imbedded in the epidermis.

The commercial leaves were found to be mixed with other leaves, of which the following are described :

1. Roundish, nearly transversely oval, 5-fid, dentate, 10 cm. broad, 8 cm. long, with radiate venation and cordate base; dark brown above, gray-green beneath; moderately hairy on both sides, more so on the under side; rather thin ; in the mesophyll mucilage cells; on both sides small club-shaped cells ; the hairs one-celled and clustered. in bundles of 6 to 8.

2. Rhomboid, obtuse, coarsely dentate, 5 cm. long, 2'5 cm. broad, three-nerved, abundantly hairy on both sides, thick, brownish-gray.

3. Five-nerved and five-lobed, sinuate, 7 cm. long, 5.5 cm. broad, the two lower lobes small and rounded, the next pair larger and with a shallow sinus at the margin, the terminal lobe largest; the base cordate; coarsely dentate; abundantly hairy on botli sides; thick ; brown above, green underneath.

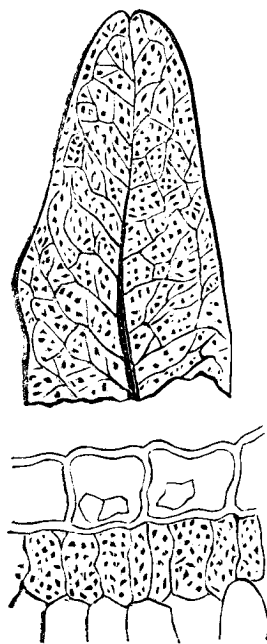
4. Palmately five-nerved and sinuately five-lobed, each lobe again divided into two smaller lobes; all acute; coarsely dentate; obcor-date at the base; about 10 cm. long and broad; brown above, gray-green beneath. In the microscopic structure, they agree with the preceding and differ but slightly from No. 1, mainly in the absence of mucilage cells.

Unmixed patchouli leaves appear to be rarely met with in the market; the sophistications amount in many cases to 80 per cent.; Nos. 2 and 3 were more frequently met with than the other two forms.

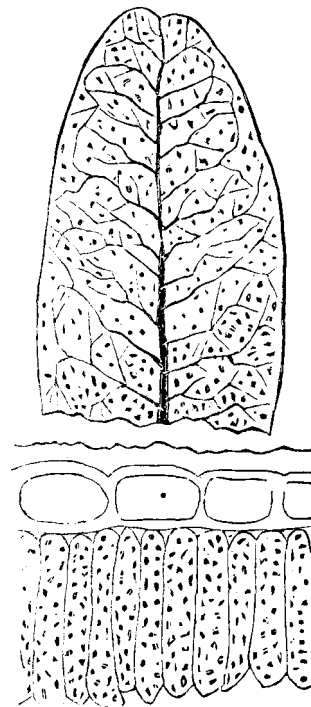
The author directs also attention to *Plectranthus Patchouli*, a labiate sold under the name of patchouly herb. The leaves are similar to true patchouli leaves, are 6 cm. long and 5 cm. broad, ovate, acute, doubly dentate and petiolate; on both sides with few stomata, with simple several-celled (up to 14) hairs and with numerous glands, the larger ones of which are imbedded in the epidermis.

The leaves of two malvaceae, *Lavatera obia* and *Pavonia Weldenii*, are five-nerved, resemble some of the false patchouli leaves, the former containing mucilage cells.—*Zeits. Oest. Apoth. Ver.*; *Phar. Jour. and Trans.*, April 2, pp. 813-815.

**False Jaborandi.**—Dr. A. Tschirch has received from Gehe & Co. leaves which bear a considerable resemblance to the leaves of *Pilocarpus pennatus*, and which are probably also derived from a rutacea. The shape and size of the leaflets of rutaceae vary considerably; in commercial jaborandi, variations from lanceolate to oval may be observed, differing in size from 6 to 15 cm. The venation is very distinct and, anastomosing near the margins, separates the inner part of the blade quite plainly from a narrow marginal zone. In the false jaborandi the final divisions of the fibro-vascular bundles are less distinct, and their anastomosing lines near the margin less clear.



**Jaborandi leaves.** Apex and transverse section.



**False Jaborandi.** Apex and transverse section.

The anatomical structure furnishes further differences. The upper epidermal tissue of both leaves consists of one row of cells, which in the true jaborandi are larger, have thin walls, and are usually filled with a brown mass, insoluble even in boiling alcohol. The epidermal cells of the false jaborandi have the inner walls relatively much thicker and occasionally contain a granular, but never a brown mass, hence these leaves are always of a brighter green. The palisade tissue under the upper epidermis is in the true jaborandi of about the height of the epidermal cells, but in the false jaborandi it is mostly twice as high. The fibrovascular bundles in the midrib of the true jaborandi have almost

always a, nearly continuous circle of bast cells, while the false jaborandi has usually merely a few scattered groups of bast cells on the line of the cambium circle.—*Phar. Zeitung*, May 21, p. 305.

## COMMERCIAL VANILLA.

*Origin.*—J. Ch. Sawer reviews the opinions expressed by different botanists as to the origin of commercial vanilla, which seems to be derived from several varieties of perhaps several species, and inclines to Morren's views (“*Bull. Acad. Roy. Belg.*,” 1 ser., xvii, p. 130), that the question can only be solved by an experienced naturalist who should examine the plants in the localities where they actually grow, compare the different length, thickness, shape, color, flavor and value of the fruit yielded by each species and variety, and accompany the diagnoses made by drawings on the spot. The finest commercial vanilla is found by Morren to closely resemble the fruit of *Vanilla planifolia*, Andrews.

*Cultivation.*—From Jaillet's report to the Societe d'Emulation (“*Rep. Phar.*,” 1880, p. 357) we quote the following condensed account of the cultivation and preparation of vanilla.

In Mexico vanilla plantations are established in forests by cutting down all shrubs, climbers and large trees as would give an excess of shade, leaving only young trees, preferably those containing a milky sap, to serve as supports to the plants. Close to each tree two cuttings are planted side by side in a shallow trench about 1½ inch deep and 15 or 20 inches long, three joints of the cuttings, after the removal of the leaves, being covered up with dried leaves, leaf mould, coarse sand, brush wood, etc., and the remainder of the shoot, 3 or four feet long, tied to the tree. The bed should be slightly raised above the level of the soil, and the supporting trees should be quite 12 to 15 feet apart. The cuttings will have taken root after a month, must be kept free from weeds and underwood, and will commence to bear fruit in the third year. For establishing vanilla plantations in a field, the land is thoroughly ploughed, and sowed with maize; and, while this is growing, young lactescent trees of the fig tribe make their appearance, and after a year are large enough for supporting the vanilla plants, from which the finest product is obtained. The fecundation of the flower is left to nature, and the plant is allowed to climb up over the trees.

In the Island of Reunion (Bourbon) the fecundation is performed artificially, and the plant is not allowed to grow out of the reach of the cultivator, but is guided along trellises formed by sticks, connecting the trunks of the trees together transversely. For supports of the vanilla in plantations established in the open field, mangoes, fig trees, or preferably physic nut trees (*Jatropha curcas*), are first grown, and the cuttings are set in trenches 8 inches deep, dug between the trees and near the trellises.

*Fecundation.*—As the labellum totally covers the stigma, and the anther rests on the labellum, spontaneous fecundation is comparatively rare, and even in Mexico, Guiana and other countries, where the plant is left to itself, it has been observed that a length of 12 to 26 inches of vine will produce only one pod from about 40 flowers, all of which can be artificially fecundated. This was formerly performed by cutting the labellum, but is now more successfully done by the method of a Creole slave in the colony, by slipping away the labellum from beneath the anther, and thus bringing that organ in direct contact with the stigma. To prevent injury to the plant by excessive fecundation, only 5 or 6 of the finest flowers on each bunch having a large fleshy peduncle, are fecundated, and when this is assured from the persistence of the flowers and their drying at the extremity of the fruit, the remainder of the bunch with all its buds should be cut off. The handsomest fruits are obtained from the first flowers, but the best from the last flowers which open on each bunch.

*Harvesting.*—The fecundated flowers decay at the extremity of the ovary, leaving the persistent gynostem attached to the fruit, which continues to grow for a month, but must be left on the stem for six months longer to allow it to ripen. Each pod should be cut off separately as it matures. The only certain indication of maturity is the crackling produced on pinching the pod between the fingers; the apple-green or greenish-yellow color is not a sufficient sign. If unripe the product will lack fragrance, color, etc.; if over-ripe, it is apt to become split in curing.

*Curing of the Fruit.*—The odor of vanilla does not pre-exist in the ripe fruit, but is developed by a process of fermentation. If allowed to remain on the plant, the pod splits into two unequal parts, becoming yellow, brown, and finally black. While it is drying it exudes an unctuous liquid, of a dark red color, called balsam of vanilla, and when quite dry becomes brittle and devoid of perfume.

The curing is effected in Guiana by placing the pods in ashes until they begin to shrivel, when they are wiped, rubbed over with olive oil and, their lower end having been tied, are hung in the open air to-dry.

In Peru the pods are dipped into boiling water, tied at the end and hung in the open air for 20 days to dry; they are then lightly smeared over with oil of palma christi, and a few days later are tied in bundles.

In Mexico the pods are placed in heaps under a shed, protected from sun and rain, and in a few days, when they begin to shrivel, are submitted to the sweating process. If the weather happens to be warm and fine, the pods are spread out in the early morning on a woolen blanket, and exposed to the direct rays of the sun, but about mid-day are wrapped in the blanket. In the evening they are enclosed in airtight boxes for sweating during the night, and on the next day they are again exposed to the sun, the dark coffee color which they acquire being deeper in proportion to the success of the sweating operation. In cloudy weather the vanilla is made into bundles; a number of these are packed together into a small bale, which is first wrapped in a woolen cloth, then in a coating of banana leaves, and the whole, enclosed in a mat, is firmly bound and sprinkled with water. The bales containing the largest beans are now placed in an oven heated to 140°F. When the temperature of the oven has fallen to 113°F., the smaller beans are introduced and the oven is closed tightly. Twenty-four hours afterwards the smaller beans were taken out, and twelve hours later the larger ones. During the sweating the vanilla acquires a fine chestnut color. It is now spread on matting, exposed to the sun every day for about two months, and when the drying is nearly complete is spread out in a dry place, and finally tied up in small packets.

In Reunion the pods are sorted according to length and scalded in water of 194°F., the long ones for 10 seconds, and the medium and short ones for 15 seconds and one minute. They are then exposed for 6 or 8 days to the sun, between woolen blankets, until they acquire the characteristic chestnut color, when they are spread out, under sheds roofed with zinc, to dry gradually for about a month, being frequently turned in the meantime. When they have acquired the proper degree of dryness to be easily twisted around the finger without cracking, they undergo the smoothing process, each bean being repeatedly passed by the operator between his fingers; the oil exuded from the entire surface of the bean

imparts the lustre and suppleness. When sufficiently dry, the beans are tied up in bundles of uniform length. The three commercial varieties are, 1, *fine vanilla*, 8 to 11 inches long, nearly black, unctuous, glossy and clean-looking, and soon becoming covered with frost-like crystals; 2, *woody vanilla*, 6 to 8 inches long, lighter in color, more or less spotted with grey, not glossy, with few crystals; collected in an unripe condition; 3, *vanillons*, either obtained from short ripe fruit, frosting well, or the abortive and unripe fruit, whose perfume is simply the result of absorption from the fine beans with which they have so long been in contact.

The total yield of the Mauritius and Reunion plantations is estimated at 29,255 kilos in 1875, 34,322 kilos in 1876, 41,270 kilos in 1877, 35,000 kilos in 1878 and 40,000 kilos in 1880.

*Vanillin*.—Its amount in commercial vanilla from various sources has been estimated at from 1.5 to 2.5 per cent. The benzoic acid found by some chemists in Mexican vanilla was, according to Tiemann and Haarmann, a mixture of vanillic acid and its aldehyd vanillin; or benzoic acid may have been dusted over inferior qualities of vanilla to imitate the natural inflorescence. Although vanillin is the principal vehicle of the aroma, it is believed not to constitute the sole flavor and perfume of vanilla, and that the vanillin prepared artificially by Tiemann and Haarmann will not quite discourage the Mexican and Bourbon planters.

*Vanillon*.—The odor of East Indian vanillon more resembles heliotrope, probably owing to a trace of benzoic aldehyd. Tiemann and Haarmann found the vanillin to amount only to 0.4 per cent., and to be more difficult to isolate by reason of the presence of a minute quantity of oily matter, which adheres to it with great tenacity.

*Products having a Vanilla-like Odor*.—The “wild vanilla” of North America is *Liatris odoratissima*, Willd.; the odor of the leaves resembles that of vanilla and tonka. For description, use, etc., see “Amer. Jour. Phar.” 1859, p. 566; 1866, p. 443; 1874, p. 299, and 1875, p. 116.

The dried leaves and fruit of *Angræcum* (s. *Aerobion*, Sprengel; *Aeranthus*, Reichenbach) *fragrans*, Du Petit-Thouars, which is known in Reunion and Mauritius as “faham,” and in Madagascar as “fanave,” possess an agreeable odor, resembling a mixture of vanilla, tonka and

melilot. The aromatic principle of the leaves is soluble in alcohol, ether and boiling water; it has been isolated by Gobley ("Jour. de Phar.," : xvii, p. 350) in the form of small white silky needles, which, on being pressed between the fingers or slightly warmed, develop the characteristic odor of "faham" and bitter almonds. It was found to contain C 76.12, H 4.12 and O 19.76, approximating it to the composition of coumarin. The fruit is supposed to contain a larger proportion of this principle than the leaves. The plant is propagated by seed. An infusion of the leaves is taken as a beverage; the mucilaginous and bitter properties contained in them are considered to act as a digestive and as a remedy for pulmonary consumption, and the dried leaves when smoked as beneficial in cases of asthma (see also this Journal, page 339). A somewhat similar odoriferous principle has been found in the leaves of other orchideous plants, as the *Orchis fusca*, and the *Ophris antropophora*, but not identical with vanillin.— *Pharm. Jour. and Trans.*, March 18, 1881, pp. 773-775.

## THE ALKALOID FROM PITURIE.

**BY PROFESSOR LIVERSIDGE, Assoc. R. S. MINES, F.I.C.**

Abstract of a paper read before the Royal Society of N. S. W., Nov. 3, 1880.

The supply of piturie upon which this investigation was conducted was obtained with considerable difficulty. The blacks prize it very highly, so that it can only be obtained from them in very small quantities at a time; hence it involves the expenditure of much time and trouble to collect together a few pounds weight of the substance. It was obtained from the Diamantina blacks who trade yearly with the Mulligan or Kykockodilla tribe, in whose country the piturie grows.

The first parcel of piturie was in the form of broken twigs, and fragments of leaves of a pale brown color, emitting a smell somewhat similar to tobacco; the fine dust causes sneezing. This is its usual state, but a second parcel was much less broken up and was of a darker color, the difference being probably due to the less careful drying which it had undergone.

The author was informed that the blacks mix the piturie with the ashes of the leaves of a particular plant, and usually roll the mixture up with a green leaf into the form of a quid before chewing; the addition of the



wood ashes is doubtless made for the same reason that lime is mixed with betel by the Malays and others, namely, for the purpose of slowly liberating the alkaloid during the process of mastication. The quid or bolus is, on ceremonial occasions, said to be passed from native to native, each one masticating it for a time, and then passing it on, it finding a resting-place behind the original proprietor's ear until again required.

The effects of the piturie seem from all accounts to be very much the same as those set up by tobacco-smoking; it does not appear to have the exciting effect upon the blacks with which it was at one time credited. As is the case with other luxuries, it is reserved by the older men for their own use exclusively, neither women nor young men being allowed to use it. The reasons for using it appear to be much the same as those which induce white people to smoke and in certain cases chew tobacco.

In a letter addressed to the author, Baron von Mueller gives the following account of the alkaloid obtained by him from piturie:

“For the preparation of piturina and piturie acid the branchlets and leaves of *Duboisia Hopwoodii*, F. v. M., were subjected to exhaustion by boiling water, the infusion evaporated to honey thickness, then mixed with three volumes of alcohol, the resulting solution evaporated to the consistence of an extract, the latter dissolved in water and precipitated by basic acetate of lead. The precipitate, separated by nitration, contained a peculiar acid substance, while the nitrate, after sufficient concentration, and after mixing with an excess of caustic soda solution and ether, yielded to the latter the alkaloid which was purified by agitating its ethereal solution with diluted sulphuric acid, thereby forming the sulphate of piturina. The aqueous solution of the latter was then again decomposed by caustic soda, the pure alkaloid removed by ether, and the solution evaporated at a gentle heat. It formed a brownish liquid of oil-like thickness, heavier than water, of acrid and burning taste and tobacco odor, much affecting the organs of sight and respiration. It is volatile and forms fogs with diluted hydrochloric acid, is of strong, alkaline reaction, and combines thoroughly with acids.

“Its hydrochloride forms precipitates with the chlorides of platinum and gold, with picric and tannic acids, phosphomolybdate of soda, bi-iodide of potassium, the iodide of potassio-mercury and potassio-bismuth, also with phospho-wolframate of soda, but this precipitate is easily dissolved

in an excess of this reagent. Piturina mixes with every proportion of water, alcohol and ether. Concentrated hydrochloric and nitric acids do not effect a coloration with it; concentrated sulphuric acid forms reddish-brown clouds and dissolves to a brownish-green liquid. The yield was about 1 per cent. of alkaloid from the dried plant.

“Piturina is in some respects allied to nicotina, but more closely akin to the duboisina of *Duboisia myoporoides* (R. Br.), the latter being of lighter color, of bitter not acrid taste, of fainter odor, less irritating to the eyes and respiratory passages; its hydrochloride in solution is not precipitated by chloride of platinum, but is so by phosphowolframate of soda, and the precipitate is not redissolved by a superabundance of that reagent.”

A. Ladenburg (“Comptes Rendus,” 1880, vol. xc, p. 874-876), however, states that the alkaloid of *Duboisia myoporoides* is identical with hyoscyamia, and that it crystallizes in small needles, fusing at 108.5°C., and is isomeric with atropia, from which it is distinguished by forming a brilliantly lustrous compound with gold chloride, fusing at 152°C. Also when treated with baryta it is converted into tropia and tropic acid, both of which are also obtained from atropia.

The great discrepancy between A. Ladenburg's account and that of Baron von Mueller's the author thinks can only be accounted for by the supposition that Ladenburg must have been supplied with a different material. Baron von Mueller and Rummel (“Jour. Chem. Soc.” January, 1879) state very plainly that the *Duboisia myoporoides* yields a volatile oily alkaloid. In the same paper Baron von Mueller also describes pituric or duboisic acid obtained from the precipitate given by the piturie on the addition of basic acetate of lead.

In the “Pharmaceutical Society's Journal” for April 5, 1879, there is an account of an examination of some piturie made by Mons. Petit, of Paris, in which he comes to the conclusion that the alkaloid is identical with nicotina; but M. Petit does not seem to have had sufficient material to permit a combustion to be made of the alkaloid; he had to rely mainly upon its reactions with certain chemicals, and apparently was only able to make one determination each of the platinum and chlorine in the platinum salt; the amounts of which apparently roughly correspond with those required for the chloroplatinate of nicotina, viz., 34.4 per cent. platinum and 37 per cent. chlorine, the percentages obtained being

platinum 34 per cent. and chlorine 36 per cent. These results, however, cannot be regarded as final, since, as will be shown later on, the platinum salt cannot be depended upon, as it is not of uniform composition.

In the preparation of the alkaloid by the author the piturie was extracted with boiling water slightly acidified with sulphuric acid, the liquid concentrated by evaporation and distilled with an excess of caustic soda, *blah blah, etc. (punch-line: they ARE different alkaloids.)*

<6 pages of agonizing minutæ deleted...trust me—agonizing>

## **ROSE OIL, OR OTTO OF ROSES.**

**BY CHARLES G. WARNFORD LOCK.**

This celebrated perfume is the volatile essential oil distilled from the flowers of some varieties of rose. The botany of roses appears to be in a transition and somewhat unsatisfactory state. Thus the otto-yielding rose is variously styled *Rosa damascena*, *R. sempervirens*, *R. moschata*, *R. gallica*, *R. centifolia*, *R. provincialis*. It is pretty generally agreed that the kind grown for its otto in Bulgaria is the damask rose (*R. damascena*), a variety induced by long cultivation, as it is not to be found wild. It forms a bush, usually 3 to 4 feet, but sometimes 6 feet high; its flowers are of moderate size, semi-double, and arranged several on a branch, though not in clusters or bunches. In color they are mostly light red; some few are white, and said to be less productive of otto.

The utilization of the delicious perfume of the rose was attempted, with more or less success, long prior to the comparatively modern process of distilling its essential oil. The early methods chiefly in vogue were the distillation of rose water, and the infusion of roses in olive oil, the latter flourishing in Europe generally down to the last century, and surviving at the present day in the south of France. The butyraceous oil produced by the distillation of roses for making rose water in this country is valueless as a perfume, and the real otto was scarcely known in British commerce before the present century.

The profitable cultivation of roses for the preparation of otto is limited chiefly by climatic conditions. The odoriferous constituent of the otto is a

liquid containing oxygen, the solid hydrocarbon or stearopten, with which it is combined, being absolutely devoid of perfume. The proportion which this inodorous solid constituent bears to the liquid perfume increases with the unsuitability of the climate, varying from about 18 per cent. in Bulgarian oil to 35 and even 68 per cent. in rose oils distilled in France and England. This increase in the proportion of stearopten is also shown by the progressively heightened fusing point of rose oils from different sources; thus while Bulgarian oil fuses at about 61° to 64°F., an Indian sample required 68°F., one from the south of France 70° to 73°F., one from Paris 84°F., and one obtained in making rose water in London 86° to 89.5°F. Even in the Bulgarian oil a notable difference is observed between that produced on the hills and that on the lowlands.

It is, therefore, not surprising that the culture of roses, and extraction of their perfume, should have originated in the East. Persia produced rose water at an early date, and the town of Nisibin, northwest of Mosul, was famous for it in the fourteenth century. Shiraz, in the seventeenth century, prepared both rose water and otto for export to other parts of Persia as well as all over India. The Perso-Indian trade in rose oil, which continued to possess considerable importance in the third quarter of the eighteenth century, is declining, and has nearly disappeared; but the shipments of rose water still maintain a respectable figure. The value, in rupees, of the exports of rose water from Bushire in 1879 was—4,000 to India, 1,500 to Java, 200 to Aden and the Bed Sea, 1,000 to Muscat and dependencies, 200 to Arab coast of Persian Gulf and Bahrein, 200 to Persian coast and Mekran, and 1,000 to Zanzibar. Similar statistics relating to Lingah, in the same year, show—Otto: 400 to Arab coast of Persian Gulf and Bahrein, and 250 to Persian coast and Mekran. And Bahrein, Persian otto: 2,200 to Koweit, Busrah and Bagdad; rose-water: 200 to Arab coast of Persian Gulf, and 1,000 to Koweit, Busrah and Bagdad.

India itself has a considerable area devoted to rose gardens, as at Ghazi-pur, Lahore, Amritzur, and other places, the kind of rose being *R. damascena*, according to Brandis. Both rose water and otto are produced. The flowers are distilled with double their weight of water in clay stills; the rose water (*goolabi pani*) thus obtained is placed in shallow vessels, covered with moist muslin to keep out dust and flies, and exposed all night to the cool air or fanned. In the morning, the film of oil which has collected on the top is skimmed off by a feather, and

transferred to a small phial. This is repeated for several nights, till almost the whole of the oil has separated. The quantity of the product varies much, and three different authorities give the following figures: (a) 20,000 roses to make one rupee's weight (176 grains) of otto; (b) 200,000 to make the same weight; (c) 1,000 roses afford less than two grains of otto. The color ranges from green to bright amber, and reddish. The oil (otto) is most carefully bottled; the receptacles are hermetically sealed with wax, and exposed to the full glare of the sun for several days. Rose water deprived of otto is esteemed much inferior to that which has not been so treated. When bottled it is also exposed to the sun for a fortnight at least.

The Mediterranean countries of Africa enter but feebly into this industry, and it is a little remarkable that the French have not cultivated it in Algeria. Egypt's demand for rose water and rose vinegar is supplied from Medinet Fayum, Southwest of Cairo. Tunis has also some local reputation for similar products. Von Maltzan says that the rose there grown for otto is the dog-rose (*R. canina*), and that it is extremely fragrant, 20 lbs. of the flowers yielding about one drachm of otto. Genoa occasionally imports a little of this product, which is of excellent quality. In the south of France rose gardens occupy a large share of attention, about Grasse, Cannes and Nice; they chiefly produce rose water, much of which is exported to England. The essence (otto) obtained by the distillation of the Provence rose (*R. provincialis*) has a characteristic perfume, arising, it is believed, from the bees transporting the pollen of the orange flowers into the petals of the roses. The French otto is richer in stearopten than the Turkish, 9 grams crystallizing in a liter of alcohol at the same temperature as 18 grams of the Turkish. The best preparations are made at Cannes and Grasse. The flowers are not there treated for the otto, but are submitted to a process of maceration in fat or oil, 10 kilograms of roses being required to impregnate 1 kilogram of fat. The price of the roses varies from .50 cents to 1 franc 25 cents per kilogram.

But the one commercially important source of otto of roses is a circumscribed patch of ancient Thrace or modern Bulgaria, stretching along the southern slopes of the central Balkans, and approximately included between the 25th and 26th degree of east longitude and the 42d and 43d degree of north latitude. The chief rose growing districts are Philippopolis, Chirpan, Giopcu, Karadshah-Dagh, Kojun-Tepe, Eski-Sara, Jeni-Sara, Bazardshik, and the centre and headquarters of

the industry, Kaz-aniik (Kisanlik), situated in a beautiful undulating plain, in the valley of the Tunja. The productiveness of the last-mentioned district may be judged from the fact that, of the one hundred and twenty-three Thracian localities carrying on the preparation of otto in 1877—they numbered one hundred and forty in 1859—forty-two belong to it. The only place affording otto on the northern side of the Balkans is Travino. The geological formation throughout is syenite, the decomposition of which has provided a soil so fertile as to need but little manuring. The vegetation, according to Baur, indicates a climate differing but slightly from that of the Black Forest, the average summer temperatures being stated at 82° F. at noon and 68°F. in the evening. The rose bushes flourish best and live longest on sandy, sun-exposed (south and southeast aspect) slopes. The flowers produced by those growing on inclined ground are dearer and more esteemed than any raised on level land, being 50 per cent. richer in oil, and that of a stronger quality. This proves the advantage of thorough drainage. On the other hand, plantations at liigh altitudes yield less oil, which is of a character that readily congeals from an insufficiency of summer heat. The districts lying adjacent to and in the mountains are sometimes visited by hard frosts, which destroy or greatly reduce the crop. Floods also occasionally do considerable damage. The bushes are attacked at intervals and in patches by a blight similar to that which injures the vines of the country.

The bushes are planted in hedge-like rows in gardens and fields, at convenient distances apart, for the gathering of the crop. They are seldom manured. The planting takes place in spring and autumn; the flowers attain perfection in April and May, and the harvest lasts from May till the beginning of June. The expanded flowers are gathered before sunrise, often with the calyx attached; such as are not required for immediate distillation are spread out in cellars, but all are treated within the day on which they are plucked. Baur states that, if the buds develop slowly, by reason of cool damp weather, and are not much exposed to sun heat when about to be collected, a rich yield of otto, having a low solidifying point, is the result, whereas, should the sky be clear and the temperature high at or shortly before the time of gathering, the product is diminished and is more easily congealable. Hanbury, on the contrary, when distilling roses in London, noticed that when they had been collected on fine dry days the rose water had most volatile oil floating upon it, and that, when gathered in cool and rainy weather, little or no volatile oil separated.

The flowers are not salted, nor subjected to any other treatment, before being conveyed in baskets on the heads of men and women, and backs of animals, to the distilling apparatus. This consists of a tinned-copper still, erected on a semicircle of bricks, and heated by a wood fire; from the top passes a straight tin pipe, which obliquely traverses a tub kept constantly filled with cold water, by a spout, from some convenient rivulet, and constitutes the condenser. Several such stills are usually placed together, often beneath the shade of a large tree. The still is charged with 25 to 50 lbs. of roses, not previously deprived of their calyces, and double the volume of spring water. The distillation is carried on for about one hour and a half, the result being simply a very oily rose water (*ghyul-suyu*). The exhausted flowers are removed from the still, and the decoction is used for the next distillation instead of fresh water. The first distillates from each apparatus are mixed and distilled by themselves, one-sixth being drawn off; the residue replaces spring water for subsequent operations. The distillate is received in long-necked bottles, holding about 1 $\frac{1}{4}$  gallon. It is kept in them for a day or two, at a temperature exceeding 59°F., by which time most of the oil, fluid and bright, will have reached the surface. It is skimmed off by a small, long-handled, fine-orificed tin funnel, and is then ready for sale. The last-run rose water is extremely fragrant, and is much prized locally for culinary and medicinal purposes. The quantity and quality of the otto are much influenced by the character of the water used in distilling. When hard spring water is employed, the otto is rich in stearopten, but less transparent and fragrant. The average quantity of the product is estimated by Baur at 0.037 to 0.040 per cent.; another authority says that 3,200 kilograms of roses give 1 kilogram of oil.

Pure otto, carefully distilled, is at first colorless, but speedily becomes yellowish; its specific gravity is 0.87 at 72.5°F.; its boiling point is 444°F.; it solidifies at 51.8° to 60.8°F. or still higher; it is soluble in absolute alcohol and in acetic acid. The most usual and reliable tests of the quality of an otto are (1) its odor, (2) its congealing point, (3) its crystallization. The odor can be judged only after long experience. A good oil should congeal well in five minutes at a temperature of 54.5°F.; fraudulent additions lower the congealing point. The crystals of rose-stearopten are light, feathery, shining plates, filling the whole liquid. Almost the only material used for artificially heightening the apparent proportion of stearopten is said to be spermaceti, which is easily recognizable from its liability to settle down in a solid cake, and from its

melting at 122°F., whereas the stearopten fuses at 81.4°F. Possibly paraffin wax would more easily escape detection.

The adulterations by means of other essential oils are much more difficult of discovery, and much more general; in fact, it is said that none of the Bulgarian otto is completely free from this kind of sophistication. The oils employed for the purpose are certain of the grass oils (*Andropogon* and *Cymbopogon* spp.), notably that afforded by *Andropogon Schoenanthus*, called *idris-aghi* by the Turks, and commonly known to Europeans as "geranium oil," though quite distinct from true geranium oil. The addition is generally made by sprinkling it upon the rose leaves before distilling. It is largely produced in the neighborhood of Delhi and exported to Turkey by way of Arabia; it is sold by Arabs in Constantinople in large bladder-shaped tinned-copper vessels, holding about 120 lbs. As it is usually itself adulterated with some fatty oil, it needs to undergo purification before use. This is effected in the following manner: The crude oil is repeatedly shaken up with water acidulated with lemon juice, from which it is poured off after standing for a day. The washed oil is placed in shallow saucers, well exposed to sun and air, by which it gradually loses its objectionable odor. Spring and early summer are the best seasons for the operation, which occupies two to four weeks, according to the state of the weather and the quality of the oil. The general characters of this oil are so similar to those of otto of roses—even the odor bearing a distant resemblance—that their discrimination when mixed is a matter of practical impossibility. The ratio of the adulteration varies from a small figure up to 80 or 90 per cent. The only safeguard against deception is to pay a fair price and to deal with firms of good repute, such as Messrs., Papasoglu, Manoglu & Son, Ihmsen & Co. and Holstein & Co., in Constantinople.

The otto is put up in squat-shaped flasks of tinned copper called *kunkumas*, holding from 1 to 10 lbs. and sewn up in white woolen cloths. Usually their contents are transferred at Constantinople into small gilded bottles of German manufacture for export. The Bulgarian otto harvest, during the five years 1867-71, was reckoned to average somewhat below 400,000 meticals, miskals or midfsals (of about 3 dwt. troy), or 4,226 lbs. avoirdupois; that of 1873, which was good, was estimated at 500,000, value about £700,000. The harvest of 1880 realized more than £1,000,000, though the roses themselves were not so valuable as in 1876. About 300,000 meticals of otto, valued at £932,077,



were exported in 1876 from Phillippopolis, chiefly to France, Australia, America and Germany.—*Phar. Jour. and Trans.*, April 30, 1881, from *Jour. Soc. Arts*, Feb. 11, 1881.