JATEORHIZA CALUMBA.

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REPRINTED FROM

The Western Druggist,

CHICAGO, JANUARY, 1898.

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BOTANICAL DESCRIPTION AND HISTORY.

Persons familiar with our common yellow parilla, menispermum canadense, have a good idea of the plant that yields the calumba root of commerce. Indeed, a casual observer would take an illustration of one for the other, so closely do they resemble each other in shape of leaf, stem and general floral appearance. One author, Roxburgh (Flora Ind., Vol. 3, p. 807) has placed the plant in the genus menispermum. The genus jateorhiza as now constituted consists of three species, all natives of tropical Africa. It belongs to the natural order menispermaceae. The plant which produces the colombo root of commerce is a herbaceous vine climbing over trees in the forests of eastern tropical Africa in the territory of Mozambique and Quilimani. The leaves are alternate, petiolate, cordate and palmately lobed. As previously stated, they look very much like the leaves of our common yellow parilla. The flowers are dioeceous and borne in pendulous axillary panicles. The female flowers have six sepals, six petals, six abortive stamens and three pistils, The male flowers have the

* Derived from the Greek words *iater,* physician, and *rhiza,* root, evidently in allusion to its healing virtues. Most German and a few English authorities (e. g. Flueckiger (26) the German pharmacopeia of 1890, the U. S. pharmacopeia of 1880, and others) spell the name "jateorrhiza," with the two r's, notwithstanding the fact that Miers, the author of the name (16), spelled it with a single r. In this he is followed by most authorities (except the Germans), including the Index Kewensis, and the U. S. pharmacopeia of 1890. Marmé (Pharmacognosie, 1886), suggests that the name *jatrorhiza,* should be used instead of jateorhiza, and so also does Koehler (Medicinal-pflanzen, 140.)

‡ The thanks of the writer are extended to Mr. C. G. Lloyd for botanical notes, and to Dr. Sigmond Waldbott, librarian of the Lloyd library, for invaluable assistance.

same floral envelopes and six perfect stamens. The anthers, as in yellow parilla, are four-celled, a structure comparatively rare save in this natural order. The plants that produce the root of commerce vary much in the shape of the leaves and in the amount of hispidity in the stem, and were formerly considered as belonging to two species, jateorhiza calumba and jateorhiza palmata, but later botanists have united them under the former name.

Calumba (also columbo) root has long been in use under the name "kalumb" among the African tribes of Mozambique, who employed it as a remedy for dysentery and other diseases (Berry)[10]. Undoubtedly the drug was brought by them to the immediate knowledge of the Portuguese when they obtained possession of that country in 1508.[23] Through the influence of their traders, knowledge of the drug was slowly diffused among the Europeans during the sixteenth and seventeenth centuries.

The first definite information regarding calumba root, however, dates from the year 1671, when Francisus Redi (1626-1697), born at Arezzo and physician to the Duke of Toscana, describing it under the name *calumba*[16] made its medicinal virtues conspicuous.*

In 1695 the celebrated Leeuwenhoek, in his work "Arcana Naturae," recorded some chemical experiments that he had made with this root, which he calls radix indica, rays columba. He also introduced illustrations of crystals observed in the study of this drug. Contemporaneously with this physicist J. C. Semmendus (probably in 1689 or shortly before) mentions *calumba* in his writings as occurring among drugs originating from India. This author's work has become more prominent in a later edition (l722).[3]

Valmont-Bomare in the 1764 edition of his dictionary describes "calumbe" as the root of an unknown tree brought to us from India. He adds that in Bengal this root is considered a specific in cases of colics, indigestion and against the effects of "mart-du-chien" which is the old French name for colchicum.[4]

Not, however, until in close succession the treatises on calumba root by Gaubius (1771)[5], Cartheuser (1773)[6] and Percival (1773)[7] appeared was there much general distribution of knowledge concerning this drug. In this connection it is perhaps of interest to note that in a previous translation (dated 1755) of Cartheuser's Materia Medica calumba root is not to be found.

Through Percival's recommendation especially the drug rapidly gained entrance into European materia medica, and since about 1776 we find a record of it in many of the pharmacopeias of European countries. However, the geographical and botanical origin of calumba root as yet remained a mystery. The Portuguese, as already stated, having had a monopoly of the trade in this article, seemed to have been careful not to disclose the origin of the drug and made it a custom to carry it to India and then to export it to Europe from Indian instead of African ports. Hence, for a long time the general impression prevailed that the plant was a native of India and that the capital of Ceylon (Colombo) gave the drug its name.

From about 1770, however, the suspicion that calumba root was of African origin had been gaining ground. In this year Philibert Commerson, a French physician, collected a specimen of a certain plant which was growing in the garden of M. Poivre in the Isle de France, which Lamarck in 1797 named memspermum palmatum, stating that this memspermum (of which he described the male plant only) perhaps yielded the root that is brought to us from India under the name of calombo or colombo root. He adds, however, that "it seems to be indigenous to India."[9]

In 1805 a distinct advance was made in establishing its African origin. M. Fortin in this year brought the root of a male calumba plant from Mozambique to the city of Madras, where it was raised and cultivated by Dr. James Anderson. From this specimen Dr. Berry, in 1811, published a botanical description in the "Asiatic Researches"[10] in which he also gives definite infor-

mation regarding its origin and uses in its native country. The specimen was transported later by him to the Calcutta botanical gardens.[12] De Candolle in 1818 named the plant *cocculus palmatus.* However, the female plant was still unknown.

In 1825 Capt. W. F. Owen brought a male and a female plant from Oibo, in east Africa, to Mauritius, where it was cultivated and observed by Bojer[21]. From this source, at last, Sir W. J. Hooker in 1830 was enabled to describe the whole plant, both male and female, under the name of cocculus palmatus, Hooker.[13]

The name of the genus *jateorhiza* was finally created in 1849 by Miers. (Hooker, Niger Flora, p. 212). *Chasmanthera columba* is another synonym for this plant proposed by Baillon. (Nat. Hist. of Plants, Vol. III., London, 1874.)

DRUG DESCRIPTION AND CONSTITUENTS.

Calumba is collected in the dry season—i.e., in March. The root is perennial and composed of a short rhizome from which issue a number of fasciculated, fusiform, fleshy roots, sometimes of the thickness of an infant's arm and covered with a brown epidermis. These roots are cut into transverse slices and are then slowly dried in the shade.

The U. S. pharmacopeia describes the drug as occurring "in nearly circular discs, 3 to 6 Cm in diameter,* externally greenish-brown and wrinkled, internally yellowish or grayish-yellow, depressed in the center, with a few interrupted circles of projecting wood-bundles, distinctly radiate on the outer portion, fracture short, mealy, odor slight, taste mucilaginous, slightly aromatic, very bitter."

A marked characteristic of this drug is the dark cambium line which separates the bark from the wood. The central depression, which is, of course, due to the greater amount of shrinkage of the less substantial interior, also distinguishes this root from possible adulterations-e. g., bryonia. (See later.)

*And 0.6 to 2 Cm in thickness.

The bitterness of calumba is due to three substances —calumbin, berberine and calumbic acid. *Calumbin* is a neutral, crystallizable principle discovered by Wittstock (1830)[26], occurring in the root in amounts determined in different proportions by various investigators, possibly due to varying qualities of the drug or the method of preparation. Some reports are as follows: 0.8 per cent, Wittstock, 1830[26]; 0.4, per cent Duquesnel, 1886[24]; 0.7 per cent, Kremel, 1887[25]. Calumbin is hardly soluble in water, sparingly soluble in alcohol and ether at ordinary temperatures, but more soluble at boiling temperatures. It is also soluble in alkalies, from which solution acids precipitate it unchanged. Various modes of isolating calumbin are described by Wittstockte, Lebourdais[15], Alessanri[22], Duquesne[24], Kremel[25] and others.

Berberine was discovered in calumba root by Boedeker in 1840, who also found *calumbic acid*, which he thought to be in combination with berberine.[26]

Starch is a prominent constituent of the drug, constituting about one-third of its weight; hence iodin in solution produces a deep-blue coloration. Tannin, on the other hand, is entirely absent, hence the drug is compatible with iron salts. Incompatibles are quoted to be acetate of lead, mercuric chlorid, lime water, also infusion of galls. Calumba root leaves 6 per cent of ash.

In 1895 Alexander Gunn observed a fluorescent principle in fluid preparations of calumba root and succeeded in separating it[27]. This observation gains strong support by the researches of A. Hilger[28], who in 1896 investigated the chemistry of calumbin, observing that it may be converted by the action of 15-per-cent hydrochloric acid into a yellowish-brown mass, while the solution exhibits a bluish green fluorescence. Thus he ascribes to the presence of a substance not yet isolated.

The presence of starch no doubt causes the drug to be so freely eaten by worms. Great difficulty is encountered in trade to obtain a batch of the root unaffected by worms. (Gehe, Handelsberichte.)

SUBSTITUTIONS AND RELATED SPECIES.

The marked pharmacological and chemical characteristics of calumba root render the detection of substitution comparatively easy.

Among possible adulterations may be mentioned bryonia alba, the root of which is sometimes cut in slices, dyed yellow with turmeric or safflower and rendered bitter by infusion of calumba or quassia. Bryonia may be recognized by the presence of annular rings, which are present in calumba root only in the center of the largest disks. The most frequent substitute for calumba root is that of the root of frasera carolinensis, also called frasera Walteri. So pronounced and common was this substitution as to lead to the popular common name, *American columbo.* Guibourt asserts that between the years 1820 and 1826 the calumba root entirely disappeared from the French market, and he found that another drug had been substituted without the least objection. That this is likely to be true is evidenced by the fact that immense amounts of American columbo root were gathered in our western states during the first part of this century and disposed of abroad. Guibourt cites the following reactions which distinguish this false drug from true calumba root: Its infusion reddens litmus, forms a greenish-black precipitate with ferrous sulfate, is rendered turbid by isinglass and evolves ammonia by the action of fixed alkalies. Besides, the dark cambium line of the true calumba is absent in the spurious drug, and unlike true calumba it contains no starch. Guibourt first had thought it to be an Algerian plant, but later acknowledged its American origin[20].

In the United States warm advocates of the use of *frasera Walteri* in place of calumba were found in the early part of this century. It was then known as the *Marietta columbo,** (see Coxe, Amer. Disp., 1818, 4th ed.). It also figures among the remedies recommended by Peter Smith (1813), "The Indian Doctor," in his dis-

* So named because a well-known physician, Dr. S. P. Hildreth of Marietta, Ohio. used it in his practice and described it in Coke's Dispensatory.

pensatory (see Amer. Jour. Pharm., Jan. 1898). Being so fortunate as to have in temporary possession perhaps the only copy in existence, the opportunity is taken to quote from this rare work part of what the author has to say (The Indian Doctor's Dispensatory. By Peter Smith, Cincinnati, 1813. Page 13) on the 'Columbo or Miami Root"

NO. 4, THE COLUMBO OR MIAMI ROOT

is found in plenty in the Ohio and Kentucky states. This valuable production is several years old before it sends up its stalk. The leaves are very smooth and grow in bunches nearly as big as mullein leaves, but not so wide; the stalk is round like a musket barrel and often grows six or seven feet high, having always four leaves at right angles growing at a joint; its seeds grow in pods shaped like a horse bean, and are much like parsnip seeds.

The columbo leaves occasion sweat copiously when laid to the forehead, and will commonly relieve the headache; and this relief will be found special in many cases-to sweat away boils, inflammations and even old chronic pains. The columbo root ought to be used as a bracing or tonic medicine; but it is both an emetic and a cathartic if taken in large quantities. * * *

One of the peculiar traits of the columbo root is that it braces the stomach, if only two or three chews of it are taken and the spittle or saliva swallowed. * * *

Bitters made of this root are proper to confirm health, and I believe that the root, or its preparations, is the best relief for the nausea and costiveness of a pregnant woman.

The use of this root will, I expect, supercede that of the Jesuit barks and so fill their place that we shall need none of them.

This Miami columbo root is of a pale yellow; its taste is a mild bitter but of a lower jist than the imported, allowed to be so by reason of the odds of climate, yet fully as efficaceous as the other.

This root might be sent to market in great quantities from the Miami country.

Dr. Richard Allison of Cincinnati claims the honor of discovering this to be the columbo root in our country, and to him I am indebted for my first ideas of its virtues. After Dr. Allison had been informed that the doctors in Phila-

delphia denied it to be the columbo root, I heard him say: "I know the columbo root as well as any of them, and I believe it to be the columbo root,"

In 1850 and 1853 Hanbury [17] and Hooker [18] report on a spurious calumba root then being imported from India into England in considerable quantities. The plant yielding it was indeed indigenous to Ceylon, where it grows plentifully and is used as a tonic among the natives, but according to the testimony of Roxburgh,[19] and before him of Thunberg, this plant is not the true calumba root of the materia medica, but is the root of a related species, *menispermum fenestratum,* Gaertner, *(coccinium fenestratum,* Colebrooke). Hanbury gives an excellent illustration of the cross-section of the stem of this plant which was offered in slices as calumba root.

That true calumba root does not grow in Ceylon (see history) is again evidenced in a list of seventy or eighty medicinal plants of Ceylon contained in a dissertation by Dr. Scott of 1819, for calumba root is not enumerated. (Bigelow, Sequel, 1822.)

In 1891 T. H. Wardleworth (Chemist and Druggist, 1891, p. 736). reported a spurious calumba root from western Africa, indiscriminately imported by the new African trading companies. He pronounces the drug to be a stem of a species of tinospora.

Taking the entire record concerning calumba, we may conclude that true calumba was imported from Africa during a period of three hundred years before its origin was known (1508 introduced, 1811 identified by Berry). During all this time the crafty tradesmen led Europeans to believe the drug was of East Indian origin. A spurious calumba root was derived from India and another from America, the latter drug being exported as a substitute in large quantity.

PHYSIOLOGICAL NOTES AND PHARMACOPEIAL RECORD.

Various medicinal virtues have been claimed for this drug. It was at one time said to be efficient in cholera and in cases of nervous vomiting, etc. Conservative

physicians agree on its being "a type of a bitter tonic, free from astringency and of stimulating properties." (Gubler, Commentaires, 1874,) More recently calumbin was suspected of being toxic, and possibly for a like reason has been placed under restricted sale in Germany (Hirsch und Schneider, Commentar, 1895.)

The drug is not recorded in any pharmacopeia at our command, prior to 1776. In this year the Pharmacopoeia Edinburgensis, edited by Baldinger, mentions the drug, which is the first record we have seen in English pharmacopeias. In an appendix the author credits the works of Gaubius[5] and Cartheuser[6] as being the source of information. The Pharmacopoeia Londinensis of 1809 (Ed. Powell) states: "Calumbae radix: Root of a plant not yet named." In 1824 it is mentioned as being derived from cocculus palmatus, De Candolle.

As far as we can ascertain, the modern pharmacopeias, including that of the United States, describe it under the names of jateorhiza calumba or jateorhiza palmata, while the French codex derives the drug from chasmanthera palmata, H. Baillon (jateorhiza palmata, Miers). The Pharmacopeia Portugueza of 1876 directs the root to be derived from jateorhiza columba, Miers (cocculus palmatus, De Cand.) and jateorhiza Miersii, Oliv. (cocculus palmatus, Hook., non De Cand.)

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