

A New Plant Source of Narcotic Drugs : *Methysticodendron Amesianum*

By Dr. Richard Evans Schultes, F.L.S.

Curator, Ames Herbarium, Botanical Museum of Harvard University

Recent ethnobotanical investigations in Colombia have greatly added to our knowledge of the narcotic and stimulant plants which are used in divination, witchcraft and medicine by the Indians of these areas. The discovery, in the high and geographically isolated Indian village of Sibundoy, of a tree, representing a new genus and belonging apparently to the *Solanaceae*, may have significant consequences in several different fields of study.

In early 1942, whilst I was engaged in ethnobotanical studies in the Putumayo of Colombia, my attention was drawn to a most extraordinary tree which the Kamsá and Inga Indians of the valley of Sibundoy cultivate for use as a narcotic. Flowering material was collected, an examination of which seemed to indicate that a new genus close to the *Brugmansia* group of *Datura* had been found. In the following years, I made several trips to Sibundoy and was able to gather additional material from the original and several adjacent trees; and colleagues, who have travelled in the area, have been kind enough to prepare specimens from still other trees both in the village of Sibundoy and the neighbouring town of Santiago. In 1953, we were able finally to introduce the tree into cultivation in easily accessible gardens. Now, with plentiful material and after more than a decade of cautious consideration, I still hold that we have at hand an undescribed genus.¹ In 1956, I was able to continue very detailed field studies on the genus in Sibundoy.

Use of the Plant in its Original Habitat

This plant, *Methysticodendron Amesianum*, known only from the valley of Sibundoy, is employed by the Inga and Kamsá Indians in their witchcraft. Its use in each tribe is restricted to several witch-doctors, and these practitioners grow the plant with special care in the neighbourhood of their huts. The wild habitat of the species is said to be the forested slopes of the mountains to the south of the valley of Sibundoy, especially the slopes of the botanically almost completely unknown Cerro Patascóy. When in cultivation, the plant is apparently the hereditary property of certain families, as the sorcerers pass it on to the eldest son together with the secrets attending its use.

Little could be learned about the use of the narcotic, partly because of the proximity of influential Christian missionaries. It would appear from what information I have been able to glean that *Methysticodendron Amesianum*, which the Indians classify together with other intoxicating solanaceous plants similarly used, is by far the strongest of all the narcotics of



FIGURE 1

*Habit drawing of a flowering bunch, about one half natural size
(Drawn by Elmer W. Smith)*

the region, surpassing in danger and potency even the tree-species of *Datura*.

A description of the intoxication indicates that the active principles may be solanaceous alkaloids of the tropane series. This intoxication, resorted to by the witch-doctors only for very important or difficult cases of divination, prophecy or therapy, usually lasts for two full days and sometimes may persist for four—with a long period of complete lack of consciousness. Missionaries who have been at work in the valley of Sibundoy for more than a quarter of a century suspect that the death of one aged witch-doctor may have been due to an overdose of this narcotic.

¹ A botanical description of the tree is presented in the appendix.

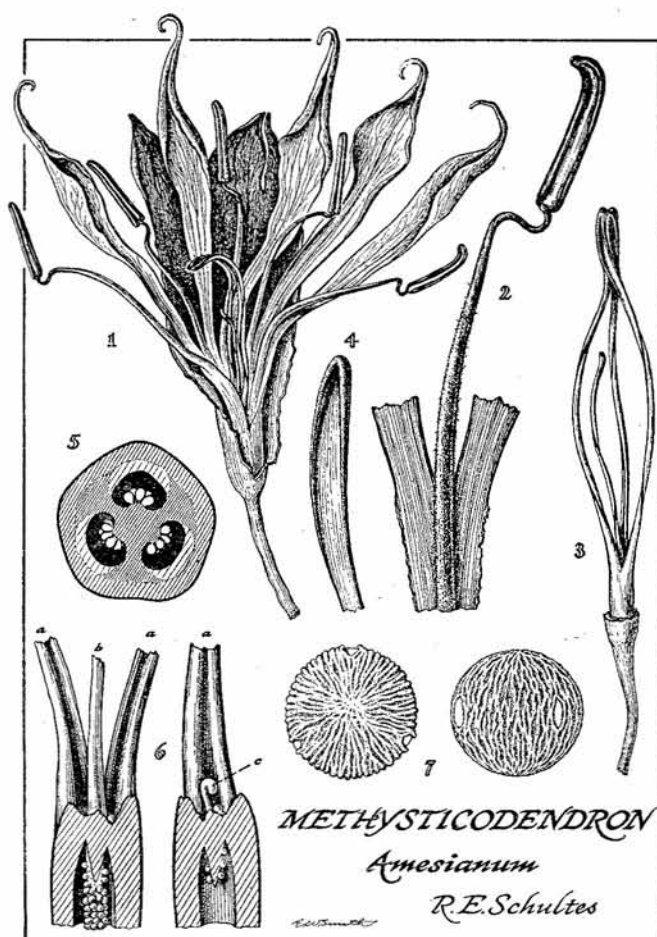


FIGURE 2

1, partly dissected flower, about one half natural size, showing the relative sizes of stamens, styles and other floral segments. 2, a stamen and its attachment, slightly more than natural size. 3, the styles and the style-like appendage, about three quarters natural size. 4, the tip of a style showing the stigmatic surface, about three times natural size. 5, cross section of the ovary, about six times natural size. 6, sagittal section of the apical part of the ovary showing (a) styles, (b) the large appendage homologous with the styles and (c) one of the minute appendages arising from the central tissue of the ovary, about three times natural size. 7, pollen grains, about four hundred and fifty times natural size (Drawn by Elmer W. Smith)

Smaller doses of the drug are administered to boys who are studying witchcraft. Certain of the medicine-men's secrets are apparently imparted only when the novice is "under the protection" of this narcotic.

According to the sparse information available, only the leaves of *Methysticodendron Amesianum* can be employed in the preparation of the narcotic infusion. The leaves, which must be gathered not more than one hour before the narcotic drink is to be taken, are stripped from the plant, crushed and allowed to remain in cold water for perhaps one half-hour. Just before the draught is to be taken, the leaves and the infusion are slightly heated and agitated. Then the liquid is strained. It is apparently never allowed to boil.

Witch-doctors never take the whole draught at one time, it is said; but they may drink as much as a large cup-full over a period of two or three hours. If, by then, the desired frenzy and initial narcosis have not been induced, an assistant prepares additional drink from fresh leaves.

According to the Indian tradition, this narcotic must be taken only during the wane of the moon.

In addition to its use in divination and prophecy, *Methysticodendron Amesianum* is employed by its "owners" in the treatment of certain diseases. The leaves and flowers are heated in water and applied in the form of a plaster for the reduction of tumours and swellings, especially of the joints. For persistent chills and fevers (advanced tuberculosis (?)), which are not uncommon at this high, damp altitude, the witch-doctor will sometimes first bathe the whole body of a patient with a warm decoction of the leaves and flowers, then smear lamb-fat on the chest, back and abdomen.

The Kamsá name of *Methysticodendron*, *mets-kwai borrachero* or *mits-kway borrachero* means "intoxicant of the jaguar". The term *borrachero* is a loan-word from Spanish, for in southern Colombia and Ecuador a large number of solanaceous narcotics are referred to popularly as *borrachero* (*borrachero* = drunken). Notwithstanding the meaning of the Kamsá *mets-kwai*, these Indians refer to the plant in Spanish as *culebra-borrachero* ("intoxicant of the snake") and not as *tigre-borrachero*. Another name which the Kamsá people apply to the plant is *goon'ssi-an borrachero*, the meaning of which I could never ascertain. The Inga Indians of the valley of Sibundoy sometimes call the plant *kin-de-borrachero*, but recent field work indicates that this is more properly applied to a species of tree *Datura* with abnormal leaves due to virus infection.



FIGURE 3

Kamsá Indian boy holding a flower of *Methysticodendron Amesianum*, Sibundoy, Colombia (Author's photograph)

Cultivation of the Plant outside its Habitat

Because of the extreme rarity of this plant, even in the valley of Sibundoy, and because of its extraordinary beauty, several attempts were made to introduce *Methysticodendron Amesianum* into cultivation. In 1953, efforts to establish it by planting short sticks cut from the upper branches met with success. The species is now in cultivation in the Capuchin Mission Station at Sibundoy; in the gardens of the Ciudad Universitaria in Bogotá, Colombia; in the Universidad del Cauca, Popayán, Colombia; at the Royal Botanical Gardens,

Kew; in the greenhouses of the Department of Biology, Harvard University; at the Division of Plant Exploration and Introduction, Bureau of Plant Industry, Beltsville, Maryland; and at Wongwood Gardens, Kennet Square, Pennsylvania.

Chemical Analysis of the Active Principle

There has as yet been no full chemical analysis of the active principle of *Methysticodendron Amesianum*, but material for this purpose has recently been procured.



FIGURE 4

Habit photograph of a flowering bunch of *Methysticodendron Amesianum*, Sibundoy, Colombia (Author's photograph)



FIGURE 5

Typical witch doctor, Sibundoy, Colombia (Author's photograph)

APPENDIX

Botanical description and comments

Methysticodendron—R. E. Schultes in *Bot. Mus. Leaflet*, Harvard Univ. 17 (1955) 2.

Tree. Leaves ligulate. Flowers solitary, very large, hanging. Calyx long-tubular, herbaceous, spathaceous. Corolla very deeply 5-divided, with spatulate, acuminate lobes. Stamens affixed near apex of tube, with rather strong filaments which are attenuate towards apex and strongly twisted; anthers linear, with parallel locules which are introrsely longitudinally dehiscent. Ovules numerous in each locule, axillary. Styles 3, free (but to the eye simple, coherent with mucilage (?), strongly twisted), rather fleshily filiform-ligulate, but in section concave-compla-

nate; stigma undivided, clavellate-tumescens; 2 or 3 appendages (1 filiform, rather similar to style but much shorter and 1 or 2 reduced to very short subulate outgrowths or bullae) arising from central part of ovary. Fruit not present.

Methysticodendron Amesianum—R. E. Schultes in *Bot. Mus. Leaflet*, Harvard Univ. 17 (1955) 2.

Tree up to 25 feet tall, with short, densely leafy branches. Leaves membranaceous, dark green, narrowly linear-ligulate, apically acuminate, basally gradually attenuate (very often without distinct petiole), marginally commonly subundulate or

undulate, in adult state 20–26 cm long, 1.3–2.0 cm wide; central nerve strong, beneath strongly elevated, secondary nerves almost parallel, somewhat conspicuous, towards margin arcuate-anastomosing; both surfaces minutely and irregularly (near veins denser) pilose. Flowers up to 28 (mostly more or less 23) cm long apically 10–13 cm in diameter in bud, at dusk and night very strongly and sweetly fragrant. Calyx spathaceous, green, papyraceous or membranaceous, 2- to 5-parted, with acute teeth, tubiform for half its length, $\frac{3}{5}$ as long as corolla (up to 13 cm long), both surfaces very minutely and irregularly pilose. Corolla divided for $\frac{3}{5}$ – $\frac{4}{5}$ its length, with lobes usually 5 (but abnormally 4 or 6), membranaceous, white, spreading, spatulate or almost spatulately rhombiform, apically long acuminate, circinnate, entire, upper half strongly inflexed, 14–16 cm long, towards apex of tube usually 6 mm. (but in widest part 2.5–3.3 cm) wide, near base very remotely and irregularly pilose within and without, with 3 conspicuous, strongly parallel veins; tube rather densely white-pilose within. Stamens usually 5, shorter than corolla lobes; with terete filaments, more or less 5 cm long, 2 mm in diameter at base, apically strongly twisted and lightly bent, pilose except at apex; anthers yellow, 2.7–3 cm long, 3–4 mm in diameter. Ovary sub-cylindric, conspicuously 3-sulcate, glabrous, up to 1.5 cm long, 0.5 cm in diameter, gradually produced into styles. Styles glabrous, up to more or less 9 cm long, 2.5 mm in diameter, apically slightly clavellate and strongly flattened, with stigmatic tissue on very apex and along edges up to 1–1.5 cm in decurrent form, black (when dry) and papillose. Appendix (rudimentary style?) like styles arising from central part of ovary, up to 5.5 cm long, accompanied by 1 or 2 subclavellate, fleshy appendices 2–5 mm long.

Methysticodendron is here described as a genus of the *Solanaceae* with some hesitation, for the concept shows several characters which are not easily accommodated in that family.

In habit, *Methysticodendron Amesianum* is a small tree, quite suggestive of some of the larger tree-species of *Datura*—i.e., *D. arborea* L., *D. candida* D. *suaveolens* RBK. and *D. sanguinea* R. and P. Like these members of the *Brugmansia* section of *Datura*, the new concept is characterized by large pendulous flowers. The intoxication which a decoction of the leaves of *Methysticodendron Amesianum* induces bespeaks the presence of similar alkaloids: hyoscyamine and scopolamine. There are also strong similarities in the branching, as well as in the structure of the calyx and stamens.

The pollen grains of the type plant of *Methysticodendron* have been studied by Dr. Thomas van der Haman, palynologist to the Servicio Geológico Nacional of Colombia, and by Professor Elso S. Barghoorn of the Botanical Museum of Harvard University. Dr. Barghoorn's description of the grains follows:

"Pollen grains spherical, chiefly inaperturate, occasionally tricolporate or triplicate with very weakly developed short furrows. Size ranging from 45 μ to 63 μ , averaging about 53 μ (after acetylation). Sculpturing of the exine striate, and of the 'finger print' pattern of striation. Striae converging at the poles and commonly anastomosing between the poles. Polar areas reticulate-foveolate. A feeble punctate or reticulate texture may be detected between the striae or along their sides. Equatorial costae conspicuous.

"In basic morphology, the grains are a modified bipolar, tricolpate type, in which both pores and furrows have been greatly reduced."

The pollen grains of *Methysticodendron* are of the same type and are, indeed, very similar to the grains of other species of *Datura*, section *Brugmansia*.

Notwithstanding these similarities, *Methysticodendron* can be distinguished at once from the tree-species of *Datura* by its very deeply lobose corolla, which is divided for three-fifths to four-fifths of its length. The tubular portion of the corolla is wholly enclosed within the tubular, spathaceous calyx, so that it bears a superficial resemblance to a polypetalous flower, the gamopetalous condition not being evident as the blossoms hang on the tree. The narrowly ligulate leaves are also strikingly unlike those of the tree-species of *Datura*.

The major and perhaps fundamental departure from the solanaceous condition, however, lies in the morphology of the ovary and styles. *Methysticodendron* has three conduplicate carpels with three free styles (with undivided stigmatic areas) which retain the conduplicate condition. The concave structure of the styles leaves the ovule cavity somewhat open at the apex, exposing the apical ovules, until, about one third of the way down, the carpel walls fuse to form a trilobular syncarp. All members of the *Solanaceae* have a simple style with a two-lobed stigma. All members of the tribe *Datureae* have a four-celled ovary. Indeed, the only tribe of the family possessing a three- to five-celled ovary is the *Nicandreae*, but even *Nicandra* has a simple style.

The structures most difficult of interpretation are the several appendages arising from the central tissue of the ovary. One of these is an elongated appendage usually entirely homologous with the styles (even to the presence of what appears to be stigmatic tissue), but much shorter. Accompanying this appendage are usually one or two anomalous knob-shaped, clavate or even subulate projections. These do not appear to arise consistently from any definite part of the ovary. They resemble adventitious stylo-like outgrowths.

Several fruits of *Methysticodendron Amesianum* were collected in 1947. These were preserved in alcohol and sent to Bogotá, but, unfortunately, they were lost in shipment. Consequently, a detailed description of them cannot be given here. We may record, however, that they were unarmed, smooth, indehiscent and fusiform, about six inches in length and in shape very like the fruit of *Datura suaveolens*. As is common in some species of tree *Daturas*, *Methysticodendron* fruits, according to the natives, sporadically every few years but never annually.

The evidence for retaining *Methysticodendron* in the *Solanaceae* seems to me to be overwhelming. Nevertheless, the several fundamental characters in which this concept diverges from the conditions now embraced by the family must be borne in mind. It would seem entirely probable that a new tribe should be set up within the *Solanaceae* to accommodate *Methysticodendron*.

Would we not be warranted in suspecting that we have at hand perhaps a primitive representative of the *Solanaceae*, possibly a prototype of what has to-day developed into the tree-species of *Datura*? The apparent primitiveness in the union of floral parts might conceivably be interpreted in this light. In any consideration that *Methysticodendron* may represent a prototype of the modern representatives of the brugmansoid *Datura*-species, it would be advisable to take into account the interesting fact that the valley of Sibundoy, a locality which we know to be a repository of many curious endemics, is a high Andean region, and the centre of origin of some tree-species of *Datura* is thought to be the northern Andean area.