

Iconography of New World Plant Hallucinogens

by RICHARD EVANS SCHULTES

Our knowledge of hallucinogenic plants of the Americas has grown apace during the past half century. Ethnobotanical understanding of many species long known as hallucinogens has progressed to a remarkable degree. In addition, sundry new psychoactive plants have been botanically identified. Spectacular advances have likewise been made in the phytochemistry of numerous species. Perhaps, however, most encouraging of all has been the realization that constituents of these mind-altering plants may be of exceptional interest as potential medicines in modern psychiatry.

During our botanical and chemical studies of the New World hallucinogenic plants, it has become increasingly clear that some of the species involved have been known in taxonomic circles for many years — long before their use as sacred elements in primitive societies of the Americas was reported.

Ethnobotany, as an integral part of the plant sciences, is basically concerned first with correct identification of species. The earliest botanical descriptions, consequently, assume a vital importance in our understanding of hallucinogenic plants. It was for this reason that I recently published a paper entitled “Hallucinogenic plants: their earliest botanical descriptions”, in which the citation of place of publica-

tion of the first description of 188 known or suspected hallucinogenic plants was indicated.

Oftentimes of equal or sometimes of even more importance for the correct identification of a plant is a good illustration. The first post-Linnaean illustrations of the hallucinogenic plants which follow are certainly of historic value, and on occasion they have played a definitive role in the work of identification. These first pictorial representations also have an added significance: of the 28 hallucinogenic genera considered in this paper, a total of 12 or 43% can claim attention as members of the fraternity of horticultural plants.

It is true that illustrations — and sometimes excellent ones — saw publication in pre-Linnaean sources. Frequently, they may be associated with significant ethnobotanical information. It is not unusual for some of these earlier illustrations to play a critical role in the taxonomic determination of an hallucinogenic plant — not uncommonly a more decisive role than depictions published later in post-Linnaean times.

An appreciable number of the illustrations presented in this paper have appeared in rare publications of difficult procurement. When this fact is considered in connection with their importance to ethnobotanical research and the pertinency of several of the species to horticulture, the advisability of publishing such an iconography as this one would seem to be obvious.

The New World is exceedingly rich in species of plants employed in primitive societies for their hallucinogenic or other psychoactive effects. They are found amongst the fungi and the angiosperms. Only a selected few are here considered — those of greatest importance from the point of view of use or of botanical rarity or historical significance. In this iconography, only species of the flowering plants are considered.

It is interesting to note that the New World is much richer in species employed as hallucinogens than the Old World. There are probably 150 species (including fungi) so used in primitive societies in the Americas, and additions to the list are frequently being discovered as ethnobotanical field studies, especially in the tropical regions, progress.

In any consideration of hallucinogenic plants it is essential to remember that primitive societies believe these psychoactive plants to be the “medicines” par excellence, and that their unusual activity which puts man in contact with the spirit world from which comes all death and illness, is due to a resident spirit or divinity. They are considered sacred medicines, not to be abused or taken merely for pleasure.

The enumeration of the families follows the Engler-Prantl system. The genera are arranged alphabetically under the families.

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MYRISTICACEAE

Nutmeg Family

Virola theiodora (*Spr. ex Benth.*) Warburg in Nova Acta Acad. Leop. — Carol. 68(1897) 187.

Slender tree up to 75 feet tall. Bark with thick reddish resinous liquid. Branchlets red-brown, tomentellous. Leaves papyraceous to chartaceous, sparsely glandular-punctate, oblong to ovate, sinuate, 9–35 cm. long, 4–12 cm. wide. Staminate inflorescences many-flowered, 15 cm. long. Pistillate inflorescences shorter. Staminate flowers pungent, single or in clusters of up to 10. Fruit subglobose, 10–20 mm. long, 8–15 mm. in diameter. Distributed mainly in the western Amazon of Brazil and Colombia and adjacent parts of Peru and Venezuela in well drained forests.

Of the several species of *Virola* — *V. calophylla* Warb., *V. calophylloidea* Markgraf, *V. elongata* (*Spr. ex Benth.*) Warb. — employed in the northwest Amazon and the headwaters of the Orinoco, the most important appears to be *V. theiodora*.

This tree and the potent snuff prepared from it have many names amongst the Indians — the best known being *epena* and *nyakwana* of the Waikas of northernmost Brazil and adjacent Venezuela.

The inner bark has an abundance of a resin-like liquid, colourless but rapidly turning a blood-red on exposure to the air. Preparation of the snuff varies from tribe to tribe. The Waikas usually scrape the liquid from strips of the bark, gather it into an earthenware pot, boil it down to a syrup which is allowed to sun-dry; it is then crushed into a powder and sifted. Occasionally, the pulverized aromatic leaves of *Justicia pectoralis* Jacquin may be added, but the *Virola*-snuff alone is highly psychoactive and is frequently used with no admixture.

Some Indians prepare the *Virola*-resin in the form of small pellets for ingestion, and one tribe merely licks the resin with no preparation.

Although the first reference to this hallucinogenic snuff was published in 1923, definitive identification of its source and a description of its preparation were not made until 1954.

The snuff prepared from *Virola theiodora* is rich in several tryptamines — up to 11%; of this, 8% is 5-methoxy-N, N-dimethyl-tryptamine, hallucinogenically the most active.

The first illustration of *Virola theiodora* was published in 1860.



Virola theiodora (Spr. ex Benth.) Warburg. Illustrated as *Myristica theiodora* Spruce ex Bentham in Martius, *Fl. Bras.* 5, pt. 1 (1860) t. 40 bis.

GOMORTEGACEAE

Gomortega Family

Gomortega Keule (*Mol.*) *I. M. Johnston* in *Contrib. Gray Herb.*, n. s., 3, no. 70 (1924) 92.

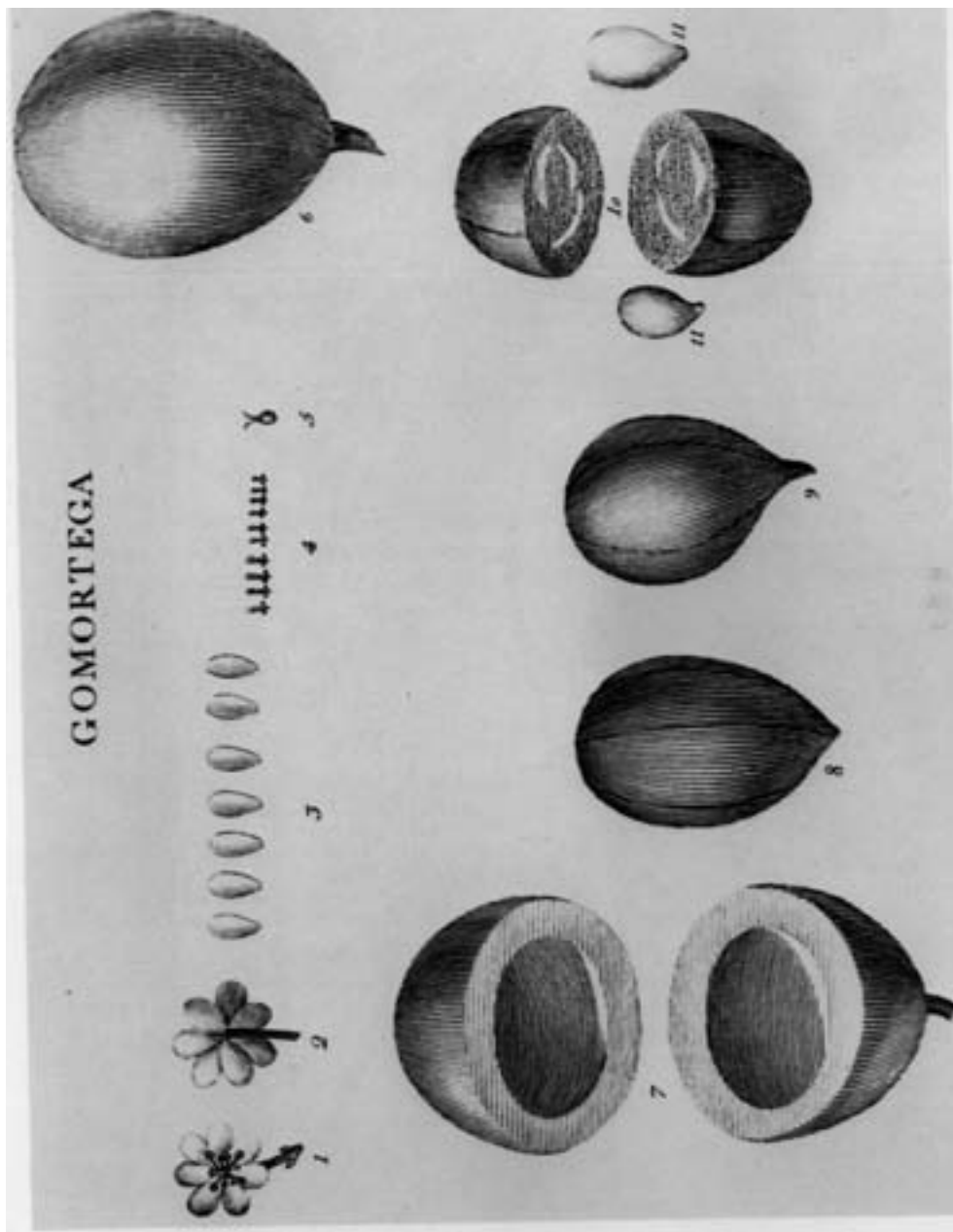
Small, evergreen tree up to 30 feet or more in height. Leaves leathery, glossy, oblong-lanceolate, apically rounded, up to 11 cm. long, 5.5 cm. wide. Flowers small: sepals 7 to 10, spiralled; petals absent; fertile stamens 2 to 3; anthers 2-loculate, opening by valves. Fruit a 1- to 3-celled ovoid drupe, 3.5 cm. long, 2 cm. wide, with a very hard nut.

The Gomortegaceae is a family of one species, a large tree occurring in an area of only 100 square miles in Chile.

Calling this tree *keule* or *hualhual*, the Mapuche Indians of Chile formerly used it as a narcotic: the intoxicating effects may have been hallucinogenic. The Spanish botanists Ruiz and Pavón wrote that the tree is so green and beautiful that it stands out at a great distance. They also remarked that the leaves, which, like the fruits, are rich in essential oils have an acid-astringent taste and that they are so resinous that they stick to the teeth when chewed. Excessive consumption of the fruits, according to these botanists, brings on headaches.

Chemical investigation of this interesting and rare tree has not been reported

The earliest illustration of this anomalous plant consisted of only flowers and fruits and appeared in 1794.



Gomortega Keule (Mol.) I. M. Johnston. Illustrated as Gomortega nitida Ruiz et Pavón in Ruiz and Pavón, *Fl. Peruv. et Chil. Prodr.* (1794) t. 10.



Anadenanthera peregrina (L.) Spegazzini *Illustrated as Piptadenia peregrina* (L.) Bentham in Safford in *Journ. Wash. Acad. Sci.* 6, no. 15 (1916) 548

LEGUMINOSAE

Pea Family

Anadenanthera peregrina (L.) Spegazzini in Physis 6(1923) 313.

Shrub or tree up to 60 feet tall. Bark thick, corky, grey to black, often armed with stout conical spines or cuneate projections. Leaves bipinnate, 12–30 cm. long; pinnae 10–30 or more, mostly 2–5 cm. long. Leaflets 25–80 pairs, linear, oblong or lanceolate, 2–8 mm. long. Inflorescence compactly globose-capitate with 35–50 very small flowers, 10–18 mm. in diameter. Flowers white: calyx 0.5–2.5 mm. long; corolla 2–3.5 mm. long; stamens 5–8 mm. long. Pods leathery, brownish, broadly linear or strap-shaped, 5–35 cm. long, contracted between seeds. Seeds 3–15, black, glossy, thin, flat, orbicular, 10–20 mm. in diameter. In open grasslands in northern South America and naturalized in the West Indies.

Better known in the literature as *Piptadenia peregrina* (L.) Benth., this tree is the source of a potent hallucinogen. The seeds are toasted and pulverized and mixed with an alkaline ash to produce the snuff known in South America as yopo. It is employed especially by tribes in the basin of the Orinoco. The tree was apparently early introduced from South America to the West Indies, where the snuff was called cojoba. Its use in the Caribbean Islands died out, however, long ago.

An early report of 1496 stated that the Tainos of Hispaniola communicated with the spirit world through this snuff which is “so strong that those who take it lose consciousness. . . . arms and legs become loose and the head drops . . . and . . . they believe that they see the room turn upside down and men walking with their heads downwards.”

Several tryptamines and β -carbolines have been found in the seeds of *Anadenanthera peregrina*.

The seeds of another species, *Anadenanthera colubrina* (Vell.) Brenan, are the source of an equally potent snuff used in southern South America, especially in Argentina where it is called cebil or huilca.

The first illustration of *Anadenanthera peregrina* was a photograph of an herbarium specimen published in 1916, when cojoba and yopo were identified as snuffs from the same species.



The first and only illustration of Mimosa hostilis (Mart.) Bentham. Illustrated in R. E. Schultes and A. Hofmann, The Botany and Chemistry of Hallucinogens, Ed. 1 (1973) 96, fig. 23.

LEGUMINOSAE

Pea Family

Mimosa hostilis (Mart.) Benth in Trans. Linn. Soc. 30 (1875) 415.

A bushy treelet, sparsely spinose, with bipinnate leaves 3–4 cm. long, 4- to 6-jugate; pinnae 2.5–3 cm. long; leaflets 1–2 mm. long. Inflorescence loosely cylindrical, measuring 5.5–6 cm. in length. Flowers white, fragrant. Pods sessile or short-stipitate, 3 cm. long. Common in dry areas of eastern Brazil.

From the roots of *Mimosa hostilis*, Indians of Minas Gerais, Bahía and Pernambuco in Brazil — especially the Pankarurús — formerly prepared a potent drink known as vinho de jurema. It was taken in a ceremony, particularly prior to battles, to enhance bravery and experience frightening visions to test men's valor. The use of this psychoactive drug has apparently died out with acculturation or extinction of the numerous tribes of the region.

An early report described the effects of this hallucinogen as follows: they would “see glorious visions of the spirit land, with flowers and birds. They might catch a glimpse of the clashing rocks that destroy men's souls or the dead journeying to their goal or see the Thunderbird shooting lightning from a huge tuft on his head and producing claps of thunder by running about.”

The active principle in *Mimosa hostilis* has been shown to be N,N-dimethyltryptamine.

No illustration of *Mimosa hostilis* was published until 1973.



Sophora secundiflora (Ort.) Lagasca ex DeCandolle. *Illustrated in Rev. Hort.*, ser. 4, 3 (1854) 201.

LEGUMINOSAE

Pea Family

Sophora secundiflora (Ort.) Lagasca ex DeCandolle, Cat. Hort. Monsp. (1813) 148.

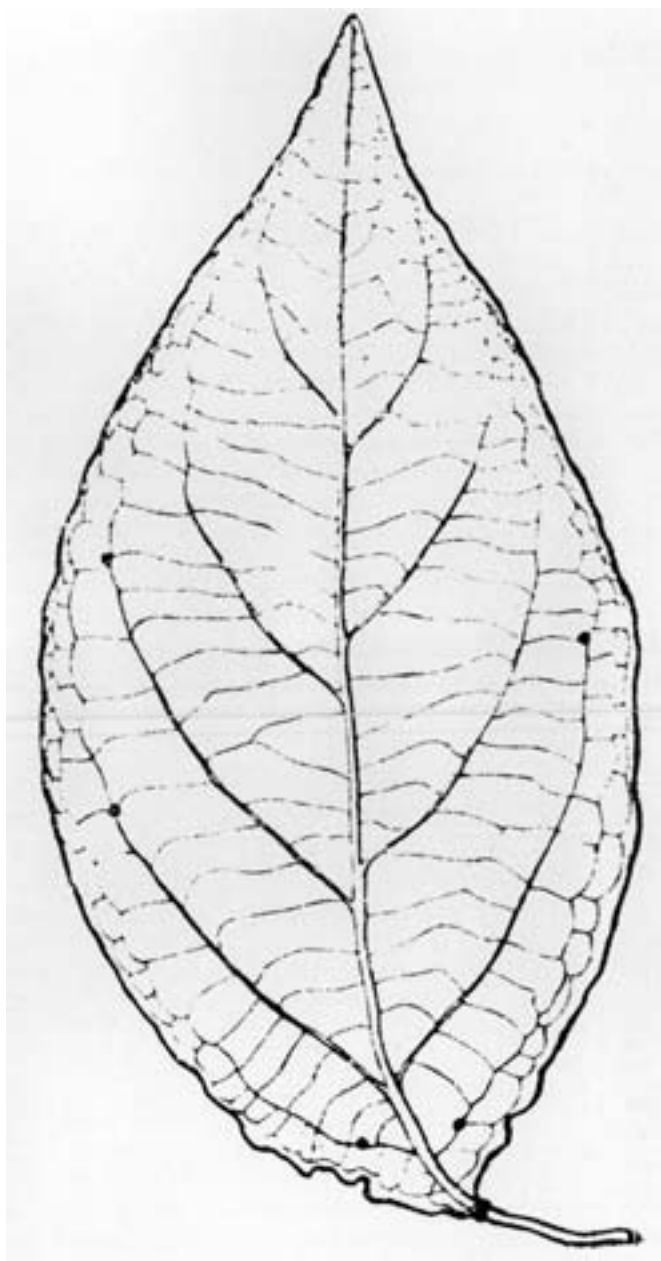
A shrub or small tree reaching a height of 40 feet. The evergreen leaves measure 10–15 cm. in length with 7 to 11 leathery, oblong-elliptic leaflets 1.5–6 cm. long. The flowers, borne in one-sided racemes up to 10 cm. in length, are sweet-scented, violet-blue. The woody, grey-tomentose pods have 1 to 8 bright scarlet, ovoid seeds which measure about 1.5 cm. in length. Ranging from northern Mexico into Texas and New Mexico, along streams in thickets and small groves, usually in limestone areas; it is now widely planted in dry areas of the American Southwest as an ornamental.

The beautiful seeds of *Sophora secundiflora* are known as red beans, mescal beans, coral beans or, in Mexico, frijolillos. They were, in the days before the peyote cactus was adopted as a sacred hallucinogen by Indians of the United States in the mid-1800's, the basis of a vision-seeking cult in the Southwest. These beans are highly toxic, containing the alkaloid cytisine which, in excess, can cause death by asphyxiation. When the safe peyote came north from Mexico as the base of another religious cult, the Indians ceased the narcotic use of the red beans. To this day, however, the priest or "roadman" of the peyote ceremony wears, as part of his ceremonial dress, a necklace of these seeds.

An early Spanish explorer of the Texan coast, Cabeza de Vaca, mentioned the red beans as an article of trade amongst the natives in 1539. Recent well dated archaeological discoveries in northeastern Mexico and Texas have unearthed *Sophora secundiflora* seeds in abundance in several sites ranging between 7000 B.C. and 1000 A.D. Since the red beans are not usable as food, it is possible that they were employed as medicine or, more probably, as ceremonial intoxicants. This possibility is supported to some extent by the discovery of dried peyote in association with the beans in several of the sites.

American Indians of today use the red bean widely as decorations on clothing and artifacts. It seems possible that these seeds, in addition to their beautiful red color, are employed so extensively as adornments because of the respect in which they are held as the result of their intoxicating properties: they are held in special awe as "living, sentient beings, capable of reproducing and initiating action on their own."

The earliest illustration of this beautiful legume was published in 1854 in an horticultural journal.



Banisteriopsis Caapi (Spr. ex Griseb.) Morton. *Illustrated in Hammerman in Bull. Appl. Bot. Leningrad 22, iv (1929) 192.*

MALPIGHIACEAE

Malpighia Family

Banisteriopsis Caapi (*Spr. ex Griseb.*) Morton in Journ. Wash. Acad. Sci. 21 (1931) 485.

Large liana. Bark light chocolate-coloured, smooth. Leaves chartaceous, broadly ovate-lanceolate, acuminate-cuspidate, entire, 8–18 cm. long, 3.5–8 cm. wide. Inflorescence axillary or terminal cymose panicles, 1.5–3 cm. long. Flowers 12–14 mm. in diameter; sepals lanceolate-ovate, densely villous, 2.5–3 mm. long, with or without 8 basal glands; petals pink, cochleate-suborbiculate or ovate, fimbriate, 5–7 mm. long, 4–5 mm. wide, with claw 1.5 mm. long. Samara nut 5 mm. long, dorsal wing semi-ovate, 2.5–3.5 cm. long, 1.2–1.4 cm. wide. Wild and frequently cultivated in western Amazon and cultivated in the Pacific Coastal regions of Colombia and Ecuador.

An intoxicating drink variously known as ayahuasca, caapi and yajé is widely employed as a sacred hallucinogen by many indigenous groups in the western Amazon: Bolivia, Brazil, Colombia, Ecuador, Peru and Venezuela and by isolated tribes along the Pacific coast of Colombia and Ecuador.

The bark is either boiled or made into a cold-water infusion. Occasionally other plants may be added to the drink, especially the leaves of another malpighiaceus vine, *Diplopterys Cabrerana* (Cuatr.) Gates, to intensify the effects.

This hallucinogen permeates all phases of life of the Indians; it is thought to reach into prenatal life and operate in life after death. It is taken to diagnose and treat disease and to contact the spirit world in a great variety of magico-religious ceremonies. The Tukanos of Colombia interpret the intoxication as a return to the cosmic uterus during which the trance represents separation of the soul from the body and union with the divinities.

The bark of *Banisteriopsis Caapi* has several β -carboline alkaloids which normally induce an intoxication marked by vomiting, dizziness, excitation or even agitation, eventual desire to sit apart to experience visual hallucinations of bright lightning-like flashes of light to well defined, sometimes frightening visions of spirits, ancestors and animals such as wild cats and boa constrictors.

Although the species was described over a century ago, the first illustration, merely a drawing of the leaf, was published only in 1929.

CACTACEAE

Cactus Family

Lophophora Williamsii (Lem.) Coulter in Contrib. U.S. Nat. Herb. 3 (1894) 131.

A small, unicephalous or polycephalous, spineless, dull bluish green cactus. Root napiform, 8–10 cm. long. Crown globular, top-shaped or somewhat flattened, 2–8 cm. in diameter, with 7–13 broad, rounded, straight or spiralled, sometimes irregular and indistinct ribs with transverse furrows forming regular polyhedral tubercles; areoles round, flat, with tufts of matted woolly hairs. Flowers solitary, borne at centre of crown, usually pink, rotate-campanulate, 1.5–2.5 cm. across when open. Fruit club-shaped, reddish, 2 cm. long. In calcareous, rocky deserts from central Mexico north to southern Texas.

The Aztecs and other Mexican Indians have long valued the crown of the peyote cactus — usually dried into so called “peyote buttons” — as a sacred hallucinogen. Archaeological artifacts depicting peyote



Lophophora Williamsii (Lem.) Coulter. Illustrated as *Echniocactus Williamsii* Lemaire in *Bot. Mag.* 73 (1847) t. 4296.

and actual specimens over 7000 years old attest to the great age of its use.

One early Spanish chronicler wrote that, “those who eat of it see visions either frightful or laughable” and that “it sustains them and gives them courage to fight and not feel fear, nor hunger, nor thirst; and they say that it protects them from all danger.” Intense persecution notwithstanding, the ceremonial use of peyote persisted. Today, the Coras, Huichols, Tarahumares and other Mexican tribes hold it in great reverence, and it has spread north into the United States and Canada where more than 250,000 Indians in over 40 tribes belong to a peyote-centered cult organized as the Native American Church. Dried peyote-buttons are legally procured through the postal service for use in this religious context.

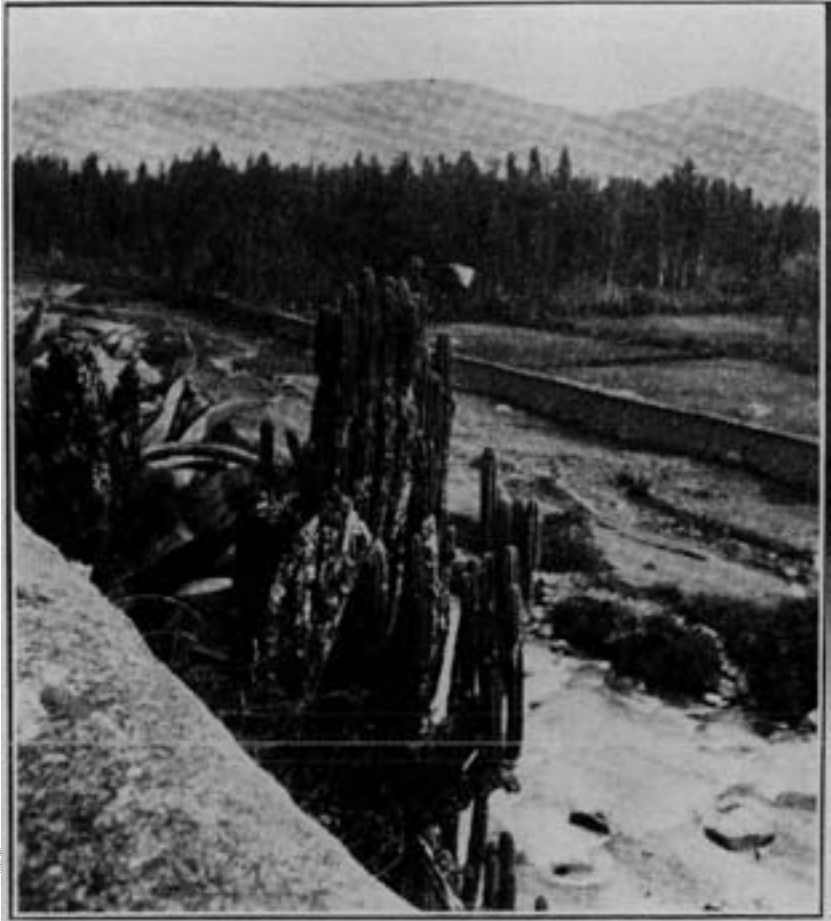
Peyote intoxication is characterized by indescribably brilliant visual hallucinations in rich colours in kaleidoscopic movement. This effect is accompanied by auditory, tactile, gustatory and olfactory hallucinations, sensations of weightlessness, depersonalization, alteration of time perception, macropsia and other weird aberrations.

Over 30 alkaloids or allied bases occur in peyote. The intense visual hallucinations are due to one: mescaline.

The earliest illustration of *Lophophora Williamsii* — a highly fanciful drawing — appeared in an horticultural publication in 1847. A year later, in 1848, an artistic and very accurate illustration was published in a book on cactus plants. Because of the near simultaneity of these illustrations, both are here published.



Lophophora Williamsii (Lem.) Coulter. Illustrated as *Echinocactus Williamsii* Lemaire in L. Pfeiffer and F. Otto *Abildung und beschreibung blühenden Cacteen* 2 (1848) t. 21.



*The first illustration of **Trichocereus Pachanoi** Britton et Rose. A habit photograph of the plant published in N. L. Britton and J. N. Rose, The Cactaceae 2 (1920) 135, fig. 196.*

CACTACEAE

Cactus Family

Trichocereus Pachanoi Britton et Rose, Cactaceae 2 (1920) 134.

Plant 9–20 feet tall. Branches strict, with 6–8 ribs which are basally broad. Spines few, often absent. Flowers large, 19–23 cm. long, night-blooming, fragrant; outer perianth segments brown-red; inner

segments white; stamen filaments green. Axis of scales on flower-tube and fruit with long black hairs. Cultivated and wild in Ecuador, Peru and Bolivia in the high Andes.

Known in Ecuador as aguacolla, in Peru as San Pedro, this cactus is the base of an hallucinogenic preparation called cimora. Cimora may contain other plant admixtures: *Neoraimondia macrostibas* (Schum.) Britton et Rose, *Brugmansia* spp.; *Pedilanthus tithymaloides* Poiteau, *Isotoma longiflora* Presl, etc.

Cimora is used in an ancient, but recently discovered, ritual connected with magico-religious ceremonies. The modern ritual is heavily influenced by Christian elements.

The active principle in *Trichocereus Pachanoi* is mescaline.

The first illustration of *Trichocereus Pachanoi* is a habit photograph published at the time of the species description in 1920.



Heimia salicifolia (HBK.) Link et Otto. Illustrated in J. H. F. Link and F. Otto, *Enum. Pl. Select.* 2 (1822) t. 28.

LYTHRACEAE

Loosestrife Family

Heimia salicifolia (HBK.) Link et Otto, *Enum Pl. Select.* 2 (1822) 3.

A shrub 2 to 6 feet tall with mostly opposite leaves (some in threes or the uppermost alternate), linear-lanceolate or lanceolate, 2–9.5 cm.

long and yellow flowers solitary in the axils. Common along streams and in damp places in the highlands of Mexico and western Texas, El Salvador, Jamaica and northern South America.

In Mexico, *Heimia salicifolia* is known as sinicuichi. The leaves, slightly wilted, are crushed in water, and the juice is allowed to ferment. The resulting drink is mildly inebriating, inducing a slight giddiness, a darkening of surroundings, shrinkage of the world around, a pleasant drowsiness and deafness or auditory hallucinations with distorted sounds coming apparently from great distances. Mexican natives ascribe supernatural virtues to sinicuichi, asserting that it helps them recall events of the past and on occasion even prenatal happenings.

The first illustration of *Heimia salicifolia* was published in 1822 by the botanists Johann Heinrich Friedrich Link and Friedrich Otto together with the descriptions of the species.



DESFONTAINIA spinosa

*The earliest complete illustration of **Desfontainia spinosa** Ruiz et Pavón. Drawing in Ruiz and Pavon, Fl. Peruv. et Chil. 2 (1799) t. 186.*

DESFONTAINIACEAE

Desfontainia Family

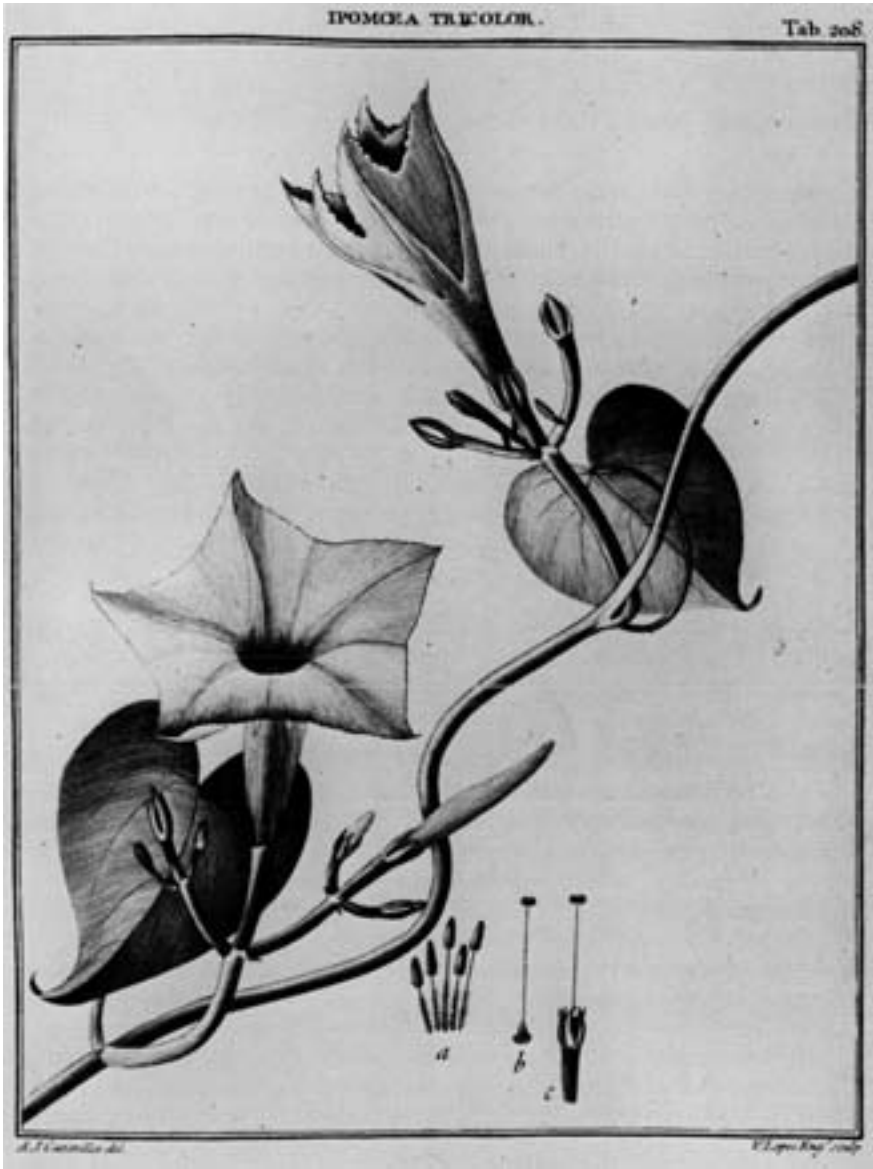
Desfontainia spinosa Ruiz et Pavón, Fl. Peruv. et Chile 2 (1799) 47, t. 181.

An erect or semi-scandent evergreen shrub from about 2 to 12 feet in height. Leaves subcoriaceous to coriaceous, dark green, glossy, elliptic to obovate, coarsely sinuate, 1.5–8 cm. long. Flowers solitary or several together. Sepals greenish or brownish green, 5–10 mm. long, 2–4 mm. wide: corolla deep orange or red, yellow within, up to 3 cm. long or longer. Fruit a berry, yellowish, many-seeded, 12 mm. in diameter. *Desfontainia spinosa* is Andean in distribution.

Known in Colombia and Ecuador as *borrachero de páramo* and in Chile and southern Peru as *taique*, *chapico*, *michai blanco* and *trautrau*, it is valued as a narcotic by the Mapuche Indians of Chile and by the Kamsá and Ingano medicine men in the Sibundoy Valley of southern Colombia. A tea is made of the leaves when these practitioners “want to dream” or “see visions and diagnose disease.” The tea is so potent that it is said to be used infrequently, since it makes the medicine men “go crazy.”

Nothing is as yet known of the chemical constitution of this interesting hallucinogen.

The earliest illustration, published by Ruiz and Pavón in 1794, consisted only of flowers. The first complete drawing of the plant appeared in a major work by these same two botanists in 1799.



***Ipomoea violacea* Linnaeus. Illustrated as *Ipomoea tricolor* Cavanilles, *Icones* 3 (1794) t. 208.**

CONVOLVULACEAE

Morning Glory Family

***Ipomoea violacea* Linnaeus, Sp. Pl. (1753) 161.**

An annual vine with deeply cordate, ovate leaves 4–10 cm. long, 3–8 cm. wide. The cymose inflorescence has 3 to 4 flowers which are 5–7 cm. wide with a white tube and white, red, purple, violet-blue or blue corolla: limbs often white-spotted. The ovoid fruit measures 13 mm. in length and has jet black angularly ovate seeds 7 mm. long. Ranging through western and southern Mexico and Guatemala, the West Indies and tropical South America.

The seeds of *Ipomoea violacea* — known also as *I. rubrocaerulea* Hooker and *I. tricolor* Cavanilles — are called badoh negro by the Zapotec Indians of Oaxaca, Mexico, who use them as a sacred hallucinogen. These seeds are employed in the same way as those of *Turbina corymbosa* and have the same, though stronger, effects. They contain the same kinds of ergoline alkaloids as does *T. corymbosa* but in much higher concentrations.

It is thought that *Ipomoea violacea* represents the narcotic tlitliltzin of the ancient Aztecs. One of the early Spanish chroniclers, for example, spoke of three inebriating agents: “ololiuqui, peyote and tlitliltzin.” This species is the parent of many important horticultural varieties such as “Heavenly Blue,” “Pearly Gates” and “Flying Saucers.”

This plant was first figured as *Ipomoea tricolor* in 1794.



Turbina corymbosa (L.) Rafinesque. Illustrated as *Convolvulus caule repente, foliis cordatis* in Plumier, *Pl. Amer.*, Ed. Burm. (1756) t. 89, fig. 2.

CONVOLVULACEAE

Morning Glory Family

***Turbina corymbosa* (L.) Rafinesque**, Fl. Tellur. 4 (1838) 81.

Large, woody, perennial vine with ovate-cordate leaves 5–9 cm. long, 2.5–6 cm. wide. Inflorescences congested axillary cymes, usually many-flowered. Flowers fragrant: corolla infundibuliform or hypercraterimorphous, 2–4 cm. long, nearly 3 cm. across when open, white or whitish with greenish stripes; stamens included; sepals enlarged and somewhat ligneous in fruit, about 1 cm. long. Fruit indehiscent, ellipsoidal, 1-seeded, 5–10 mm. long, 4–5 mm. broad, dark brown. Seed roundish, brown 4 mm. × 3–5 mm. with nearly circular scar. Known from tropical and subtropical America: Florida and the Gulf Coastal areas, the West Indies, Middle America and the northern half of South America; naturalized in various parts of the Old World.

The Aztecs and other Indians of Mexico made extensive hallucinogenic use of the seeds of *Turbina corymbosa* in pre-Conquest days: they were called *ololiuqui* and the vine was known as *coaxihuitl* ("snake plant"). "The natives communicate with the devil," wrote one Spanish chronicler, "when they become intoxicated with *ololiuqui*, and they are deceived by the various hallucinations which they attribute to the deity which . . . resides in the seeds." Today, numerous tribes in Oaxaca still employ the seeds in divinatory and healing rituals where, as one writer reported, one finds in almost every village "these seeds still serving . . . as an ever present help in time of trouble."

Indians ingesting these seeds are quickly intoxicated. Visual hallucinations occur following a stage of dizziness and one of a general feeling of ease and well-being, lassitude and drowsiness. Lasting for several hours, the intoxication may end in a stupor.

In 1960, the active chemical constituents of the seeds of *Turbina corymbosa* were shown to be several ergoline alkaloids or lysergic acid derivatives previously known in ergot, *Claviceps purpurea* (Fr.) Tulasne, a primitive fungal parasite of rye, long employed in European medicine and midwifery and the source of occasional outbursts of mass poisonings ("St. Anthony's Fire") when it was inadvertently milled into rye flour and eaten in Europe.

Although *ololiuqui* was accurately figured in early Spanish writings as a morning glory, the use of convolvulaceous seeds as an intoxicant was not known nor was the plant definitively identified until the early 1940's.

This morning glory is perhaps better known as *Rivea corymbosa* (L.) Hallier fil. It has also been called *Ipomoea sidaefolia* Choisy.

The earliest post-Linnaean illustration of *Turbina corymbosa* appeared as *Convolvulus caule repente, foliis cordatis* in 1756.



Salvia divinorum Epling et Játiva-M. Illustrated in W. A. Emboden, Jr. *Narcotic Plants, Ed. 1* (1972) fig. 50 (Macmillan Co., New York).

LABIATAE

Mint Family

Salvia divinorum *Epling et Játiva-M.* in Bot. Mus. Leaflet, Harvard Univ. 20(1962) 75.

Perennial herb, 3 feet tall or taller. Leaves 12–15 cm. long, ovate, crenate-serrulate. Flowers slightly pubescent, in full panicles on branches 30–40 cm. long: calyx tube bluish, 15 mm. long with superior lip 1.5 mm. long; sigmoid corolla 22 mm. long, with superior lip 6 mm. long, inferior lip shorter and incurved; stamens inserted near mouth of tube; style hirtellous, with posterior branch rather long, flat, anterior branch carinate. Known only in cultivation from black soil in forest ravines in northeastern Oaxaca, Mexico, at about 5,500 feet altitude.

The Mazatecs of Oaxaca call this plant *hierba de la Virgen* or *hierba de la Pastora* and value it for use in divinatory rites when more potent hallucinogens — the sacred mushrooms and morning glories — are not available. Many Mazatec families cultivate it in hidden plots far from home sites; the plant is vegetatively reproduced.

Although the psychoactive properties of this *Salvia* have been experimentally verified, chemical studies have thus far failed to identify the responsible principle.

The first illustration of *Salvia divinorum* was a watercolor published in 1972.



The earliest illustration of Brugmansia sanguinea (R. et P.) D. Don. Figured in colour in R. Sweet, Br. Fl. Gard., ser. 2, 3 (1835) t. 272.

SOLANACEAE

Nightshade Family

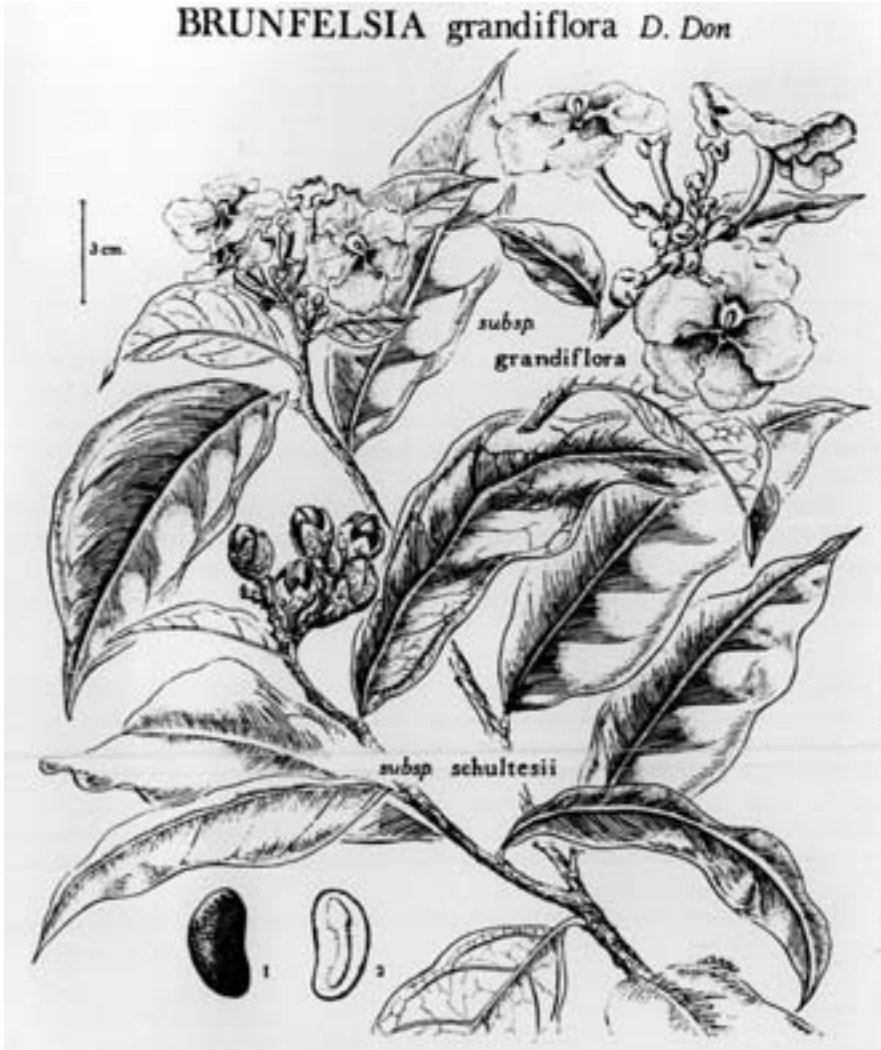
Brugmansia sanguinea (*R. et P.*) *D. Don* in Sweet, Brit. Fl. Gard. 3 (1835) 272.

A tree-like shrub up to 15 feet tall with clustered leaves (5 to 7 arising from the same location), narrowly oblong, lightly pubescent, entire or sinuate, mostly 7 to 8 cm. long. Flowers usually 17 to 23 cm. long: calyx one third as long as the corolla; corolla tubular, slightly flaring upwards, blood red or orange red, sometimes yellow, with conspicuous yellow veins. Fruit a top-shaped capsule about 9 cm. long. Native to the highland regions of the Andes from 9000 to 11000 feet.

This beautiful horticultural species is employed as an hallucinogen in many areas of the Andes, where the natives hold it in high esteem as a sacred plant. It is especially valued by Ecuadorian Indians who believe that, during the intoxication which it induces, the soul leaves the body and wanders afar to visit ancestors. In Peru, this plant is called huacacachu or "grave plant", since the Indians believe that it will, through the intoxication, reveal treasure buried in graves or huacas. The pre-Columbian Chibchas of Colombia, where this species is known as tonga, gave a fermented maize drink to which seeds or leaves of *Brugmansia sanguinea* were added to wives and slaves of dead warriors or chieftains to induce a stupor before they were buried alive to accompany their husbands or masters into the after life.

All parts of the plant are highly toxic, containing several alkaloids, especially scopolamine.

Despite its early horticultural attraction, *Brugmansia sanguinea* was not illustrated until 1835. It was described as *Datura sanguinea* by the Spanish botanists Ruiz and Pavón in 1799.



The first illustration of *Brunfelsia grandiflora* D. Don. Illustrated in *Bot. Mus. Leaf.*, Harvard Univ. 23 (1973) 261, pl. xviii.

SOLANACEAE

Nightshade Family

Brunfelsia grandiflora D. Don in *Edinb. New Phil. Journ.* (April–October, 1829) 86.

Shrub to small tree, 3–15 feet tall. Bark exfoliating in flakes, buff-coloured. Leaves broadly elliptic to oblong-lanceolate, 6–20 mm. long,

2–8 cm. wide, dark green above, paler beneath. Calyx tubular to somewhat inflated, 5–10 mm. long, persistent. Corolla hypocrateriform, slightly zygomorphic, tube 2 to 3 times longer than calyx, pale violet: limb undulate, 1.5–4 cm. across, rounded lobes 1.2 cm. long, violet to purple with white ring at throat, fading to white with age. Fruit capsular, ovoid to globose, 1.7–2.2 cm. in diameter. A variable species widely distributed in tropical South America in humid forests.

Although members of this genus have long been recognized as toxic and have found wide employment in folk medicine, only recently has real evidence of the use of several species as hallucinogens been found. *Brunfelsia grandiflora* and *B. Chiricaspi* Plowman are valued for their intoxicating properties in Amazonian Colombia, Ecuador and Peru — especially amongst the Kofáns and Jívaros of Ecuador. The leaves and bark are utilized.

The chemistry of *Brunfelsia* is poorly understood. Whether or not the intoxicating effects are due to an alkaloid or another type of constituent is not known. A nitrogen-free compound, scopoletin, has been reported, but this constituent is not known to be hallucinogenic.

This genus, named for the first great German botanist Otto Brunfels who died in 1534, is a tropical American group of perhaps forty species, several of which are horticulturally important; probably the best known is the yellow-to-white flowered shrub called lady of the night.

Although the concept *Brunfelsia grandiflora* was published in 1829, no illustration appeared until 1973.



Datura innoxia Miller. Illustrated as *Datura meteloides* De Candolle ex Dunal in *Fl. des Serres*, ser. 2, 2 (1857) t. 1266.

SOLANACEAE

Nightshade Family

***Datura innoxia* Miller**, Gard. Dict., Ed. 8 (1768) *Datura* no. 5.

Plant up to 6 feet tall, usually smaller. Leaves ovate, entire to unequally dentate, flowers white, sometimes slightly violet: corolla funnel-shaped, 10-toothed, 15–18 cm. long; limb 10–15 cm. wide; calyx half as long as corolla with unequal lobes; anthers white, 2 cm. long; style 13–18 cm. long. Capsule globose to ovoid, nodding, 4–6.5 cm. in diameter, with slender spines. Seeds brown.

Known widely by the Mexican name of toloache, this beautiful but highly toxic species has had a long history as a sacred hallucinogen in the American Southwest and Mexico. Many tribes still employ it in ceremonies. The Yumans, for example, value it to induce “dreams” for gaining occult powers to predict the future. The Zunis believe that it belongs to the rain priests who are the only ones allowed to collect it: they put the powdered root into the eyes to commune with the feathered kingdom and chew the root to intercede for rain. The Yokuts take the seeds only once in a lifetime except for boys studying witchcraft who must undergo an intoxication once a year. Many Indians are of the opinion that supernatural powers can be acquired through the effects of this plant.

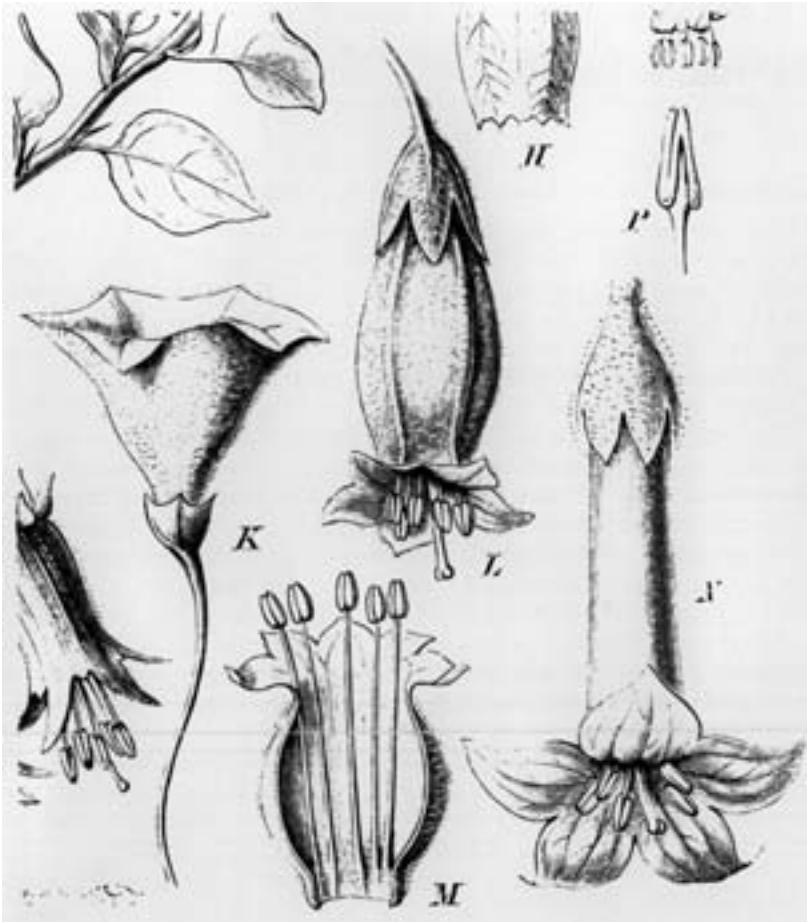
In ancient Mexico toloatzin was often added as an intoxicant to fermented maize beer — a practice still common amongst the Tarahumaras who consider *Datura innoxia* to be an hallucinogen inhabited, unlike peyote, by a malevolent spirit.

Datura innoxia has been more widely known as *D. meteloides* DeCandolle ex Dunal.

There are several other species of *Datura* used in the American Southwest and Mexico. The effects of all of these species are similar and are due to tropane alkaloids, especially to scopolamine.

In the eastern part of North America, *Datura Stramonium* L. was employed as a sacred intoxicant. The Algonquins prepared a powerfully hallucinogenic drink called wysocan apparently from this species. Boys undergoing adolescent rites were kept intoxicated with wysocan for long periods during which “. . . they became stark, staring mad, in which raving condition they were kept eighteen or twenty days” to “. . . unlive their former lives” and begin manhood with no memories of their boyhood.

The earliest post-Linnaean illustration of *Datura innoxia* was published as *D. meteloides* in 1857.



Latua pubiflora (Griseb.) Baillon. Illustrated in A. Engler and K. Prantl, *Natürl. Pflanzenfam.* 4, iii B, (1891) 12 (L,M) — flower only.

SOLANACEAE

Nightshade Family

Latua pubiflora (Griseb.) Baillon, *Hist. Plantes* 9 (1888) 334.

Shrub or small tree, 9–30 feet tall. Bark thin, reddish to greyish brown, streaked with fissures. Branches spiny: spines in leaf axils, 2 cm. long. Leaves elliptic to oblong-lanceolate, acute, entire to serrate, 3.5–12 cm. long, 1.5–4 cm. wide. Calyx campanulate, persistent, 8–10

mm. long, green to purple; corolla larger than calyx, urceolate, 3.5–4 cm. long, 1.5 cm. in diameter at middle, densely pilose, magenta to red-violet. Fruit fleshy, globose, 2 cm. in diameter, green to yellow. Growing in humid forests in central Chile between 1500 and 2000 feet in altitude.

Mapuche Indian medicine men in Chile formerly employed this highly toxic plant in folk medicine and malevolently as an hallucinogen. It caused delirium and permanent madness. The doses were a closely guarded secret. The plant apparently was not ritualistically used.

The leaves contain high percentages of hyoscyamine and scopolamine.

Although the concept *Latua pubiflora* was first published in 1854 as *Lycioplesium pubiflorum* Grisebach, it was not illustrated until 1891, when drawings of the flowers alone were published.

METHYSTICODENDRON
Amesianum
R. E. Schultes



The first drawing of *Methysticodendron Amesianum* R. E. Schultes. Illustrated in *Bot. Mus. Leaf.*, Harvard Univ. 17 (1955) pl. I.

SOLANACEAE

Nightshade Family

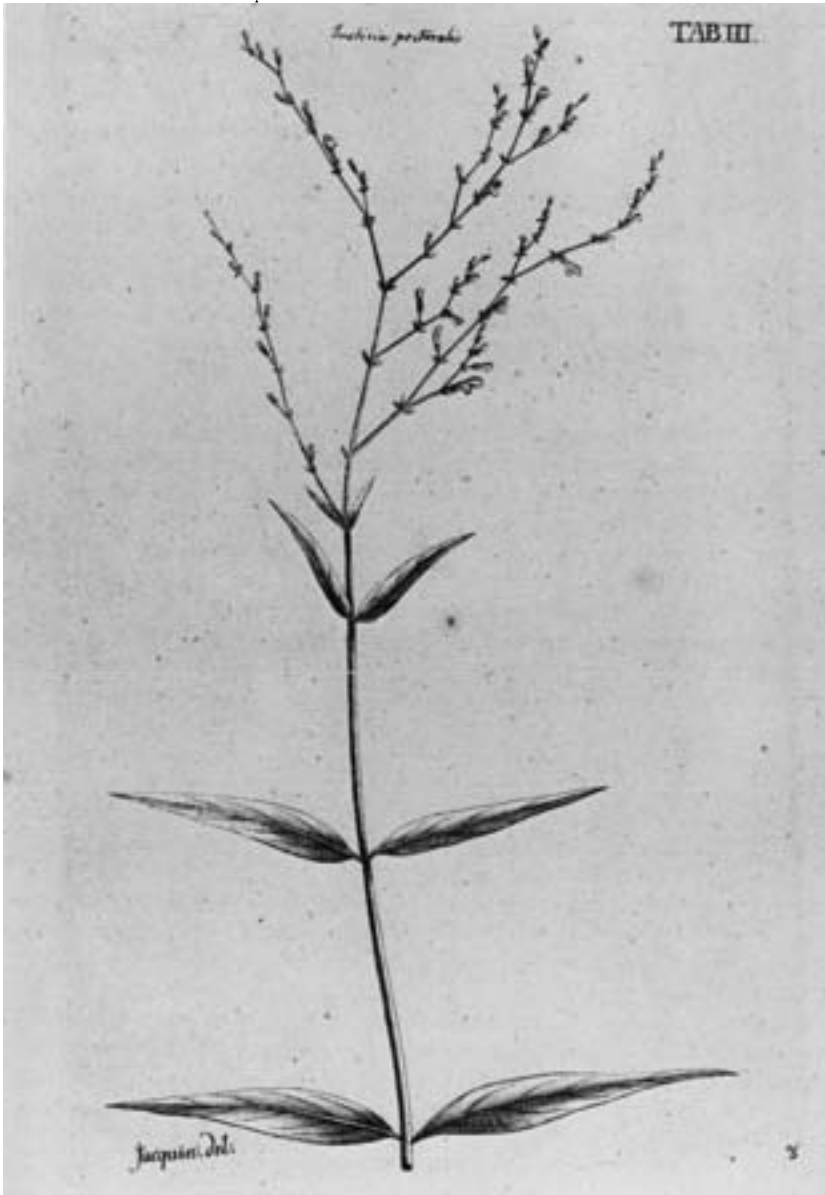
Methysticodendron Amesianum R. E. Schultes in Bot. Mus. Leaflet., Harvard Univ. 17 (1955) 2.

Tree up to 25 feet tall. Leaves membranaceous, very narrowly ligulate, marginally subundulate, minutely pilose on both surfaces, 20–26 cm. long, 1.3–2 cm. wide. Flowers up to 28 cm. long, apically opening to a width of 10–13 cm., strongly fragrant at sundown: calyx spathaceous, green; corolla divided $\frac{3}{5}$ to $\frac{4}{5}$ its length, usually with five lobes, white, spatulate, long acuminate, circinate, 14–16 cm. long. Known only from the Valley of Sibundoy in southern Colombia at about 7,500 feet.

The Kamsá and Inga Indians of Sibundoy in southern Colombia use numerous solanaceous plants as hallucinogens, the most potent of which is *Methysticodendron Amesianum*. A drink prepared from the leaves and flowers serves as a medicine and as a narcotic employed in the diagnosis of the cause of sickness and death, to find lost articles and in the practice of witchcraft in general. The strong effects of the plant are due to its high content of scopolamine.

This plant is an enigma. Some doubt exists that it represents a genus distinct from *Brugmansia*. Reproduced vegetatively, it may be an extremely aberrant clone of a *Brugmansia* to which genus it is obviously closely akin. One investigator called it *Datura candida* (Pers.) Safford cv. Culebra Bristol; it has also been suggested that it represents a cultivar of *Brugmansia aurea* Lagerheim. It has further been intimated that it is a species of *Brugmansia* highly atrophied as a result of viral infection, but there is no proof of this possibility. Another explanation holds that it has resulted from the action of a single pleiotropic gene mutation and that it represents only a monstrosity of a species of *Brugmansia*. Until the problem finds a solution and it can be referred to a definite species of *Brugmansia* without any doubt, recognition as *Methysticodendron* would seem to be warranted.

The first botanical illustrations of *Methysticodendron Amesianum* are drawings published together with the original description of the genus. At the same time, a photograph of the habit and one of the leaves and flowers gathered for the preparation of the intoxicating drink were published (Bot. Mus. Leaflet., Harvard Univ. 17 (1955) plates iii (habit), iv (leaves and flowers)).



The first drawing of *Justicia pectoralis* Jacquin. Illustrated in N. J. Jacquin, *Sel. Stirp. Am. Hist.* (1763) t. 3.

ACANTHACEAE

Acanthus Family

***Justicia pectoralis* Jacquin var. *stenophylla* Leonard in Contrib. U.S. Nat. Herb. 31 (1958) 615.**

Herb up to 1 foot tall. Leaf blades narrowly lanceolate, 2–6 cm. long, 2–8 mm. wide. Inflorescence often dense, up to 10 cm. long but usually shorter. Flowers small: calyx 2 mm. long, 0.35 mm. wide, puberulous; corolla white or violet, sometimes purple-spotted, 7–8 mm. long. Capsules 8 mm. long. This variety of *Justicia pectoralis* is known only from eastern Colombia and adjacent parts of Amazonian Brazil, where it is frequently semi-cultivated.

Justicia pectoralis var. *stenophylla* is cultivated by Indians of the northwest Amazon for use as an admixture to the snuff prepared from *Virola theiodora*: the aromatic leaves are dried and pulverized. It is known amongst the Waikas of Brazil as mashihari. It is probable that the widespread *Justicia pectoralis*, differing from var. *stenophylla* primarily in having larger and broader leaves, may be similarly employed.

According to some reports, this and several other species are utilized alone in the elaboration of an hallucinogenic snuff. Tryptamines have been reported from several species of *Justicia*, but this report needs confirmation.

The earliest illustration of *Justicia pectoralis* appeared in 1763.



Psychotria subterminalis

Psychotria cordata

The earliest drawing of Psychotria viridis Ruiz et Pavón. Illustrated in Ruiz and Pavón, Fl. Peruv. et Chil. 2 (1799) t. 210, fig. b.

RUBIACEAE

Madder Family

***Psychotria viridis* Ruiz et Pavón, Fl. Peruv. 2 (1799) 61, t. 210, fig. b.**

Shrub or small tree up to 14 feet tall. Stipules large, brownish, caducous. Leaves obovate or obovate-oblong, basally long-cuneate, 8–15 cm. long, 2.5–5 cm. wide. Inflorescence terminal, up to 10 cm. long. Flowers sessile in glomerules, very small (usually 4 mm. long), greenish white. Fruit small. Ranging throughout the Amazon basin north to Central America and Cuba.

In several far-separated parts of the Amazon Valley, the leaves of *Psychotria viridis* are occasionally added to ayahuasca, the hallucinogenic drink made from *Banisteriopsis Caapi*. In Ecuador, the Kofán Indians add these leaves “to lengthen and strengthen” the visual hallucinations. In the Acre of Brazil, this additive is likewise used. The Kashinahua of eastern Peru and adjacent Brazil also add leaves of an unidentified species of *Psychotria* to the beverage.

Psychotria viridis apparently is never employed alone as an hallucinogen. The leaves contain the psychoactive N,N-dimethyltryptamine, a compound which is believed to be inactive when taken orally unless it is accompanied by a monoamine oxidase inhibitor. The drink prepared from *Banisteriopsis Caapi* contains β -carboline alkaloids which act as monoamine oxidase inhibitors, so that the tryptamine, when employed as an additive, does alter the intoxicating effects.

The earliest figure of *Psychotria viridis* was published with the description of the species in 1799.



Lobelia Tupa Linnaeus. Illustrated in *Bot. Mag.* 52 (1825) t. 2550.

CAMPANULACEAE

Bell Flower Family

Lobelia Tupa Linnaeus, *Sp. Pl.*, Ed. 2 (1763) 1318.

Herb, sometimes basally woody, up to 6 feet tall. Leaves oblong-ovate or oblong-lanceolate, 13–20 cm. long, 3–6 cm. wide, slightly tomentose on both surfaces. Raceme up to 60 cm. long with many

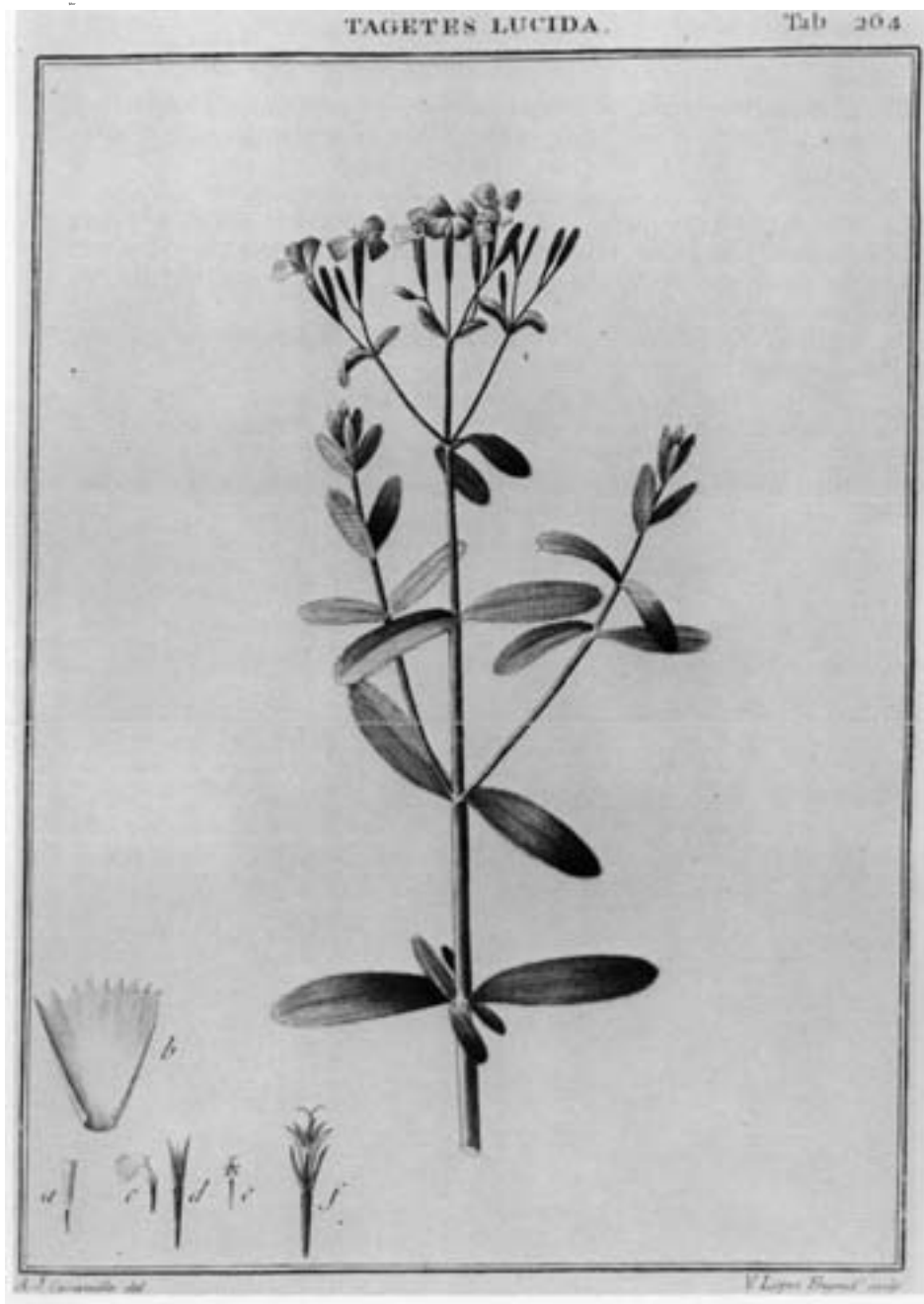
blood-red flowers arising from conspicuous bracts. Calyx green; corolla up to 3.5 cm. long, cleft at back its entire length, the segments apically united; filaments united into a tube, bearing bearded, coherent anthers.

This polymorphic herb of the southern Andes of South America is widely recognized as a toxic species. It is known by its native name tupa and in Spanish as tabaco del diablo ("devil's tobacco"). The plant is esteemed in Chile as a narcotic and as a medicine. Peasants treat toothache with the juice, and the Mapuche Indians smoke the leaves for inebriation. Field research has not yet established the truly hallucinogenic nature of the intoxication, but the plant has definite psychoactive properties.

The leaves contain the alkaloids lobeline, lobelanidine and norlobelanidine.

Lobelia Tupa is one of the most spectacular species of the genus with its scarlet flowers and was early introduced to European horticulture.

The earliest drawing of *Lobelia Tupa* appeared in 1825 in an horticultural publication.



Tagetes lucida Cavanilles. Illustrated in Cavanilles, *Icones* 3 (1795) t. 264.

COMPOSITAE

Composite Family

Tagetes lucida *Cavanilles*, *Icones* 3 (1795) 33, t. 264.

A strongly sweet-scented perennial herb up to 1½ feet tall. Leaves opposite, ovate-lanceolate to oblong-lanceolate, serrulate, punctate with oil glands. Inflorescences 10–12 mm. in diameter, 2- to 3-rayed, yellow to orange. Akenes with a pappus of 2 or 3 short scales and 2 longer awn-like bristles. *Tagetes lucida* is native to Mexico, where it is very abundant in Nayarit and Jalisco.

This relative of our common garden marigold was known to the Aztecs as yahutli and is now called yauhtli in Mexico. According to early Spanish reports, it was powdered and thrown into the faces of captives “to dull their senses” before sacrifices. Today, the Huichol Indians ceremonially smoke a mixture of *Tagetes lucida* and *Nicotiana rustica* L. — a preparation called ye-tumutsali — for inducing visions. Smoking of this mixture is frequently associated with the use of peyote (*Lophophora Williamsii* (Lem.) Coulter) and the drinking of tesguino (fermented maize) or cai (a fermented cactus beverage). Taken with these other psychoactive preparations, ye-tumutsali is said to produce clearer hallucinations but less intense visions. Since this *Tagetes* is usually more abundant than the *Nicotiana*, it is frequently smoked alone for its effects.

The genus *Tagetes* apparently lacks alkaloids. It does, however, possess essential oils, thiophene derivatives, saponines, tannins, cyanogenic glycosides and coumarine derivatives. The chemical constituent responsible for its psychoactivity has not yet been determined.

The Spanish botanist Cavanilles published the earliest illustration of *Tagetes lucida* in 1795.