ETHNOPHARMACOLOGY OF THE NORTHWEST AMAZON: UNEXPECTED CHEMICAL DISCOVERIES

Por *Richard Evans Schultes**

With a rich flora and many diverse Indian tribes, the northwest Amazon --especially that part situated in Colombia-- has given us nearly 2000 species of plants employed as medicines, poisons or narcotics. Many or most of these species have never been chemically studied. That they have any biological activity is an indication that they have at least one active principle. Many of these active chemical constituents are undoubtedly new to science. That the Amazonian flora --especially that of the western Amazon, the richest area of the hylea species-- is an unexplored emporium of chemical compounds, some of which may have practical physiological effects that could interest modern pharmacopoeas, has been indicated even by preliminary analyses of a few of the plants employed by the Indians. Several of these plants are herewith discussed.

The plants are considered in order of their location in the Engler-Prantl system of classification. The voucher specimens, when cited, are deposited in the Economic Herbarium and/or the Gray Herrium of Harvard University or the Herbario Nacional de Colombia in Bogotá.

ANNONACEAE
Anaxagorea sp.

The Kofán Indians of Ecuador and Colombia employ the root of a species of *Anaxagorea* as a major ingredient in one of their curares; they call this treelet *ko-yo-vee-fa-nti* (3,4).

Cyanogenesis has been reported from a Philippine species of *Anaxagorea* (1).

Unonopsis veneficiorum (Mart.) R. E. Fries in Acta Hort. Berg. 12 (1939) 238.

This species is widely used in the Colombian Amazonas as the basis of a curare. The first report of this use was published by the German botanical explorer von Martius who stated in the 1830's that the Indians of the Rio Japura or Caqueta valued it for this purpose (5). The second report, more than 130 years later, placed its use amongst the Kofán Indians on the Colombo-Ecuadorean border (4). The Barasana Indians of the Río Apaporis of Colombia likewise esteem it as an arrow poison plant. (4).

The nomadic Makú Indians of the Río Pirapará in the Vaupes of Colombia employ the plant as an antifertility agent, calling it *we-wit-kat-ku'* ("no children medicine") (4).

It is suspected that *Unonopsis veneficiorum* contains bisbenzylisoquinoline alkaloids (1).

MYRISTICACEAE

Virola calophylla Warburg in Nova Acta Acad. Leop. -Carol. 68 (1897) 231.

Virola calophylloidea Markgraf in Repert. Sp. Nov. 19 (1923) 24.

Virola elongata (spr. ex Bth.) Warburg in Berl. Deutsch. Bot. Ges. 13 (1895) 89.

Virola theiodora (Spr. ex Bth.) Warburg in Nova Acta Acad. Leop. -Carol. 68 (1897) 187.

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Many Indians living in the northwest Amazon of Brazil, Colombia and Peru value these species —especially *Virola theiodora*— as the sources of hallucinogenic preparations. Those tribes in the Colombian Comisaría del Vaupés and adjacent parts of Brazil —Barasanas, Makunas, Puinaves, Kabuyaris, Kuripakos, and others— utilize a snuff prepared from a reddish resin-like exudate of the inner bark (11-13); the Witotos and Boras of the Colombian Comisaría del Amazonas and adjacent parts of Peru make small pellets of the exudate which are ingested for intoxication (12, 16, 17).

The snuff is employed by medicine-men and, amongst the Waika Indians of Brazil, in several ceremonies or occasionally during the year when they feel that its use is needed. In these ceremonies, all adult males may partake of the snuff (15). Usually enormous doses of the snuff are blown into the nostrils. The intoxication is rapid in its inception but is of short duration if additional doses are not administered (15, 24).

Analysis of the snuff prepared by the Waika Indians indicated that the powder had an 11% content of tryptamines, 8% of which were in the form of 5-methoxy-N, N-dimethyl-tryptamine. The intoxication induced by the snuff is the result of this high tryptamine content (15). A problem arose with the pellets that the Witotos and Boras ingest: tryptamines are not active when taken orally, unless they are in the presence of a monoamineoxidase inhibitor (10). Further chemical studies of the exudate from *Virola* bark indicated that small amounts of two new beta-carboline alkaloids are present (6) —and the beta-carbolines are monoamineoxidase inhibitors (7,9).

The very primitive nomadic Makú Indians who live on the Rio Piraparaná in Colombia do not prepare the Virola exudate in either a snuff or pellets: they ingest the exudate directly from the bark with no preparation (23). There is the suggestion that Venezuelan Indians smoke a species of Virola as an intoxicant (13).

Several other species of Virola and other myristicaceous genera have been shown to possess tryptamines, but they are appartently not employed in making hallucinogenic preparations (14).

There are other uses of the bark exudate of certain species of *Virola*. The Waikas paint their darts with the resin-like liquid and dry it in the heat of a fire to make poisonous darts.

There is no idea as to what constituent in *Virola* can act as a curare, but it is one of the Waikas' favourite arrow-poisons (15).

Another important use of the liquod from *Virola* is as a fungicide. Skin infections of fungal origin are very common in the wet tropics of the Amazon. The Waikas paint the infected area each morning with the reddish liquid from fresh bark for ten or fifteen days. The rashes or infection disappear —whether due to a cure or to suppression is not yet known. It has been suggested that perhaps the effect is due to the content of neolignans (8).

LEGUMINOSAE

Anadenanthera peregrina (L.) Spegazzini in Physis 9 (1923) 313.

Piptadenia peregrina (L.) Bentham in Hooker, Journ, Bot. 4 (1842) 340.

In the northwestern Amazon of Brazil and the Orinoco basin of Colombia and Venezuela, an hallucinogenic snuff is prepared from the seeds of *Anadenanthera peregrina,* locally known as *yopo* (19,24). The plant formerly was called *Piptadenia peregrina,* a binomial commonly encountered in the literature (20). The snuff was formerly employed in the West Indies where it was called *cojoba* (21).

The main active principles in yopo snuff are tryptamines and β-carbolines: 5-hydroxydimethyl tryptamine, N, N-dimethyltryptamine, N, N-dimethyltryptamine-N-oxide and 5-hydroxydimethyltryptamine-N-oxide and very small concentrations of 2-methyl-6-methoxy-1,2,3,4-tetrahydro-β-carboline and 1,2-dimethyl-6-methoxy-1,2,3,4 tetrahydro-β-carboline, in addition to smaller amounts of two other β-carbolines (18, 23).

In 1977, it was possible, through the kindness of the authorities of the Royal Botanic Gardens at kew, to procure for analysis seeds of this legume collected in the upper Orinoco in 1854 by Richard Spruce. Of the several alkaloids found in freshly collected material, only one remained in the 120-year old Spruce specimens: bufotenine or 5-hydroxy-N, N-dimethyltryptamine (22).

ERYTHROXYLACEAE

*Erythroxylon*** *Coca* Lamarck, Encycl. 2 (1786) 393.

Erythroxylon Coca Lamarck var. *Ipadu* Plowman in Bot. Mus. Leafl., Harvard Univ. 27 (1979) 49.

** It has been shown that, according to the International Code of Botanical Nomenclature, the correct generic name is now *Erythroxylum* (Plowman: in Taxon 25 (1976) 141-144). I prefer, however, to use the etymologically more correct and more widely known orthography -*Erythroxylon*.

Erythroxylon novogranatense Hieronymus in Engler, Bot. Jahrb. 20, Beibl. 29 (1895) 35.

Erythroxylon novagranatense Hieronymus var. *truxillense* (Rusby) Plowman in Bot. Mus. Leafl., Harvard Univ. 27 (1979) 56.

The custom of chewing coca leavesor powdered coca together with an alkaline admixture goes bach millennia in the Andes and probably somewhat less in the western Amazon. Millions of Indians engage daily in this habit (27, 30). It has been much maligned in the media and in governmental and international agencies that strive to equate it with the obviously dangerous use of cocaine–a pure chemical substance derived from the leaves of the several species of *Erythroxylon.* The social and economic backwardness of the Andean Indian has too frequently been blamed on the coca-chewing habit, but numerous unbiased investigations attribute the condition of the Andean Indian coca-users to the socio-economic exploitation under which he lives: it deprives him of time, for one result, for cultivating his own garden, hence food is scarce. It is not the coca that leads to malnutrition and nutritional scarcity; coca-chewing natives who are not obliged to work long hours have adequate diets (25).

In this connection, it has been shown that coca actually provides highland Indians with dietary needs that are often lacking in their normal food intake. This study (25) indicated that coca leaves colletected in Bolivia, when compared to an average of 50 other Latin American plant foods, are higher in calories, protein, carbohydrates, fibre, ash, calcium, phosphorus, iron, vitamine A and riboflavin and other constituents. Coca leaves were lower than the average in oils, moisture, niacine, and ascorbic acid. This study was comparable with an average of earlier coca analyses from Bolivia and Peru. These studies suggest strongly that the often repeated statements that coca lacks nutritional value must be re-evaluated (25, 26, 27).

Coca leaves contain a number of alkaloids –cocaine and some 12 others–which might make coca leaves undesirable as a source of nutrients (25).

In the highlands, where these analyses were made, the leaves are not swallowed but are spat out, once the chewer feels that the quid has been exhausted (25). In the Amazon, however, the leaves are pulverized and taken into the mouth in the form of a powder which is allowed slowly to pass down the esophagus into the stomach; this means that the Amazonian Indian, unlike the highland people, is getting the full complement of the nutritional constituents in the coca leaves (28, 29, 31).

MALPIGHIACEAE

Diplopterys Cabrerana (Cuatr.) Gates in Brittonia 31 (1979) 109.

Banisteriopsis Rusbyana (Ndz.) Morton in Journ. Wash. Acad. Sci. 21 (1931) 487.

This liana, formerly known as *Banisteriopsis Rusbyana* (34), is a very commonly utilized additive to the brew made as an intoxicant from the bark of the malpighiaceous *Banisteriopsis Caapi* (35). The leaves are added to the brew to increase and lengthen the narcotic effects of the basic drink. This species of *Diplopterys* is used in the westernmost Amazon, where it is known as *chagropanga* or simply as *yajé;* the latter name is applied also to *B. Caapi* and to the drink prepared from it (34, 35).

The discovery in this malpighiaceous species of N, N-dimethyl-tryptamine is the first indication of the presence of tryptamines in the family Malpighiaceae (32, 33).

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

The British plant explorer of the Amazon and Andes in 1851 botanically identified the source of *caapi,* an hallucinogen widely used in the western Amazon. In the upper Río Negro region of Brazil he was able to collect flowering material of a malpighiaceous vine which he recognized as a new species and which he described as *Banisteria Caapi* (38); the correct name is now *Banisteriopsis Caapi.*

Spruce was far ahead of his time: he gathered stem material for chemical examination and sent it downstream to the Brazilian town of Manaos. The box in which the material was packed to be sent to the Royal Botanic Gardens in Kew, England, was lost on the long journey when the man who was transporting it was seized by the police en route for debt. The box was later discovered and taken to Manaos and shipped to Kew. The box and much of its contents had, however, suffered from the dampness and rain during the many months of neglect. Spruce wrote: "I obtained a good many pieces of stem, dried them carefully and packed them in a large box... The man who took that box and four others... was seized for debt... and his boat and all its contents confiscated. My boxes were thrown aside in a hut with only the damp earth for floor and remained there many months, when muy friend Senhor Henrique Antonik of Manaos... succeeding in redeeming them and getting them sent to the port of Pará. When Mr. Bentham came to open them in England, he found the contents somewhat injured by damp and mould... The bundle of *caapi* would presumably have quite lost its virtue from the same cause, and I do not know that it was ever analyzed chemically; but some portion of it should be in the Kew Museum at this day" (38).

In 1968, the authorities at Kew kindly located this material and sent five pieces of stem for analysis. It is remarkable that an analysis made 115 years later could indicate the chemical content of specimens that had fared so poorly in transit. Gas chromatography-mass spectrometry showed that there was a 0.4% yield of alkaloids. When newly collected material was analyzed and compared with it, a yield of 0.5% was found. While *Banisteriopsis Caapi* bark normally contains harmine, harmaline and tetrahydroharmine, the original Spruce specimens had only harmine. There is no way of telling whether the Spruce material originally had only harmine; more probably, the harmaline and tetrahydroharmine had, over the more that a century that had elapsed, been transformed into the more stable aromatic β-carboline harmine (37).

SAPINDACEAE

Paullinia Yoco R. E. Schultes et Killip in Bot. Mus. Leafl., Harvard Univ. 10 (1942) 302.

A wild liana of the westernmost Amazon, it is, amongst the Indians of Colombia and Ecuador, the most important non-alimentary plant in the economy. It is known to he tribes of the region --regardiess of their linguistic differences-- as *yoco* (45).

The natives of the Colombian Putumayo --Kofans, Inganos, Sionas, etc.-- recognize different "strains" of the liana and have distinguishing names for them. It has been impossible, however, taxonomically to distinguish these "strains" as different species or even as different botanical varieties. They may, in some cases, represent various chemovars, but we cannot explain how an Indian can ocularly distinguish, sometimes at a considerable distance, these variants if they are only chemically distinct (45).

Every Indian house keeps a large supply of *yoco* stems, and few Indians ever make a long trip throught the forest or by canoe without carrying two or three pieces. Because of the great demand for *yoco,* wild plants of *Paullinia Yoco* are becoming scarce and hard to find near Indian settlements. The natives, when a supply of *yoco* lianas becomes scarce near their home-sites, merely move on to a new location (45).

In preparing the drink from *yoco,* the epidermis, cortex and phloem are rasped. The scraps of material are squeezed to express the sap into cold water. *Yoco* is never prepared with hot water. The resulting drink is either a cloudy milk-white or a light chocolate-brown in colour. These two kinds --recognized as *yoco blanco* and *yoco colorado,* are used without discrimination (45).

It is the general custom of the Indians of the Putumayo to eat nothing until noontime. Instead, *yoco* is taken each morning between five and six o'clock. It is sufficient to allay junger sensations for at least three or four hours and to supply muscular stimulation. In addition to its use as a stimulant, *yoco* is employed in larger doses as an anti-malarial febrifuge and as a medicine in the treatment of a bilious disease which is frequent in the region (45).

High concentrations of caffeine have been found in the bark of *yoco* but the chemists who first analyzed the material did not deposit voucher specimens in herbaria (39, 40). The exact identification of *Paullinia Yoco* as the source of *yoco* was not made until 1942 on material collected in Puerto Asís in the Comisaría del Putumayo, Colombia (*Schultes 4028;* July 6, 1942); the type specimens are deposited in the Gray Herbarium and duplicated types are available in the Economic Herbarium of Oakes Ames (both at Harvard University) and in the Herbario Nacional de Colombia in Bogotá (45).

In 1926, Rouhier and Perrot reported that *yoco* had caffeine, but they could not identify the botanical material beyond stating that it was "*yocco,* nouvelle drogue simple a caffeine". According to these two investigators, *yoco* bark contains 6.1% ash, 12.3% water and 2.73% caffeine (41, 42, 43).

Caffeine is found in sufficient concentration for human consumption in only a few plants: coffee (*Coffea* spp. of the Rubiaceae); tea (*Camellia sinensis* of the Theaceae); kola nuts (*Cola nitida* of the Sterculiaceae); cacao (*Theobroma Cacao);* maté (*Ilex paraguariensis* of the Aquifoliaceae); yaupon (*Ilex vomitoria*); guayusa (*Ilex Guayusa*) and guaraná (*Paullinia Cupana* of the Sapindaceae). In all of these species, the highest caffeine concentration is found in the leaves, fruits or seeds. Consequently, these are the economically important parts of the plant, *Paullinia Yoco* is apparently the only plant of which the bark is utilized for its high caffein content.

BOMBACACEAE

Matisia cordata Humboldt et Bonpland, Pl. Aequin. 1 (1808) 9. t. 2.

This widely esteemed tree, source of an edible fruit in South America, is known as sapote. A Dragendorff spot-test for alkaloids indicates that the leaves are positive (47).

The Bombacaceae have not been known as an alkaloid-rich family. In fact, we believe that this is the first indication that an alkaloid occurs in the Bombacaceae. The spot-test was made on fresh material in the Colombian town of Leticia on the Amazon River.

There has long been disagreement amongst taxonomists concerning the separation -- if indeed there is separation-- between *Matisia* and *Quarari-*

bea. It may well be that any division between these two generic concepts rests only on chemical differences.

Quararibea funebris (LaLlave) Vischer in Bull Soc. Bot. Geneve, ser. 2, 11 (1919) 205, t.p. 205.

In this connection, it is significant to point out a recent study of the Mexican *Quararibea funebris,* known locally in Oaxaca as flor del cacao,
known locally in Oaxaca as *flor del cacao,* since the very aromatic-pungent dried flowers are sold in the local herb market to flavour chocolate drinks (49, 50). A recent phytochemical study of this bombacaceous plant disclosed two related aminolactones: 3-amino-4, 5-dimethyl 2 (5H) –furanone and its saturated analogue in the flowers– the first time that these compounds had been found in the Plant Kingdom (48). Recent reports of anticonvulsant activity and potentical clinical usefulness of a group of alkyl susbtituted butyrolactones structurally related to them make this discovery rather significant and suggest strongly that the Bombacaceae be looked into from a phytochemical viewpoint. Furthermore a novel amino acid (2S, 3S, 4R-4-hydroxyisoleuchne) has been insolated from *Quararibea funebris;* it is a diasteriomer new to nature. A number of non nitrogenous compounds were likewise isolated from *Q. funebris* (46).

THYMELAEACEAE

Schoenobiblos peruvianus Standley in Field Mus. Publ. Bot. 11 (1936) 169.

One of the most useful plants employed as the source of an arrow poison amongst the Kofán Indians of Colombia and Ecuador is *Schoenobiblos peruvianus.* It is not known to be employed for this purpose by other Indians of the northwest Amazon (53).

The roots and fruits are employed in preparing the arrow poison. The fruits are also used by the Kofáns as a fish poison (52, 54, 56).

The Tikuna Indians of the Río Loretoyacu in the Colombian Amazon powder the dried leaves and prepare a poultice to help the healing process in cases of persistent and infected cuts and wounds (55).

Nothing is known of the chemistry of *Schoenobiblos.* A number of thymelaeaceous species are poisonous to man. The family is rich in coumarine derivatives (51).

SOLANACEAE

Iochroma fuchsioides (HBK). Miers in Hooker, Lond. Journ. Bot. 7 (1848) 346.

For a number of years, vague reports have suggested that several species of the solanaceous shrub *Iochroma fuchsioides* may occasionally be taken for hallucinatory purposes by Andean Indians. It is now known that the Kamsá and Ingano Indians of the Valley of Sibundoy in southern Colombia employ the plant in magico-religious curative rituals. In this 6700-foot valley, the shrub is known as *borrachero* ("intoxicant"), but it has also several other vernacular names: *árbol de campanilla, guatillo, nacadero, paguando;* in the Kamsá language, it is known as *totubjansush* (58).

The medicine-men assiduously cultivate *Iochroma fuchsioides* in their herb gardens, but it occurs also as a kind of abundant weed along local roadsides.

The shrub –often the root– is the source of a highly valued medicine for treating colic, stomach ache, difficulties with digestion or bowel disfunction; it is reputedly a potent purgative. The root is rasped and eaten raw with salt when internal injury is suspected following a blow. A tea is said to aid in cases of difficulty in childbirth. When it is used as an hallucinogen by shamans, a handful of fresh bark rasped from the stem and an equal amount of fresh leaves are boiled in water to make a tea which is drunk with no admixtures. From one to three cupfuls of a strong decoction over a three-hour period is said to be a usual dose for hallucinogenic use (58).

This brew was employed much more frequently in "the old days", according to medicine-men. They now prefer to carry out divination, prophecy or curing with one of the many strains of *Brugmansia* cultivated in the area. But *Iochroma* is still occasionally used for "extremely difficult cases of divination". When malaise from this drink is experienced, the medicine-men often take a sudorific tea prepared from the chloranthaceous *Hedyosmun translucidum* Cuatr., a shrub common in the high moors near Sibundoy (58).

The chemistry of *Iochroma fuchsioides* has not been known. Present preliminary studies, however, indicate that it is alkaloidal and that it has withanolides with a steroid skeleton (58). Compounds of this type are known from the allied genera *Acnistus* and *Withania* (57).

Brunfelsia Chiricaspi Plowman in Bot. Mus. Leafl., Harvard Univ. 23 (1973) 255, t. 17.

Brunfelsia grandiflora D. Don in N. Edin. Phil. Journ. (1829) 86.

Brunfelsia grandiflora D. Don subsp. *Schultesii* Plowman in Bot.

Mus. Leafl., Harvard Univ. 23 (1973) 259, t. 18.

The genus *Brunfelsia* has long given native peoples in South America medicinal and toxic plants. A least five species are known to be used as medicines. These properties have been discovered independently over a wide area. In the northwest Amazon of Colombia, Ecuador and Peru, two species and one subspecies are valued as medicines and narcotics (59).

Numerous tribes in the Colombian and Ecuadorean Amazon know this species. There are many vernacular names for it, the commonest perhaps is *chiricaspi* ("cold medicine"), in reference to the sensation of cold or chills produced by ingestion of teas or other preparations of the root or bark. This species, however, has other uses: as a narcotic or hallucinogen adn, in high doses, as a poison (60).

Brunfelsia grandiflora, frequently cultivated, is known to be a cattle poison. As an hallucinogen, it has strong narcotic properties; it is sometimes taken alone, but more frequently it is used as an additive to the hallucinogenic drink prepared from *Banisteriopsis Caapi.* Medicinally, it is valued in treating rheumatism and arthritis, back pains and to reduce high fevers. The leaves are reported to be used in treating bronchitis (60).

The "strongest" species of the northwest Amazon is *Brunfelsia Chiricaspi,* a species not cultivated but found wild in the forests. Amongst the Kofán Indians of Colombia and Ecuador, few Indians now use this species because it is considered dangerous. The effects, as described by a field botanist, included "swollen lips and heavy tongue, crazy in the head, cold sweat, stomachache, nausea and weak vomiting, urtication, inability to walk or move and vertigo; in addition: "...the world was spinning around me like a great blue wheel. I felt I was going to die" (60).

It is often added to the hallucinogenic brew known locally as *ayahuasca* and prepared from *Banisteriopsis Caapi.* A field observer of this use of *Brunfelsia Chiricaspi* suggests that the tingling sensations produced by ingestion of this plant may potentiate its use with an hallucinogen, since it might produce striking tactile hallucinations which, in small doses as an additive, could create greater physical awareness during the *ayahuasca* ceremony (60).

Brunfelsia grandiflora subsp. *Schultesii,* a wide-ranging and polimorphic plant, grows as an understory shrub in primary and secondary forests over a wide area in western South America. It is likewise cultivated for medicinal use and as an additive to *ayahuasca.* A variety of common names attest to its wide range and to the esteem in which it is held in primitive societies (60).

Little is yet known of the chemical constituents of these three Brunfelsias. That they contain potent compounds there can be no doubt from experimentation by field botanists, but as yet no alkaloids or other secondary organic compounds capable of all of the many effects have been isolated. A recent study has discovered from *B. grandiflora var. Schultesii* a novel convulsant called brunfelsamidine (pyrrole-3-carboxamidine), but it is not certain that this compound can be physiologically active (58).

RUBIACEAE

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

Occasionally, the leaves of *Psychotria viridis,* a shrub or small tree that is widpspread in tropical America, are added to the hallucinogenic drink basically prepared from the malpighiaceous *Banisteriopsis Caapi* and variously known as *ayahuasca, caapi, natema, pinde* or *yajé.* This drink is used in ceremonies and witchcraft in the western part of the Amazon (34, 62, 64, 65).

A large number of plant additives are frequently used with the basic malpighiaceous drink, some of them highly psychoactive (61, 62, 65), although the basic preparation made of *Banisteriopsis* is itself very hallucinogenic. One of the commonly used additives in the Amazon of Colombia and Ecuador is the leaf of this rubiaceous shrub which greatly enhances the strength and duration of the narcotic effects of the drink (62). Other species of *Psychotria,* especially *P. cartharginensis,* may also be used (66).

The chemical composition of the *Psychotria* leaves explain why this plant is utilized as an additive and not as a sole base of the drink. They contain N, N-dimethyltryptamine (23), which is inactive when ingested without a monoamine oxidase inhibitor (9). When the leaves are mixed with the *Banisteriopsis* drink containing β -carboline alkaloids which are monoamine oxidase inhibitors, the tryptamine can be effective in an orally administered form (9).

The discovery of N, N-dimethyltryptamine in *Psychotria* is the first indication of the presence of tryptamines in the Rubiaceae or Coffee Family (63, 67).

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