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Plants in Association with Ayahuasca

Introduction

Ayahuasca is an hallucinogenic brew used by about 70 ethnic groups in the Bolivian, Peruvian, Ecuadorian, Colombian, Brazilian and Venezuelan Amazonia, and amongst tribes of the Pacific Coast of Ecuador and Colombia. It is a decoction of two plants: *Banisteriopsis caapi* (SPR. ex GRISEB.) MORTON or *inebrians* MORTON and *Psychotria viridis* RUIZ & PAVON (48).

The use of this visionary drink, which could be older than 1.000 years (28), is performed only in shamanic contexts, for religious and therapeutic purposes, and no data are present in literature about a possible hedonistic employment. Its use is structured in nocturnal healing ceremonies, under the leadership of a curandero, in which the participants, patients included, drink the potion. The therapeutic technics are focused on the magic extraction of illness through strong inhalation of tobacco smoke (*Nicotiana sp.*) (63).

The active compounds of *Banisteriopsis sp.* are b-carboline alkaloids, while *P. viridis* produces derivatives of tryptamine (DMT), beside little amounts of β -carbolines. Today, the synergic mechanism of β -carbolines (which possess a MAO inhibitor action) with tryptamines (which could be degraded by MAO enzymes in the gastroenteric system), has been generally accepted and explained.

An important question concerns the fact that the hallucinogenic brew is often ingested in association with other plants, whose role has not yet been understood.

This group of plants is part of the knowledge of the local healers, elaborated during hundreds of years. These plants, over 75 in number, are part of an initiation corpus: some of them are related to a particular spirit, which is able to "teach" a specific aspect of the shamanic knowledge, when assumed with ayahuasca, and therefore they are called plantas maestros, or "teaching plants". Of course, greater will be the number of the contacted plants during the initiatic process, greater will be the esoteric power of the future shaman. In this process the spirit of ayahuasca introduces the shaman apprentice to the different plants spirits, and for this ayahuasca is considered a "laboratory plant". Every "teaching plant" is characterized by a particular diet (*dieta*), that sometimes could last many months. With this concept of diet they are indicated both the abstention from some foods (salt, sugar, fats, alcohol) and a sexual abstinence, often accompanied by a complete isolation in the forest. We agree to the fact that this kind of "diet" could influence the contents of the visionary experience through a progressive refinement of the sensory level of the person. There are at least three different levels of hypothesis regarding the possible role of diet:

- a possible interference with the biosynthesis of the chemical catabolism of the endogenous or exogenous b-carboline and dimethyltryptaminic molecules (both classes of substances are closely linked to the serotonergic metabolism, that has as its precursor tryptophan, an essential amino acid). This may

modify the "receptivity" of the biological ground for the introduction of psychoactive molecules.

- it may belong to the series of rites of passage, as already identified by VAN GENNEP, through which the individual is separated from social life and as such may foster the loss of the "common coordinates" of everyday life.
- the severity of the diet progressively weakens the subject, possibly inducing a "breakdown" of his psycho-physical defence structures: it is fairly common that as an individual progresses in the diet his experiences under ayahuasca become increasingly intense.

In fact, it is the diet that really distinguishes the initiatory itinerary of the shaman from that of the non-shaman. Indeed, it is only through the diet that one can succeed in perceiving the "Mothers" or essences of the *plantas maestros* and until this stage of perception is attained, the experience induced by the hallucinogen will not be classed as being of a shamanic nature. It may have the connotations of a self-healing, introspection or contact with various natural spirits but its value, in the absence of meeting the "Mother" of the plant, will be limited to the personal history of the subject experiencing it. Aside from this, there exist however two basic differences between Mestizo and indigenous shamanism: the great variety of types of ayahuasca that are recognized by native taxonomy compared to Mestizo taxonomy and, above all, the fact that the *curanderos mestizos* take the hallucinogenic drink throughout their lives. The native indigenous shamans consider ayahuasca and the other *plantas maestros* indispensable to make contact with the "Mothers" or essences of the plant, but once contact has been established, the spiritual nature of the shaman will be modified to the point that, at the most advanced levels, he will be capable of evoking the visions of the plant, in himself and in the participants in the seance, simply by singing the relative songs (*icaros*). This level, where the shaman no longer needs to ingest the hallucinogenic plant, is defined *Muraya* by the Shipibo: they say that the essence of ayahuasca or another teaching plants has penetrated the spirit of the shaman.

Because of the process of fast acculturation in the North-West Amazonia, this system of knowledge is not static, but in continuous transformation, simultaneously to the progress of transcultural contacts between the ethnic groups and the western civilization. In this way, particularly in the urban context, some of these plants have been replaced by new products of Western culture (parfums, gasoline, etc.). Different authors studied this argument through the direct analysis of different socio-cultural contexts: PINKLEY (38); RIVIER & LINDGREN (44); MCKENNA, LUNA & TOWERS (25); LUNA (23). The aim of the present communication is to confront these different sources and to establish some possible interpretative keys, from a pharmacodynamic point of view, to elaborate future research.

PLANTS ASSOCIATED WITH AYAHUASCA

Abuta grandifolia (Mart.) Sandwith (MENISPERMACEAE)VERN: *abuta*, *trompetero sanango*, *caimitillo*. SOURCE: 23ETB: In different parts of Brasil the fruits are considered edible (4). The Karijonas use the plant with *Chondrodendron toxiciferum* and other species as an arrow poison; the Taiwanos use the bark as a curaro ingredient (51).BIOCH: Palmatine (benzylisoquinoline alkaloid), with strong antypiretic activity (24). *A. sandmithiana* produces tetrahydroprotoberberine alkaloids, with analgesic activity (15).

POP.MED.: In Colombia as antimalaric (3) and in Brasil against the fevers (4); a decoction of the roots in Peru in anaemia and as an heart tonic (58), and in Ecuador as antiemetic during childbirth; given to children to calm them or when they suffer from colic or "to make them strong"; always in Ecuador, the Ketchwas apply the boiled leaves to infected eyes and in the treatment of snakebite (51). Amongst the Mato Quicha against dysentery (12).

Alchornea castanaefolia (Willd.) Jussieu (EUPHORBIACEAE)VERN: *hiporuru*, *ipurosa*, *yacochihua*, *pajaro arbol*. SOURCE: 23

POP.MED.: In Venezuela the bark in cataplasms in ray sting (4). Amongst the Tikunas a decoction of the bark against diarrhea, and the crushed leaves rubbed on painful joints (51).

NOTES: In Equatorial Africa the roots of *A. floribunda* Müll.-Arg. and *A. hirtella* Benth. are used for their excitant and hallucinogenic properties. *A. floribunda* is the *alan*, an hallucinogenic plant used in the Bieri cult of Gabon. These two African species contain in the roots alchorneine-like alkaloids, and not yohimbine, as previously reported (31,43,20).*Alternanthera lehmannii* Hieronymus (AMARANTHACEAE)VERN: *picurullana-quina*, *borrachera*. SOURCE: 13ETB: In the Putumayo region (Colombia) this plant is added to *chicha* as condiment, but it seems that the drink induces a very strong intoxication which affects the voice (51).

POP.MED.: In Colombia the decoction as purgative (51).

Anthodiscus pilosus Ducke (CARYOCARACEAE)VERN: *chamisa*, *tahuari*, *boton caspi*. SOURCE: 25

POP.MED.: The natives of Rio Piraparanã rub the fresh rind of the fruit on sprains; the Tanimukas use the leaves as insecticide and repellent (51).

Brugmansia insignis (B.-R.) Lockw. ex R.E. Schultes (SOLANACEAE)VERN: *toa-toë*, *sacha-toë*, *danta borrachera*. SOURCE: 51

ETB: Leaves and branches are used as hallucinogen and for the diagnosis of the illness in many regions of Amazonia (51).

ETB: Tropane alkaloids in all its parts.

NOTES: Different species of the genus are occasionally added to ayahuasca to increase the hallucinogenic effects; leaves are burned and the ashes are added to the drink, but it would seem that burning would destroy the active alkaloids (51).

Brugmansia suaveolens (H. & B.) B. & P. (SOLANACEAE)VERN: *toë*, *borrachero*, *floripondio*. SOURCE: 44

ETB: Known as toxic and narcotic in Amazonia, it is used as an hallucinogen alone or together other drugs (46). With ayahuasca 2 or 3 leaves are required to "see the witch that caused the illness" (25).

- BIOCH: Tropane alkaloids in all its parts
Brunfelsia chiricaspi Plowman (SOLANACEAE)
 VERN: *chiricsanango, chiricaspi.* SOURCE: 51
 ETB: In Colombia (Putumayo region) and in Ecuador it is used as hallucinogen. Because of its extreme toxicity and the unpleasant side effects, its use as drug appears to be on the wane (51).
 BIOCH: Scopoletin (7).
 POP.MED.: In Colombia against fevers (51).
Brunfelsia grandiflora D.Don (SOLANACEAE)
 VERN: *chiricaspi, chiricsanango.* SOURCE: 48
 ETB: Poisonous to cattle, it has been used as an ichthyotoxic agent.
 BIOCH: Scopoletin in all its parts (0,1%) (26).
Brunfelsia grandiflora subsp. *schultesii* Pl. (SOLANACEAE)
 VERN: *chiric sanango, sanango.* SOURCE: 23
 ETB: The Kofans and the Siona-Secoyas of Ecuador utilize this plant as an hallucinogen, particularly the root (51).
 BIOCH: Scopoletin (26).
 POP.MED.: As abortifacient amongst the Siona-Secoyas (51).
Cabomba aquatica Aubl. (NYMPHAEACEAE)
 VERN: *murere mureru, mureru.* SOURCE: 23
 POP.MED.: In Peru the leaves in dysentery and in haemorrhoids (58).
Calathea veitchiana Veitch ex Hooker f. (MARANTACEAE)
 VERN: *pulma.* SOURCE: 49
 ETB: Amongst the natives of Rio Nanay (Peru) it is added to ayahuasca "to obtain visions"; considered a species of *yajé* in the Iquito area (49).
Callaeum antifebrile (Gris.)Johnson (MALPIGHIACEAE)
 SOURCE: 14
 ETB: Species reported for its presumed or potential psychoactive properties (48).
 BIOCH: Harmine in stems and leaves (27).
Calliandra angustifolia Spruce ex Bentham (LEGUMINOSAE)
 VERN: *bobinsana, quinilla blanca, chipero.* SOURCE: 23
 POP.MED.: In the Rio Pastaza the roots as stimulant; their decoction is taken for strenght before swimming a river or fighting (51).
 NOTES: In different species of the genus structurally undetermined alkaloids have been found (64).
Calycophyllum spruceanum (Benth.)Hooker f. (RUBIACEAE)
 VERN: *capirona negro, palo mulato.* SOURCE: 23
 POP.MED.: In Colombia the powdered bark in the skin infections caused by fungi (50).
Capirona decorticans Spruce (RUBIACEAE)
 VERN: *capirona negra, kshi muna.* SOURCE: 23
Capsicum sp. (SOLANACEAE)
 VERN: *catsi, aji.* SOURCE: 44
 ETB: Amongst the Kulinas the fruit is added to ayahuasca (44).
 NOTES: The fruit of many species of the genus contains the pungent principle capsaicine, and preparations with these species have a strong irritating action, sometimes followed by local anaesthesia (8).
Carludovica divergens Drude (CYCLANTHACEAE)
 VERN: *tamshi.* SOURCE: 23
Cavanillesia hylogeiton Ulb. (BOMBACACEAE)
 VERN: *puca lupuna, embirana.* SOURCE: 25
Cedrelinga catenaeformis Ducke (LEGUMINOSAE)
 VERN: *huairacaspi, tornillo, cedrorana.* SOURCE: 23

Ceiba pentandra Gaertn. (BOMBACACEAE)VERN: *lupuna, ceiba, kapok.* SOURCE: 23

POP.MED.: In Peru the bark as diuretic and emetic (58). In the Philippines as aphrodisiac and in the feverish catarrh; at Burma as tonic; in Cambodia in the fever resulting from congestion (35).

NOTES: Luna (22) reports the identification of this additive to ayahuasca, popularly called *lupuna*, as *Chrorisia speciosa* and, before, as *Troclidia tucacheana*.*Clusia* sp. (GUTIFERAE)VERN: *miya, tara.* SOURCE: 38

ETB: The Sharanahuas chew 1 or 2 leaves during the ayahuasca sessions; this plant may also be boiled with the ayahuasca drink (44).

Cornutia odorata (Peopp. & Endl.) Peopp. (VERBENACEAE)VERN: *shinguarana, ulape, tal.* SOURCE: 25ETB: Soukup (58) report that "it is used to prepare ayahuasca instead of *yajé*".

BIOCH: The leaves have shown negative chromatographic results for alkaloids (25).

POP.MED.: In Ecuador a tea of the leaves in the rheumatic pains; the leaves are strongly and pleasantly aromatic (3).

Couroupita guianensis Aubl. (LECYTHIDACEAE)VERN: *ayahuma.* SOURCE: 23ETB: A *vegetalista* from Pucallpa (Peru) affirms that "the spirit of this plant is without head; it is used to strenght the body" (23).

BIOCH: The ripe fruits contain the indolic alkaloids couroupite A and B (this last is equal to indirubine), in addition to stigmasterol and camphesterol (54,5).

POP.MED.: In Peru the fruit as astringent (3), and in the cure of the sores (22).

Coussapoa tessmannii Mildbr. (MORACEAE)VERN: *renaco.* SOURCE: 23*Cyperus* spp. (CYPERACEAE)VERN: *piri-piri.* SOURCE: 38

ETB: The Sharanahua put the roots in the ayahuasca drink (44).

NOTES: From some species of the genus β -carboline alkaloids have been isolated (48). Different *Cyperus* spp. are cultivated and utilized for magical, hallucinogenic and medicinal purposes in the Peruvian Amazonia. Recently, it has been clarified the importance of the mushroom *Balansia cyperi*, endophyte of *Cyperus* spp. producing ergolin alkaloids, over the whole pharmacologic action of these plants (21,39).*Cyperus digitatus* Roxb. (CYPERACEAE)VERN: *chicorro.* SOURCE: 25

ETB: The leaves are added to ayahuasca. In Peru the roots, sometimes smoked together tobacco, are considered hallucinogenic when smoked (39).

Diplopterys cabrerana (Cuatr.) B.Gates (MALPIGHIACEAE)VERN: *yaco-ayahuasco, yajé.* SOURCE: 41

ETB: The leaves are regularly added to ayahuasca by the Kofan of Ecuador and Colombia "to increase and to make longer the visions" (38).

BIOCH: The leaves contain DMT (0,64%) (41).

Epiphyllum sp. (CACTACEAE)VERN: *pokere, wamapanako.* SOURCE: 38

ETB: The Sharanahuas add one leaf to ayahuasca, or drink its fresh juice together ayahuasca (44).

Erythrina fusca Lour. (LEGUMINOSAE)

VERN: *amasisa, gachico, assacù-rana*. SOURCE: 23 (*E.glauca* Willd.)
 ETB: In America it has been used as a fish poison (16).
 BIOCH: Erythraline, erythramine, and erythratine (16).
 POP.MED.: In Peru (Iquito) the flowers in stomach pains, the bark in rheumatic pains (25). In Guatemala the flower to induce sleep (6). Amongst the Tikunas the boiled bark externally on the wounds, internally in malaria; in Brasil, where it is considered narcotic, as purgative (51).

Erythrina poeppigiana (Walp.) O.F.Cook (LEGUMINOSAE)

VERN: *amaciza, oropel*. SOURCE: 22

BIOCH: Erythrina-alkaloids.

POP.MED.: In Peru the bark resin in contusions (58).

NOTES: Different species of the genus have narcotic properties at low dosage; higher dosage shows a curare-like action. In Guatemala the seeds of *E.flabelliformis* Kearney are eaten by the shamans to "make possible the communication with spirits" (48).

Euphorbia sp. (EUPHORBIACEAE)

VERN: *ai curo*. SOURCE: 59

ETB: Amongst the Shipibo-Conibo (Ucayalli, Peru) it is used to be singers; the apprentices drink a tea of the plant to improve the view during the ayahuasca intoxication; it is added to the drink to ameliorate the voice to sing *icaros* and *taquinas* (59).

Ricus insipida Will. (MORACEAE)

VERN: *renaco, hojé, huito, bamba*. SOURCE: 23

ETB: Sometimes it is used alone (23).

POP.MED.: The antihelminthic properties of its latex are recognised by all amerindian pharmacopeia (37). In Brasil, the fruit as aphrodisiac and to promote memory (51).

Gnetum nodiflorum Brongniart (GNETACEAE)

VERN: *tap-kam', hoo-roo', itua*. SOURCE: 51

ETB: The addition of this plant to ayahuasca has not been confirmed. The Wyanas of Suriname call it "shaman devil spirit", indicating presumably some use in association with witchcraft (51).

POP.MED.: Amongst the Tirios a decoction of the crushed plant as a wash in headaches, and amongst the Wayanas in weakness, thinness, and loss of appetite (51).

Guettarda ferox Standl. (RUBIACEAE)

VERN: *garabata*. SOURCE: 23

NOTES: The American species *G.viburnoides* is suspected to have psychoactive properties (6).

Himatanthus sukuuba (Spr. ex M.-A.) Woodson (APOCYNACEAE)

VERN: *bellaco-caspi, sukuuba, platanote*. SOURCE: 23

ETB: It is used in the extraction of the magic darts (*virote*) (23).

BIOCH: Fulvoplumierone (32).

POP.MED.: In Brasil the latex in pulmonary diseases (3). Amongst the Karijonas the powdered bark externally on wounds; amongst the Tikunas the fresh latex on wounds (51).

Hura crepitans L. (EUPHORBIACEAE)

VERN: *catahua, assacu*. SOURCE: 23

ETB: It is taken also alone (23). The latex is very caustic; it is given to dogs "to make them good hunters" (58). In Peru it is usually used as a fish poison (51).

BIOCH: Piscicid compounds (45), and lectines (33).

POP.MED.: In Brasil in leprosy (3). In Peru the leaves smoked in asthma, and the seeds as drastic purgative, in stomach pains, diarrhoea, and liver attacks (2). Always in Peru the juice of petioles and stems in syphilis (4).

Iochroma fuchsoides (HBK.) Miers (SOLANACEAE)VERN: *borrachera, guatillo, paguando.* SOURCE: 25

ETB: In Colombia (Sibundoy) leaves and bark are used as an hallucinogen (48).

BIOCH: Alkaloids, probably tropane derivatives (48).

POP.MED.: In the Andean region the root in colics, stomach acidity, internal haemorrhage and in difficult childbirth (48).

NOTES: In Colombia other two species, *I. gesnerioides* (HBK.) Miers and *I. umbrosa* Miers, are called *borrachero*, thus indicating some probable psychoactive properties (48,51).*Iresine* sp. (AMARANTHACEAE)

SOURCE: 49

Juanulloa ochracea Cuatr. (SOLANACEAE)VERN: *ayahuasca, bi-ti-ka-oo-k, na-ka-te-pé.* SOURCE: 46ETB: In Colombia (Putumayo) this plant is repeatedly called *ayahuasca*; this fact suggests its use as additive to the ayahuasca drink, or as direct source for an hallucinogenic drink (52).

NOTES: From different species of the genus it has been isolated the alkaloid parquine (46).

Lomariopsis japurensis (Mart.) J. Sm. (DRYOPTERIDACEAE)VERN: *shoka, dsuiitetseperi.* SOURCE: 38

ETB: The Sharanahuas add 2 or 3 stems to ayahuasca (44).

Lygodium venustum Swartz (SCHIZAEACEAE)VERN: *tchai del monte, rami.* SOURCE: 38

ETB: A handful of the leaves is added to ayahuasca. The Sharanahuas think that in this manner the drink is stronger (44).

Malouetia tamaquarina (Aubl.) A. DC. (APOCYNACEAE)VERN: *cuchura-caspi, chicle.* SOURCE: 52

ETB: Amongst the Makunas some leaves are added to ayahuasca when the diagnosis of the illness is difficult (52). They are also added to the curare preparations (51).

BIOCH: Indolic alkaloid conessine, dihydrokurchessine, kurchessine, tetramethylolarhimine (5).

POP.MED.: Amongst the Kubeos, Puinaves, and Tikunas, its latex is spreaded to the wounds (51).

Mansoa alliacea (Lam.) Gentry (BIGNONIACEAE)VERN: *ajo sacha.* SOURCE: 23

ETB: Sometimes it is taken alone (23).

POP.MED.: In Peru it is applied externally in the rheumatic infirmities (23).

Markea formicarium Dammer (SOLANACEAE)

SOURCE: 52

Maytenus laevis Reiss. (CELASTRACEAE)VERN: *chuchuasca.* SOURCE: 23 (as *M. ebenifolia* Reiss.)

ETB: Taken by apprentices (Lanisto, Peru), a week after the ayahuasca intoxication (23).

POP.MED.: In Peru the bark as a strong stimulant, and against rheumatism and arthritis (51).

NOTES: A *Maytenus* sp. from Rio Ica (Brasil) has shown 0,85% of caffeine in the aril (51).*Montrichardia arborescens* Schott (ARACEAE)VERN: *raya balsa, camotillo.* SOURCE: 23

ETB: Sometimes it is taken alone (23). In Honduras the boiled and roasted fruits are eaten as food (3).

POP.MED.: Amongst the Creoles of Guyana as diuretic and antidiabetic (15).

Nicotiana tabacum L. (SOLANACEAE)VERN: *mapacho.* SOURCE: 38

ETB: It plays an important part in curative rituals and in tribal ceremonies. Considered a trance-inducing drug amongst many latin-american tribes (63). The ayahuasca sessions are always accompanied by its use.

BIOCH: In the leaves nicotine alkaloids and, in low quantities and particularly in the smoke, β -carboline alkaloids (40,56).

Ocimum micranthum Will. (LABIATAE)

VERN: *pichana, abaca.* SOURCE: 38

ETB: Species reported for its presumed or potential psychoactive properties (48).

POP.MED.: Amongst the Tikunas the leaves in the fevers through head washings; the leaf juice applied on the eyes in the ocular inflammations (51). Amongst the Wayapi against fevers (15).

Opuntia sp. (CACTACEAE)

VERN: *tchai.* SOURCE: 44

ETB: It is considered hallucinogenic; it does not seem used for medicinal purposes (44).

NOTES: In 1960 Turner & Heyman (60) isolated from *O.cylindrica* (Lam.)DC. 0,9% of mescaline; afterwards it was doubted the botanical identification of the sample previously analysed, supposing it was matter of *Trichocereus pachanoi* (cfr., for ex., 42), a species really very different and unlikely confusing with the first species. Schultes & Farnsworth (47) consider correct the first identification. Also in *O.spiniosior* (Engelm.)Toumey, native from USA and Mexique, mescaline has been identified, thought in low quantities (30).

Petiveria alliacea L. (PHYTOLACCACEAE)

VERN: *muckra, mucura, chanviro.* SOURCE: 23

ETB: In Brasil the Tikunas use it in the curare preparations (3).

BIOCH: 19 different coumarines; from the roots the trithiolane trithiolaniacin (1). Isoarborinol from the leaves (53).

POP.MED.: In Amazonia as diuretic, sudorific, expectorant, antispasmodic, and depurative (58). Amongst the Tikunas the leaves in fevers and headaches (51).

Pfaffia iresinoides (AMARANTHACEAE)

VERN: *marosa.* SOURCE: 59

ETB: Amongst the Shipibo-Conibos (Ucayalli, Peru) a half of a cup of tea of this plant is taken for 6 days, followed by a repose of other 6 days; after that, ayahuasca is taken. In this manner the inebriation has its stronger effect (59).

POP.MED.: Amongst the Creoles of Guyana as sedative and febrifuge (15).

Phrygilanthus eugenioides Eichler (LORANTHACEAE)

VERN: *miya, ho-ho-bo.* SOURCE: 38

ETB: The leaves are added to ayahuasca; their juice is also drunk alone for psychoactive purposes (44).

Phtirusa pyrifolia HBK. Eichler (LORANTHACEAE)

VERN: *sueda con sueda.* SOURCE: 23

Pithecellobium laetum Peopp. & Endl. (LEGUMINOSAE)

VERN: *remo caspi, pashaquillo, shimbillo.* SOURCE: 23

ETB: When added to ayahuasca, the resulting drink is very strong, and it could let in an unconscious state for 12 hours (22).

NOTES: In different species of the genus alkaloids have been found, particularly pithecolobine (64). *P.contortum* Mart., of Asiatic origin, has stupefying properties (35).

Pontederia cordata L. (PONTEDERIACEAE)

VERN: *amaron borrachero.* SOURCE: 25

ETB: Its vernacular name, signifying "intoxicant of the boa", suggests that this species possess intoxicating principles (51).

- POP.MED.: In Colombia in the relieve of facial paralysis (51).
Prestonia amazonica (Benth.) Macbride (APOCYNACEAE)
 SOURCE: Spruce, 1908
 ETB: Spruce, in 1908, reported this species was added to ayahuasca; Reinberg, in 1921, suggested that *yajé* was prepared with this plant; from these informations the idea that this plant was a chief component of the drink spreaded in literature, while it has to be seen as a probable minor additive (52).
 BIOCH: DMT has been found in the leaves (17), but probably the analyzed material concerned *Banisteriopsis caapi* (52).
Psychotria sp.1 (RUBIACEAE)
 VERN: *batsikawa, rami-appane*. SOURCE: 51
 ETB: Amongst the Sharanahuas (Peru) the leaves are added to ayahuasca "to give the impression of coldness and produce fewer visions" (51).
Psychotria sp.2 (RUBIACEAE)
 VERN: *pishikawa, kawa-kui*. SOURCE: 51
 ETB: Amongst the Sharanahuas the leaves are added to ayahuasca; it is considered stronger than *batsikawa* (*Psychotria* sp.1) (51).
Psychotria carthaginensis Jacq. (RUBIACEAE)
 VERN: *yage-chacrana, rami appani, sameruca*. SOURCE: 38
 ETB: The Sharanahuas and the Kulinas add the leaves to ayahuasca. Together other species of the genus it has been associated to *nai-kawa*, whose leaves are used by the Kashinahuas for hallucinogenic purposes (48).
 BIOCH: The leaves contains 0,66% of total alkaloids, of which the 99% is DMT; MMT and MTHC follow in traces (44).
Rinorea viridifolia Rusby (VIOLACEAE)
 VERN: *ayahuasca*. SOURCE: 51
 ETB: The fact that it is called *ayahuasca* by the Siona-Secoyas may suggest that it is employed as an hallucinogen or as an additive to ayahuasca (51).
Rudgea retifolia Standley (RUBIACEAE)
 VERN: *chacrana, amanga, capinuri*. SOURCE: 51
 ETB: Its vernacular name is the same to that given in Peru to *Psychotria viridis*; the two plants are quite different, and the same popular name could refer to the similitudes of their pharmacologic actions; the leaves are occasionally added to ayahuasca (51).
Sabicea amazonensis Wernham (RUBIACEAE)
 VERN: *kana, koti-kana-ma, chá-dê-kê-na*. SOURCE: 51
 ETB: In Colombia (Vaupés) it is added to ayahuasca "to make it sweet instead of bitter". Amongst the Tikunas the fruit form part of the initiation rites of the children (51).
Sclerobium setiferum Ducke (LEGUMINOSAE)
 VERN: *palisangre, palisanto*. SOURCE: 25
Scoparia dulcis L. (SCROPHULARIACEAE)
 SOURCE: 23
 ETB: In Equatorial Africa the leaves are smoked as tobacco substitute (43).
 BIOCH: Amelline (35), 6-methoxybenzoxozolinone, triterpenes (25).
 POP.MED.: Amongst the Shipibo-Conibo (Ucayalli, Peru) in the headache and as an external cicatrizing (59). Amongst the Tikunas as contraceptive and abortifacient; sometimes mixed with *Chenopodium ambrosioides* (51). In Malesia in cough, in Indonesia sometimes as opium substitute, in the Philippines the roots in fevers (35).
Stygmaphyllon fulgens (Lam.) A. Jussieu (MALPIGHIACEAE)
 VERN: *ki-ria, kairia*. SOURCE: 51

ETB: It is added to ayahuasca to improve its "strenght" (51). An herbal specimen from British Guyana is labelled "for yajé test" (3).

Tabebuia heteropoda (DC.) Sandwith (BIGNONIACEAE)

VERN: *tahuari*. SOURCE: 23

Tabernaemontana sp. (APOCYNACEAE)

VERN: *uchu-sanango*. SOURCE: 23

NOTES: Many species of *Tabernaemontana* produce indolic alkaloids with psychopharmacologic action. The seeds of the asiatic species *T. dichotoma* Roxb. ex Wall. are considered narcotic, producing delirium and other symptoms similar to those caused by *Datura* (34). In Peru *T. sananho* is used particularly as psychostimulant (9).

Teliostachia lanceolata Nees var. crispa Nees (ACANTHACEAE)

VERN: *toé negro*. SOURCE: 51

ETB: The leaves are used also alone as an intoxicant. The psychoactive effects may last 3 days (51).

Tournefortia angustiflora R. & P. (BORAGINACEAE)

SOURCE: 61

ETB: Amongst the Sionas and Secoyas of Ecuador it is used as purgative, to klean the body before the ayahuasca sessions. The liane is cutted in sections which are dipped in water all long night. The water is drank some hours before the ayahuasca session (61).

Tovomita sp. (CLUSIACEAE)

VERN: *chullachaqui caspi*. SOURCE: 23

ETB: The bark is added to ayahuasca (25).

Triplaris surinamensis var. chamissoana Meisn. (POLYGONACEAE)

VERN: *tangarana*. SOURCE: 23

ETB: A Peruvian *vegetalista* affirms that the shoots of this tree may be added to ayahuasca when *chacruna* lacks (*Psychotria viridis*) (22).

Tynanthas panurensis (Bur.) Sanwith (BIGNONIACEAE)

VERN: *clavohuasca*. SOURCE: 23

Uncaria guianensis (Aubl.) Gmelin (U. tomentosa?) (RUBIACEAE)

VERN: *garabata, unganangi*. SOURCE: 25

BIOCH: Indolic alkaloids in leaves, stems, and flowers: angustine, isorynchophylline, rynchophylline N-oxide, dihydrocoryantheine, hirsutine, hirsuteine (36).

POP.MED.: The leaves in the cure of wounds (36). In the Rio Apaporis a tea in dysentery (51).

Virola sp. (MYRISTICACEAE)

VERN: *cumala*. SOURCE: 23

Virola surinamensis (Rol.) Warburg (MYRISTICACEAE)

VERN: *caupuri, cumala blanca*. SOURCE: 23

ETB: Species orally used by the Witotos and the Boras of Peru for hallucinogenic purposes (52).

BIOCH: Neolignans (25).

POP.MED.: In Brasil a tea of the leaves in colics and dyspepsia; the sap, together *Physalis angulata*, in external applications for haemorrhoids (51).

Vitex triflora Vahl. (VERBENACEAE)

VERN: *tahuari, taruma*. SOURCE: 23

Vouacapoua americana Aubl. (LEGUMINOSAE)

VERN: *huacapo, hucapù*. SOURCE: 23

**Plants in Association with Ayahuasca:
Information from Scientific Literature.**

Abbreviations:

ETHNO = Ethnopharmacological Data

L = local (other cultures from South America)

F = foreign (corroboration from cultures on other continents)

PHARM = Pharmacological information on the genus:

Y = Yes, the studies reported could support a hypothesis of their role in Ayahuasca sessions

N = No, the studies reported are not related to their use in Ayahuasca sessions

CHEM = Chemical information on the genus:

Y = Yes

N = No

TOXIC = Toxicological information on the genus:

Y = Yes, the genus has been resulted toxic on animals;

N = No data available

Y/N = Conflicting reports from different assays, extracts, or species in the same genus

	ETHNO	PHARM	CHEM	TOXIC
ABUTA GRANDIFLORA	L	Y/N	Y	Y
ALCHORNEA CASTANEIFOLIA	F	Y	Y	
ALTERNANTHERA LEHMANI	F	Y/N		Y/N
ANTHODISCUS PILOSUS	L			
BRUGMASIA INSIGNIS	L	Y	Y	Y
BRUGMASIA SUAVEOLENS	L	Y	Y	Y
BRUFELSIA CHIRICASPI	L	Y	Y	Y
BRUFELSIA GRANDIFLORA	L	Y	Y	Y
CABONBA AQUATICA	L			
CALATHEA VEITCHIANA	L			
CALLAEUM ANTIFEBRILE	L	Y	Y	
CALLIANDRA ANGUSTIFOLIA	L	Y/N	Y	
CALYCOPHYLLUM SPRUCEANUM	L			
CAPIRONA DECORTICANS	L			
CAPSSICUM sp.	S	Y	Y	Y

	ETHNO	PHARM	CHEM	TOXIC
CAARLUDOVICA DIVERGENS	L			
CAVANILLESIA HYLOGEITON				
CEDRELINGA CATENAEFORMIS				
CEIBA PENTANDRA	S	Y/N	Y	
CLUSIA sp.	L	Y/N	Y	
COUROPITA GUIANENSIS	L	Y/N	Y	
COUSSANDRA TESSMANII				
CYPERUS sp.	S	Y	Y	Y/N
CYPERUS DIGITATUS	L	Y	Y	
DIPLOPTERIS CABREANA	L	Y	Y	Y/N
EPIPHYLLUM sp.	L	Y/N	Y	
ERYTHRINA FUSCA	L	Y	Y	Y
ERYTHRONA POEPPIGIANA	S	Y	Y	Y
EUPHORBIA sp.	S	Y	Y	Y/N
FICUS INSIPIDA	S	Y/N	Y	N
GNETUM NODIFLORUM	L	Y	Y	

	ETHNO	PHARM	CHEM	TOXIC
GUETTARDA FEROX	L			
HIMANTHUS SUCUUBA	L			
HURA CREPITANS	L	Y	Y	Y
IOCHROMA FUCHSINOIDES	L	Y	Y	Y
TERSINE sp.	L			
JUANULLOA OCHRACEA	L		Y	
LOMARIOPIA JAPURANENSIS	L			
LYGODIUM VENUSTUM	L			
MALOUETIA TAMARAQUARINA	L	Y	Y	
MANSOIA ALIACEA	L			
MARKEA FORMICARIUM				
MAYTENUS LAEVIS	L	Y	L	Y
NICOTIANA TABACUM	S	Y	Y	Y
OCIMUM MICHRANTUM	S	Y/N	Y	
OPUNTIA sp.	L	Y/N	Y	

	ETHNO	PHARM	CHEM	TOXIC
PETIVERIA ALIACEA	L	Y/N	Y	
PFAFFIA IRISINOIDES	L	Y/N	Y	
PHRYGILANTHUS EUGENOIDES	L			
PHTIRUSA PYRIFOLIA				
PITHECELLOBIUM LAETUM	S	Y/N	Y	
PONTERERIA CORDATA	L	Y/N	Y	
PRESTONIA AMAZONICA	L	?	?	
PSYCHOTRIA sp.	S	Y	Y	N
PSYCHOTRIA CARTHAGINENSIS	L	Y	Y	N
RINOREA VIRIDIFOLIA	L			
RUDGEA RETIFOLIA	L			
SABICEA AMAAZONENSIS	L			
SCLEROBIUM SETIFERUM	L			
SCOPARIA DULCIS	S	Y	Y	Y
STIGMAPHYLLON FULGENS	L	Y/N	Y	

	ETHNO	PHARM	CHEM	TOXIC
TABEBUIA HETEROPODA	L	Y/N	Y	
TABERNAEMONTANA sp.	S	Y	Y	Y/N
TELIOTACHYA LANCEOLATA	L			
TOURNEFORMA ANGUSTIFOLIA	L	Y/N	Y	
TOVOMITA sp.	L			
TRIPLARIS SURINAMENSIS	L			
TYNANTHAS PAANURENSIS				
UNCARIA GUIANENSIS	L	Y	Y	N
VIROLA sp.	S	Y	Y	Y/N
VIROLA SURINAMENSIS	L	Y/N	Y	N
VITEX TRIFLORA				
VOUCAPIA AMERICANA				

Discussion

Unlikely, concerning many of these plants, there is little or no information. First of all we could differentiate these plants respect to the kind of association with ayahuasca. It is possible, in this way, to distinguish three main groups:

- 1) Plants cooked together ayahuasca; this is the most numerous group.
- 2) Plants assumed during the ayahuasca session. A typical example is *Nicotiana tabacum*, smoked in great amount during the healing sessions.
- 3) Plants assumed before or after the ayahuasca effects: before to purificate the body for the ingestion of the hallucinogenic brew, and after, until a week after, to integrate the ayahuasca experience. Often, these plants have emetic activity.

It could be interesting to evidenziate some biochemical reflections. We could hypothesize, because the data on the plants, we could have the following pharmacodynamic interactions (ayahuasca has been indicated as a whole of tript + β -carb. alkaloids):

(tript + β -carb.) + tript.	strengthening action
(tript + β -carb.) + β -carb.	strengthening action
(tript + β -carb.) + β -carb. + trip.	strengthening action
(tript + β -carb.) + tropane alkaloids	
(tript + β -carb.) + nicotine alkaloids	
(tript + β -carb.) + indolic (couropitine-like) alkaloids	
(tript + β -carb.) + indolic (<i>Erythrina</i>) alkaloids	
(tript + β -carb.) + indolic (conessine-like) alkaloids	
(tript + β -carb.) + indolic (<i>Uncaria</i>) alkaloids	
(tript + β -carb.) + ergot alkaloids	
(tript + β -carb.) + coumarines	

The possible biochemical interaction will be greater of this; the data about many plants are lacking, for the establishment of a complete system of interrelations.

Furthermore, the cultural system connected with indigenous shamanism is disappearing due to the rapid process of acculturation which they are undergoing. This is reflected, on the one hand, by the decreasing number of the various types of ayahuasca used by contemporary indigenous shamans compared with the data reported in the literature of a few decades ago and, on the other hand, by the gradually decreasing number of principal plants used as an additive. Amongst the Shipibo shamans, for example, our informant (Don Guillermo A.) has related how he still uses today, for hallucinogenic purpose, *tchai*, a cactus that, as it probably belongs to the *Opuntia* genus, may be hypothesized as containing molecules of a phenylethylaminic nature. Neither he nor any of the shamans that he knows added it any longer to ayahuasca, considering that the experience is too intense. If the presence of mescaline alkaloids in the cactus were proved, it would be the demonstration of how the knowledge linked to the interaction of b-carbolin-mescaline is completely disappearing. The use of marosa (*Pfaffia iresinoides*) both as

a hallucinogenic mixture and in preparation for ayahuasca is rapidly disappearing amongst the younger shamans of the Shipibo ethnic group. Numerous other plants probably exist that are connected to the initiatory system of ayahuasca, the use of which will probably be lost before scientific documentation is possible. Anyway we could appreciate, on the basis of still limited number of observations, the great knowledge of local curanderos contrasting with our practically total ignorance respect to the effects of single and associated components. In this case it would be very useful any information collected from the curanderos, particularly any reference to plants which could influence, in such way, the ayahuasca intoxication.



Fig.1: TCHAI.

Hallucinogenic cactus, the use of which as an additive to ayahuasca has been documented in the past by Rivier and Lindgren (44); today some Shipibo and Amahuaca shamans use its raw juice.



*Fig. 2: MAROSA (Pfaffia iresinoides).
Hallucinogenic plant, the use of which is rapidly disappearing amongst the Shipibo.
There is a preference towards using it for a few days in small quantities in
preparation for the experience with ayahuasca.*

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