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ORIGINAL ARTICLE

Plantas com possíveis ações psicoativas utilizadas pelos índios Krahô, Brasil*.

Plants with possible psychoactive actions used by the Krahô Indians, Brazil*.

Eliana Rodrigues** and E. A. Carlini

Department of Psychobiology, Federal University of São Paulo (UNIFESP), Rua Botucatu, 862 - 1º andar Edifício Ciências Biomédicas CEP 04023-062, São Paulo, S.P., Brazil

**Corresponding author Tel: + 55-11-2149-0155

Fax: + 55-11-5084-2793

E-mail address: elirodri@psicobio.epm.br

RESUMO

OBJETIVO: Apesar da riqueza biológica encontrada no Brasil não foram desenvolvidos, até o momento, fitoterápicos voltados para tratamentos psiquiátricos a partir desta flora. O principal objetivo deste estudo foi documentar as plantas utilizadas pelos índios Krahô em rituais de cura, sobretudo aquelas com potenciais ações psicoativas. Esta etnia indígena ocupa uma área no bioma cerrado, numa região central do Brasil. Além disso, estes resultados foram comparados àqueles obtidos durante um levantamento bibliográfico realizado a respeito das plantas psicoativas utilizadas por outras 25 etnias indígenas brasileiras.

MÉTODOS: Os dois anos de trabalho de campo foram conduzidos utilizando-se métodos da antropologia e botânica.

RESULTADOS: Sete xamãs locais foram entrevistados e indicaram 98 receitas preparadas a partir de 45 plantas para 25 usos, que parecem estar envolvidos a propriedades psicoativas, são eles: *“para evitar ficar louco”*, *“estimulante”*, *“calmante”*, *“para diminuir tremores”*, *“para dormir por mais tempo”*, *“para abrir a cabeça”* e *“para induzir o sono”*. Este artigo descreve também um levantamento bibliográfico que registrou 58 plantas utilizadas por 25 etnias indígenas brasileiras que de modo similar podem ter alguma ação psicoativa.

CONCLUSÃO: É muito rica a terapêutica para males psicológicos/psiquiátricos a partir de plantas utilizadas pelos índios Krahô. Este mesmo fato ocorre entre outras etnias indígenas brasileiras. Futuros estudos de fitoquímica e farmacologia a serem realizados com estas plantas poderão prover a psiquiatria com novos medicamentos.

Palavras-chave: etnofarmacologia; sistema nervoso central; substâncias psicoativas; plantas medicinais; curadores; xamanismo.

ABSTRACT

OBJECTIVE: Apart from the richness of the Brazilian biodiversity, there are no phytomedicines concerning psychiatric treatments available until now, developed from this flora. The aim of the present study was to document the use of plants, with possible psychoactive actions, in rituals carried out by the Krahô Indians, who occupy the cerrado savannahs biome in the central region of Brazil. Also the present data were compared with those obtained during a bibliographical survey on the use of psychoactive plants by 25 Brazilian indigenous groups.

METHOD: Two years of fieldwork were carried out, using methods of anthropology and botany.

RESULTS: Seven local shamans were interviewed and have indicated 98 formulas, consisting of 45 plant species with 25 uses that appear to involve psychoactive properties, such as: “*to prevent going crazy*”, “*stimulant effect*”, “*to calm down*”, “*for tremors*”, “*to sleep longer*”, “*to have an open mind*” and “*to induce sleep*”. This article also describes the bibliographical survey which recorded 58 plants utilized by 25 Brazilian Indian cultures whose may have psychoactive actions/effects.

CONCLUSION: The therapeutics concerning psychological/psychiatric disorders from the plants utilized by the Krahô Indians is very rich. It is also observed among other Brazilian

indigenous groups. Future phytochemical and pharmacological studies on these plants could bring new medicines to treat psychiatric disorders.

Keywords: ethnopharmacology; central nervous system; psychoactive substances; medicinal plants; healers; shamanism.

INTRODUCTION

It is well known the rich heritage from plants to medicine, such as: cardiac glycosides (digoxin from *Digitalis lanata* Ehrhart and digitoxin from *Digitalis purpurea* L.), drugs acting on cholinergic system (atropine from *Atropa belladonna* L. and pilocarpine from *Pilocarpus jaborandi* Holmes.) and narcotic analgesics (morphine from *Papaver somniferum* L.). Some of them are such contributions, which are nowadays still useful as therapeutic agents, nonetheless, nature was not as prodigious to yield of psychoactive phytomedicines. Apart from the richness of the many hallucinogenic plants^{1,2,3,4} which, however, are not useful to treat mental illnesses, *Rauvolfia serpentina* (L.) Benth. ex Kurz, a breakthrough for the initial brain treatment and understanding of schizophrenia biochemical disturbances, no other great discovery has yet occurred. In fact, in spite of a few plants seemingly possessing either anxiolytic (*Piper methysticum* G. Forst. - kava-kava, and species belonging to *Passiflora* sp.), antidepressive (*Hypericum perforatum* L.) or stimulant properties (*Ephedra vulgaris* Willk.), it is not known up to the present days examples of plants doted with anti-maniac or anti-psychotic properties that could make them accepted useful psychoactive medicines.

And this is a sad reality, as psychiatric treatments with synthetic drugs is far from being satisfactory. In fact, the available psychotherapeutic agents are not fully active against the symptoms of mental disease, may take too long to start acting and induce an array of serious adverse reactions^{5,6}.

However it is well possible that nature has already yield its mysteries to psychiatry. Actually it may well be that psychoactive plants are still waiting for psychiatry and psychopharmacology to extend their hands to them. In fact, the contact of mankind with

these plants may have already occurred probably centuries ago, as data obtained from ethnopharmacological studies. In Brazil and other South American countries the situation is not different. Thus, ethnopharmacological surveys carried out among indigenous groups living in the Northwest of the Amazon region revealed psychoactive plants⁷ and specifically those for senile diseases⁸ some of which used for symptoms mimicking Alzheimer disease. In Brazil, seemingly psychoactive plants - those that have the ability to affect aspects of the mind and behavior, including patterns of thought, humor, anxiety, cognition performance and well-being⁹, are more usually used by indigenous groups and by the Brazilian African descendants, mostly during healing ceremonies, facilitating the communication with the spirits¹⁰.

The present work describes an ethnopharmacological survey carried out among the Krahô Indians, concerning the plants with possible psychoactive effects in ritual contexts - so much in the sense of curing mental pathologies as of producing mental alterations. Also the present data were compared with those obtained during a bibliographical survey on the use of psychoactive plants by 25 Brazilian indigenous groups (Rodrigues et al.¹¹).

METHODS

Five criteria were used to select the geographical area and the human group to be studied. They are, by order of importance: a) groups living in cerrado savannahs and/or pantanal wetlands; as these two biomes were less studied than Mata Atlântica rain forest, and Amazon Equatorial rain forest; b) the choice of indigenous group, as these populations at least apparently, possess a great knowledge on plants that may alter behaviour; c) the indigenous groups should also practice rituals associated with the use of medicinal plants; d) the “cures” should be exercised by “specialists” (shaman, healers, and so on) present

among the chosen indigenous population and finally e) geographical isolation in relation to governmental or private organizations providing conventional medical assistance.

In order to comply with these criteria, professors and researchers from the following institutions dealing with the Brazilian indigenous groups were consulted: University of São Paulo; Federal University of Santa Catarina and Mato Grosso; Non-Governmental Organization such as Comissão Pró-Índio (Acre State) and Centro de Trabalho Indigenista (CTI-São Paulo State).

Based on the information provided, the Krahô Nation was selected. Furthermore, the Krahô Indians had already manifested great interest in having their medicinal plants studied, as they have stated to the anthropologist Gilberto Azanha (from CTI), who maintain contact with the Krahô for the last 20 years.

The fieldwork was undertaken by one of the authors (ER) from July 1999 through July 2001, by utilizing methods from anthropology (ethnography) and botany. A total of ten trips, 20 days duration for each trip, were made to three Krahô villages. Prior consent was obtained during meetings in each village in the beginning of fieldwork.

At the beginning of the fieldwork, while becoming acquainted with the area, informal interviews¹² were performed among two hundred adult inhabitants of the three villages. Seven individuals were selected to participate in the study, as they were identified as *wajaca* (a healer or shaman) by the others. Once selected, the knowledge of these seven *wajacas* regarding the methods of diagnosis and healing, and on their beliefs, were obtained through dozens of interviews, and participant observations, which were carried out during daily activities such as fishing, hunting and fruit harvest. Personal and ethnopharmacological knowledge aspects of the interviewees were obtained with the use of

questionnaires with open questions in semi-structured interviews¹³ where the following topics were addressed: line of descent, age, level of schooling, and the status of each interviewee in his/her community (personal data); composition of a given formula, its respective therapeutic indication, doses, method of preparation and counterindications (ethnopharmacological data). Furthermore, it was recorded in a notebook of “field notes” all details of Krahô daily living habits, in order of not forgetting important items. Such recording were useful for the future interpretation of what was said by the interviewees in contrast with was direct observed by the interviewer.

The same interviewees were repeatedly queried during different field trips to confirm the information provided by them previously.

During the interviews, it was possible to learn about and to document on the use of plants for many therapeutic purposes. These information were used to select the plants and their medicinal formulas with possible CNS activity, the focus of this study.

It was furthermore necessary to establish a translation procedure with the help of Krahô teachers, since despite utilizing rudimentary Portuguese to communicate with the “whites,” the interviewees also had their own language, which they used most of the time. Through this process, correlations were made between the indications by the Krahô and those according to conventional medicine. This translation permitted the understanding of certain beliefs linked to the cause of some illnesses. For example, in Krahô medicine there are three types of fever, each one of them having a different origin, symptomatology and name.

Three samples of each plant were collected and the following information were obtained; blooming, fruiting, origin and location at the time of collection. The plant

material collected was identified by taxonomists at the Botanical Institute of São Paulo State (SP) and a voucher sample deposited at that Institute.

RESULTS AND DISCUSSION

It was decided not to publish the scientific names of the plants indicated in this research. However, they are referenced by their respective names in Timbira language, written in bold italics throughout the text. Our decision is part of a trend in global conduct by investigators developing projects with medicinal plants associated with traditional knowledge, aiming guaranteeing the ethnic groups their rights in a possible patent^{14,15,16}. It is certain that the Krahô deserves to obtain adequate compensations for their knowledge, as they have contributed with useful information.

Observations on the Krahô Medicine

The healing process involves two parts: the first is a ceremony conducted by the *wajacas*, mainly at night; during this practice they smoke tobacco, marijuana or some other native plants, such as *caprankohiré*; *pjejapac*, *ahkrô* and *mãputréhô*, for which a special pipe is used, called a *côt*. The act of smoking helps in communicating with the *pahi* (spiritual guides, generally represented by the spirits of animals, plants, objects or even the deceased) or in furnishing more power at the moment of the healing, according to the interviewees. The exhaled smoke is blown on the patient, “spreading out the illness”, turning it “more easily diagnosed”; or, even, to “gather” the illness, which was spread throughout the body of the patient, to a single point so that it could then be “aspirated”. Some *wajacas*, after “aspirating” the illness with their mouth, materialize it in the form of

an object that is shown to the relatives of the ill person as proof of the healing. The act of materializing the illness, related above, is also seen between other Brazilian indigenous nations, as Bakairi (observed during field work by the author E.R.) and also African societies, such as the Azande¹⁷.

In the second part, after the ceremony, the *wajaca* chooses one plant to be utilized in the treatment and returns in the following hours and days several times to the patient's home to follow up on the effects of the remedy administered.

The *wayaca* is specialist in one or more illnesses, such as snakebites, fever, or may have "expertise" to deal with illnesses related to the *karõ* (soul). It is believed that when the *karõ* leaves the body of a very sick patient, the *wajaca* needs to bring it back, to improve the patient health. In these healing ceremonies, the souls of the deceased often fight with the *wajaca* over the *karõ* of the patients and at this moment a struggle takes place where this *wajaca* receives help from two other *wajacas* who need to be on hand to help him to "win the battle". When a Krahô is near death, the *karõ* escapes and it is impossible to retrieve it.

The seven shamans have indicated 98 formulas, consisting of 45 plant species utilized for 25 uses that appear to involve psychoactive properties. Those 25 uses were grouped into 7 categories according to similarities among their expected effects, as can be seen in Table 1. For example, uses 1 to 4 (category 1- **hallucinogens**) comprised a total of 23 plants employed to alter the perception; uses 11 to 16 (11 plants) were included within the category 4 - **sleep disorders**. In some instances the same species was cited for more than one use. For example, the species known as *wrywry cahàcré*, was cited by different interviewees for various uses, belonging to the categories: **thought modifiers** and **memory enhancers**.

Besides knowledge on how to compound the formulas (parts of the plant utilized and methods of preparation), the Krahô medicine also has notions on the doses required (distinctly for adults and children), and has indications and counterindications (generally for children, elderly and pregnancy) for each of the formulas. It was then observed that the knowledge and care of this indigenous culture regarding the “pharmacology” of these plants are very close to the principles of pharmacovigilance¹⁸.

Below is a description of the plants utilized by the Kraho Indians and their uses belonging to five of the categories listed in Table 1.

Category: Hallucinogens (23 plants): Sixteen plants were cited as “*mind modifiers*” substituting for marijuana (referred to as *iamhô*) in therapeutic and social contexts. Based on reports, they are dangerous plants, as they stay longer than marijuana in the body, and their abuse could result in mental disturbances. During the healing ritual, they are very often used for the diagnosis and the healing.

Category: Head illnesses (15 plants): According to the beliefs of the Krahô, a person is “*crazy*” or is “*mixed up in the mind,*” when he or she begins to behave strangely. Such persons do not know what they are doing or saying. They may begin to throw things (clothes, pans) out of the home. They may think that the food or water is contaminated and therefore refrain from eating and drinking; or they begin to talk to themselves. Often, they may be aggressive, putting the lives of family members and domestic animals at risk. All these symptoms in a way resemble those that may be observed in person diagnosed as schizophrenics or suffering from other psychotic diseases. Eight plants were indicated for

“*craziness*,” which are generally consumed as teas over a long period of time (several months) in connection with rituals. *Wajacas* are known to have many powers to reverse the crises that befall such patients, as there have been accounts of such success. However, the Krahô believed that this type of illness originates from white people, and therefore, only a white person can cure those afflicted with it. Many interviewees explained that some Krahô could not mix marijuana and alcoholic beverage, or it could unchain madness in them.

Anxiolytics (14 plants): Some plants may be ingested in the form of teas “*to calm down*” and others can be chewed before traveling through the forest to prevent the fear of encountering certain animals, such as jaguars and snakes. This fear was related to the indication “*anxiety*.”

Sleep disorders (11 plants): The possible oneirogenic effect – the production or the increase of nature divinatory dreams – attributed to a mushroom by Krahô raises the attention, mainly because its use occurs when the *wajaca* is unable to diagnose the disease. Mayagoitia et al.¹⁹ studied the species *Calea zacatechichi*, used by Mexican Indians to obtain divinatory messages during the sleep. It was observed that this plant induces sleep in cats; increases the superficial stages of sleep and the number of spontaneous awaking, in humans.

Antidepressants and/or Stimulants (10 plants): The plants can be consumed as teas or can also be used to do body paintings with the same aim. Some of former have been substituted by the introduction of coffee. The Krahô Indians did not demonstrate knowledge concerning the pathology: depression, therefore, some of the plants indicated as

stimulants could be anti-depressives, once this culture does not recognize this second effect. Moreover, the observation that these plants are not related to appetite loss, not being an amphetamine like drug²⁰, reinforces such supposition.

Finally, in a recent review article concerning the ethnopharmacological surveys carried out among 25 Brazilian Indian cultures (Figure 1), it was described 58 plants with potential psychoactive actions/effects, many of them being already studied by science¹¹. This article described 25 plants as hallucinogens, 10 as anxiolytics, 8 for head illnesses, 7 for sleep disorders, 6 as antidepressants and/or stimulants and 2 as memory enhancers, as can be seen in Table 2. While the Krahô Indians have indicated 28 plants as hallucinogens, 15 as anxiolytics, 16 for head illnesses, 12 for sleep disorders, 10 as antidepressants and/or stimulants and 6 as memory enhancers (Table 1).

Comparing both studies, we verify that the plant potential described during the survey developed among Krahô Indians is still superior to those other comprising 25 Indian cultures.

One of the reasons to explain this disparity may be the fact that not all the data obtained during ethnopharmacological surveys are published, moreover some of the studies focus the hallucinogens utilized among Indians that live in Amazon forest.

The data obtained in the ethnopharmacological study carried out among the Krahô Indians; as well as those from the bibliographical survey concerning the Brazilian indigenous knowledge about medicinal plants with possible psychoactive effects, point promises at the future development of new medicines available for the psychiatry. Only a

joint effort of the pharmacology and phytochemistry will be able to turn such development a reality.

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Figure 1: Map of the South America, showing the geographical location in the Brazilian territory of each one of the 25 analyzed indigenous cultures [apud Rodrigues *et al*¹¹].

Table 1: The 25 uses of 45 identified plant species by the Brazilian Krahô *wajacas* with possible psychoactive actions, grouped in 7 categories.

Uses related to possible psychoactive action (n° of plants cited)*	Category	Number of formulas (per category)
1- " <i>to modifying mind</i> " (16) 2- " <i>to talk to pahis (spirits)</i> " (4) 3- " <i>smoking substituted by tobacco</i> " (1) 4- " <i>to get slow</i> " (2)	1- Hallucinogens	28
5- " <i>to prevent going crazy</i> " (1) 6- " <i>illnesses of the karō (soul)</i> " (5) 7- " <i>for tremors</i> " (1) 8- " <i>craziness</i> " (8)	2- Head illnesses	16
9- " <i>anxiety</i> " (2) 10- " <i>to calm</i> " (12)	3- Anxiolytics	15
11- " <i>to stop snoring</i> " (2) 12- " <i>to sleep longer</i> " (1) 13- " <i>to have premonition dreams</i> " (1) 14- " <i>to sleep more lightly</i> " (1) 15- " <i>to have good dreams</i> " (1) 16- " <i>to induce sleep</i> " (5)	4- Sleep disorders	12
17- " <i>to help thinking</i> " (5) 18- " <i>to rest the head</i> " (1) 19- " <i>to have an open mind</i> " (1) 20- " <i>to clear one's thoughts</i> " (1)	5- Thought modifiers	11
21- " <i>for being happy</i> " (6) 22- " <i>to remove sadness from the body</i> " (1) 23- " <i>stimulant</i> " (3)	6- Antidepressants and/or Stimulants	10
24- " <i>to enhance memory</i> " (5) 25- " <i>to remember dreams</i> " (1)	7- Memory enhancers	6
25 uses (87 citations of plants)	7 categories	98 formulas

* Although the total number of plant species with possible psychoactive action is 45 (belonging to the 7 categories), there are a total of 87 citations of plants - in parentheses - once, in some cases, the same species was cited for more than one use.

Table 2: Number of plants and uses per category of use, indicated by the 25 Indigenous Brazilian cultures, resembling psychoactive actions/effects.

Category of use	Number of uses per category	Number of species per category indicated by the Brazilian Indians
Hallucinogens	Uses (7)	Species (25)
	Additives to some plants (<i>Anadenanthera peregrina</i> , <i>Virola theiodora</i> and other <i>Virolas</i>); Hallucinogen; Inebriating snuff; Narcotic; To see far (shamanism); Substitute for <i>Nicotiana tabacum</i> ; Psychoactive.	<ol style="list-style-type: none"> 1. <i>Anadenanthera macrocarpa</i> (Benth.) Brenan 2. <i>Anadenanthera peregrina</i> (L.) Speg. (yopo) 3. <i>Banisteriopsis caapi</i> (Spruce ex Griseb.) C.V. Morton (caapi, ayahuasca) 4. <i>Brugmansia insignis</i> (Barb. Rodr.) R.E. Schult. and <i>Banisteriopsis caapi</i> (Spruce ex Griseb.) C.V. Morton 5. <i>Cestrum laevigatum</i> Schltld. (dama-da-noche) 6. <i>Chelonanthus alatus</i> (Aubl.) Pulle 7. <i>Elizabetha princeps</i> Schomburgk ex Benth. 8. <i>Erythrina glauca</i> Willd. 9. <i>Helicostylis tomentosa</i> (Poepp. & Endl.) Rusby (takini) 10. <i>Justicia pectoralis</i> Jacq. 11. <i>Justicia pectoralis</i> Jacq. var. <i>stenophylla</i> Leonard (mashi-hiri) 12. <i>Licania humilis</i> Cham. & Schltld. (akukuti) 13. <i>Maquira calophylla</i> (Poepp. & Endl.) C.C. Berg. 14. <i>Maquira sclerophylla</i> (Ducke) C.C. Berg (rapé-dos-índios) 15. <i>Mimosa hostilis</i> (Mart.) Benth. (maconha-brava, wild marihuana, jurema, yurema) 16. <i>Nicotiana tabacum</i> L.

		<p>17. <i>Ocotea aciphylla</i> (Nees) Mez (airipana) 18. <i>Psychotria viridis</i> Ruiz & Pav. (yajé) 19. <i>Tetrapteris methystica</i> (caapí-pinima) 20. <i>Theobroma subincanum</i> Martius in Buchner 21. <i>Trichilia tocacheana</i> C. DC. 22. <i>Viola calophylla</i> (Spruce) Warb. (yakee, paricá, epená, nyakwana) 23. <i>Viola calophylloidea</i> Markgr. (yakee, paricá, epená, nyakwana) 24. <i>Viola elongata</i> (Benth.) Warb. 25. <i>Viola theiodora</i> (Spruce ex Benth.) Warb. (yakee, paricá, epená, nyakwana)</p>
category	Uses (4)	Species (10)
Anxiolytics	To calm the nerves; To calm; Childish indisposition; Nervousness child's cry.	<p>1. <i>Baccharis uncinella</i> DC.(vassoura-do-campo) 2. <i>Cymbopogon citratus</i> (DC.) Stapf (capim-santo) 3. <i>Henriettea granulata</i> O. Berg & Triana (pöra) 4. <i>Lippia alba</i> (Mill.) N.E. Br (cidreira) 5. <i>Melissa officinalis</i> L. (erva-cidreira) 6. <i>Miconia holosericea</i> (L.) DC (pöra-imö) 7. <i>Miconia rubiginosa</i> (Bonpl.) DC. (pöra-imö) 8. <i>Passiflora edulis</i> Sims. (maracujá) 9. <i>Tabernaemontana sananho</i> Ruiz & Pav. 10. <i>Tococa formicaria</i> Mart.</p>
category	Uses (4)	Species (8)

Head illnesses	Madness; Stimulant for the growth of the breasts; Antidote of the <i>Dioclea</i> species; Antidote against curare.	<ol style="list-style-type: none"> 1. <i>Anacardium giganteum</i> W. Hancock ex Engl. (oroi) 2. <i>Chondrodendron tomentosum</i> Ruiz & Pav. 3. <i>Clitoria guianensis</i> (Aubl.) Benth. (yawi arokö) 4. <i>Dichorisandra affinis</i> Mart. (püreu-imö) 5. <i>Myrcia multiflora</i> (Lam.) DC. (nono atü) 6. <i>Pterocarpus michelii</i> Britton (iruluma-iriki) 7. <i>Spondias lutea</i> L. (mope) 8. <i>Tachigalia paniculata</i> Aubl.
category	Uses (4)	Species (7)
Sedatives	Elderly who find difficult to sleep; Induce sleep; Insomnia; Sedative.	<ol style="list-style-type: none"> 1. <i>Brugmansia insignis</i> (Barb. Rodr.) R.E. Schult. 2. <i>Lactuca sativa</i> L. (alface) 3. <i>Marcgraviastrum elegans</i> de Roon (no-tê-wê-tá) 4. <i>Mimosa pudica</i> L. (cipó-dorme-dorme) 5. <i>Passiflora laurifolia</i> L. 6. <i>Pilocarpus pennatifolius</i> Lem. (ibirarta-iba) 7. <i>Urera lobulata</i> Urb. & Ekman (guaxima)
category	Uses (1)	Species (6)
Antidepressants and/or Stimulants	Stimulant.	<ol style="list-style-type: none"> 1. <i>Aniba canelilla</i> (Kunth) Mez 2. <i>Boerhavia coccinea</i> Mill. (pega-pinto) 3. <i>Brosimum acutifolium</i> Huber (inharé) 4. <i>Erythroxylum coca</i> L. var. Ipadu (botô) 5. <i>Paullinia cupana</i> Kunth 6. <i>Tachigalia paniculata</i> Aubl.
category	Uses (2)	Species (2)
Memory enhancers	Improve memory; Old people who are forgetful.	<ol style="list-style-type: none"> 1. <i>Ficus anthelmintica</i> Mart. 2. <i>Tabernaemontana heterophylla</i> Vahl

Source: *apud* Rodrigues *et al*¹¹