

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

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

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Abstract

Objective: In spite of the richness of the Brazilian biodiversity, no phytomedicines have been developed from this flora with the purpose of being used in psychiatric treatments. The objective of the present study was to document the use of plants with possible psychoactive effects in rituals performed by the Krahô Indians, who live in the cerrado savannahs biome in the central region of Brazil. Also, the present data were compared with the data obtained during a review of the literature on the use of psychoactive plants by 25 Brazilian indigenous groups. **Method:** The study was carried out during two years of fieldwork during which anthropological and botanical methods were employed. **Results:** Seven local shamans were interviewed and they indicated 98 formulas, consisting of 45 plant species that appear to have psychoactive properties and were used in 25 different treatments. Some of the psychoactive properties were "prevention of madness", "stimulant effect", "tranquilizing effect", "prevention of tremors", "longer sleeping period", "open mind" and "induction of sleep". This article also describes the review of literature, which recorded 58 plants that may have psychoactive effects used by 25 Brazilian Indian cultures. **Conclusion:** The treatment of psychological/psychiatric disorders based on the plants used by the Krahô Indians is very rich. It is also observed among other Brazilian indigenous groups. Future phytochemical and pharmacological studies on these plants may develop new medicines to treat psychiatric disorders.

Descriptors: Ethnopharmacology; Central nervous system; Psychotropic drugs; Plants, medicinal; Shamanism

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 é 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. **Método:** 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.

Descritores: Etnofarmacologia; Sistema nervoso central; Psicotrópicos; Plantas medicinais; Xamanismo

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Introduction

The rich heritage from plants to medicine is well known through plants 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 so important that even nowadays they still are useful as therapeutic agents, nonetheless, nature was not as prodigious to yield of psychoactive phytomedicines. In spite of the richness of the many hallucinogenic plants,¹⁻⁴ which, however, are useless to treat mental illnesses, such as *Rauvolfia serpentina* (L.) Benth. ex Kurz, a breakthrough for the initial brain treatment and understanding of schizophrenia biochemical disturbances, no other great discovery has occurred yet. In fact, except for a few plants that seem to have either anxiolytic (*Piper methysticum* G. Forst. – kava-kava, and species belonging to *Passiflora* sp.), antidepressive (*Hypericum perforatum* L.) or stimulant properties (*Ephedra vulgaris* Willk.), there are not examples of plants with antimanic or antipsychotic properties so that they could be accepted as useful psychoactive medicines.

And this is a sad reality, as psychiatric treatments with synthetic drugs are far from being satisfactory. In fact, the available psychotherapeutic agents are not fully active against the symptoms of mental disease. They 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 start studying them. In fact, the contact of mankind with these plants may have probably occurred centuries ago, according to data obtained from ethnopharmacological studies. In Brazil and other South American countries the situation is not different. Thus, ethnopharmacological researches carried out among indigenous groups living in the Northwest of the Amazon region found out psychoactive plants,⁷ and specifically those for senile diseases,⁸ some of which were used for symptoms mimicking Alzheimer's disease. In Brazil, 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-being,⁹ – are more often used by indigenous groups and by the Brazilian African descendants, mostly during healing ceremonies, facilitating the communication with the spirits.¹⁰

The present study describes an ethnopharmacological research carried out among the Krahô Indians, concerning the plants with possible psychoactive effects in ritual contexts – both in the sense of curing mental pathologies and producing mental alterations. Also, the present data were compared with the data obtained during a review of literature on the use of psychoactive plants by 25 Brazilian indigenous groups.¹¹

Method

Five criteria were used to select the geographical area and the human group to be studied. These criteria are as follow and are presented according to the order of importance: 1) 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; 2) indigenous group, as these populations at least apparently have great knowledge on plants that may alter behavior; 3) practice of rituals associated with the use of medicinal plants; 4) “cures”

performed by “specialists” (shaman, healers, and so on) who were members of the indigenous population, and finally, 5) 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: Universidade de São Paulo; Universidade Federal de Santa Catarina and Mato Grosso; Non-Governmental Organizations 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 has maintained contact with the Krahô population for the last 20 years.

The fieldwork was undertaken by one of the authors (ER) from July 1999 to July 2001 by means of anthropological (ethnographical) and botanical methods.¹²⁻¹³ A total of ten 20-day long trips were taken to three Krahô villages. Prior consent according to Brazil's specific laws concerning Indians was obtained from legal representatives from the villages during meetings in each village in the beginning of fieldwork.

At first, while becoming acquainted with the area, informal interviews¹² were performed with 200 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. After being selected, the knowledge of these seven *wajacas* about the diagnosis and healing methods, and their beliefs, were obtained through dozens of interviews and participant observations, which were carried out during daily activities such as fishing, hunting and fruit harvesting. Personal and ethnopharmacological knowledge aspects of the interviewees were obtained by means of questionnaires with open questions in semi-structured interviews,¹³ 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). In addition, all details of Krahô daily living habits were recorded in a notebook of “field notes”, in order to avoid missing important items. Such records were useful for the future interpretation of what was said by the interviewees in contrast with what was directly observed by the interviewer.

During different field trips, the same interviewees were repeatedly asked 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. Such information was used to select the plants and their medicinal formulas with possible CNS activity, which is the focus of this study.

It was also 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 Indians and those of conventional medicine. This translation provided 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.

This project has been approved by the UNIFESP's Research Ethics Committee (n° 056/00).

Results and discussion

We decided not to publish the scientific names of the plants indicated in this research. However, they are mentioned 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, with the purpose of guaranteeing the rights of the ethnic groups in case of a possible patent.¹⁴⁻¹⁶ It is certain that the Krahô Indians deserve to obtain adequate compensations for their knowledge, as they 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 *māputréhô*, for which a special pipe called a *côt* is used. The act of smoking makes it easier to communicate with the *pahi* (spiritual guides, generally represented by the spirits of animals, plants, objects or even the deceased) or provide more power at the moment of the healing, according to the interviewees. The exhaled smoke is blown on the patient in order to "spread out the illness", facilitating its diagnosis, or, even, to "gather" the illness, which was spread throughout the body of the patient, in 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 sick person as proof of the cure. The act of materializing the illness, mentioned above, is also observed among other Brazilian indigenous nations, like the Bakairi (observed during fieldwork by the author ER) and also African societies, such as the Azande.¹⁷

In the second part of the healing process, after the ceremony, the *wajaca* chooses one plant to be used in the treatment and returns for several times during the next hours and days to the patient's home to follow up on the effects of the medicine administered.

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

The seven shamans indicated 98 formulas, consisting of 45 plant species that had 25 uses apparently related to psychoactive properties. Those 25 uses were grouped into 7 categories according to the similarities among their expected effects, as shown 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 knowledge on the doses required (which are different for adults and children), and on the indications

Table 1 - The 25 uses of 45 identified plant species by the Brazilian Krahô *wajacas* with possible psychoactive effects, grouped into 7 categories

Uses related to possible psychoactive effect (no. of plants mentioned)*	Category	Number of formulas (per category)
1- "to modifying mind" (16) 2- "to talk to pahis (spirits)" (4) 3- "smoking substituted by tobacco" (1) 4- "to get slow" (2)	1- Hallucinogens	28
5- "to prevent going crazy" (1) 6- "illnesses of the karô (soul)" (5) 7- "for tremors" (1) 8- "craziness" (8) 9- "anxiety" (2) 10- "to calm" (12)	2- Head illnesses	16
11- "to stop snoring" (2) 12- "to sleep longer" (1) 13- "to have premonition dreams" (1) 14- "to sleep more lightly" (1) 15- "to have good dreams" (1) 16- "to induce sleep" (5) 17- "to help thinking" (5)	3- Anxiolytics	15
18- "to rest the head" (1) 19- "to have an open mind" (1) 20- "to clear one's thoughts" (1) 21- "for being happy" (6)	4- Sleep disorders	12
22- "to remove sadness from the body" (1) 23- "stimulant" (3) 24- "to enhance memory" (5)	5- Thought modifiers	11
25- "to remember dreams" (1)	6- Antidepressants and/or Stimulants	10
25 uses (87 citations of plants)	7 categories	98 formulas

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

and counterindications (generally for children, elderly and pregnant women) 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 similar to the principles of pharmacovigilance.¹⁸

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

1) **Hallucinogens** (23 plants): Sixteen plants were mentioned as "mind modifiers" substituting for marijuana (referred to as *iamhô*) in therapeutic and social contexts. Based on reports, they are dangerous plants, as they have longer half-lives than marijuana, and their abuse could result in mental disturbances. During the healing ritual, they are very often used for diagnosis and healing.

2) **Head illnesses** (15 plants): According to the beliefs of the Krahô Indians, 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 their 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 a person diagnosed as schizophrenic or suffering from other psychotic diseases. Eight plants were indicated for "craziness", which are generally used as tea over a long period of time (several months) together with rituals. *Wajacas* are known to have many powers to reverse the crises that affect these patients, as there have been reports of such success. However, the Krahô Indians believed that this type of illness originates from white people, and therefore, only a white person can cure those suffering from it. Many interviewees explained that some Krahô Indians could not mix marijuana and alcoholic beverages, otherwise it could cause madness in them.

3) **Anxiolytics** (14 plants): Some plants may be ingested in the form of tea "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."

4) **Sleep disorders** (11 plants): The possible oneirogenic effect – the production or the increase of nature divinatory dreams – attributed to a mushroom by Krahô Indians is interesting mainly because its use occurs when the *wajaca* is unable to diagnose the disease. Mayagoitia et al. 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.¹⁹

5) **Antidepressants and/or Stimulants** (10 plants): The plants can be used as tea or also to paint the body with the same purpose. Some plants have been substituted by the introduction of coffee. The Krahô Indians did not demonstrate knowledge concerning depression, therefore, some of the plants indicated as stimulants could be antidepressives, once this culture does not recognize the second effect. Moreover, the observation that these plants are not related to appetite loss, not being amphetamines,²⁰ reinforces such supposition.

Finally, in a recent review article concerning the ethnopharmacological researches carried out among 25 Brazilian Indian cultures (Figure 1), 58 plants with potential psychoactive effects were described, many of them being already studied by science.¹¹ 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 shown in Table 2. While the Krahô Indians 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 verified that the plant potential described during the study developed among Krahô Indians is higher than the plant potential described by the other 25 Indian cultures.

One of the reasons for this difference may be the fact that not all the data obtained during ethnopharmacological researches are published, moreover some of the studies focus on the hallucinogens used among Indians who live in Amazon forest.

The data obtained in the ethnopharmacological study carried out among the Krahô Indians, as well as those from the review

of the literature concerning the Brazilian indigenous knowledge about medicinal plants with possible psychoactive effects, reveal positive expectations for the future development of new medicines to be used in the psychiatric treatment. Only a common effort of pharmacology and phytochemistry will turn these expectations into reality.

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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	7	25
Additives to some plants (<i>Anadenanthera peregrina</i> , <i>Viola theiodora</i> and other <i>Violas</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> Schldl. (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. & Schldl. (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. 17. <i>Ocotea aciphylla</i> (Nees) Mez (airipana) 18. <i>Psychotria viridis</i> Ruiz & Pav. (yajé) 19. <i>Tetrapteris methystica</i> (caapi-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)
Anxiolytics	4	10
To calm the nerves To calm Childish indisposition Nervousness child's cry		<ol style="list-style-type: none"> 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 (póra) 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 (póra-imô) 7. <i>Miconia rubiginosa</i> (Bonpl.) DC. (póra-imô) 8. <i>Passiflora edulis</i> Sims. (maracujá) 9. <i>Tabernaemontana sananho</i> Ruiz & Pav. 10. <i>Tococa formicaria</i> Mart.
Head illnesses	4	8
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. (oroí) 2. <i>Chondrodendron tomentosum</i> Ruiz & Pav. 3. <i>Clitoria guianensis</i> (Aubl.) Benth. (yawi arokô) 4. <i>Dichorisandra affinis</i> Mart. (püreu-imô) 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.
Sedatives	4	7
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-té-wé-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)
Antidepressants and/or Stimulants	1	6
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. <i>lpadu</i> (botó) 5. <i>Paullinia cupana</i> Kunth 6. <i>Tachigalia paniculata</i> Aubl.
Memory enhancers	2	2
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