

# **THE IMPORTANCE OF ETHNOBOTANY IN ENVIRONMENTAL CONSERVATION**

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**RESUMEN:** Uno de los más importantes aspectos de la educación medioambiental es la conservación etnobotánica. Los miembros de las sociedades primitivas, desde los primeros tiempos de existencia humana, han tenido que depender de la vegetación de su entorno para sobrevivir. Durante muchos milenios, a través de la curiosidad y la experimentación, han adquirido un extraordinario conocimiento sobre las propiedades y usos de sus plantas. Hoy en día este conocimiento puede ser de vital importancia para la humanidad, incluyendo las naciones agroindustriales avanzadas que usualmente han estado aisladas de las floras del mundo. Esta íntima relación con las plantas ha sido transmitida de forma oral de padres a hijos. Lamentablemente se está perdiendo rápidamente con la improductiva aculturación y "occidentalización" de las sociedades primitivas o incluso la extinción de muchos pueblos indígenas. La creciente construcción de carreteras, embalses, la actividad comercial, de las misiones, las guerras, el turismo y otros aspectos de la vida moderna, está provocando la rápida desaparición de este valioso conocimiento, a menudo en sólo una generación. Esto es particularmente evidente en el uso que los nativos hacen de las plantas medicinales: cuando las medicinas modernas, efectivas y fáciles de usar, están al alcance, se produce una completa aceptación de los remedios occidentales. Además, la íntima familiaridad con la diversidad biológica de las plantas -un valioso elemento de riqueza botánica entre muchos pueblos indígenas y de gran valor para la ciencia- está condenada a la extinción. Existen probablemente medio millón de especies vegetales en el mundo. Muchas regiones, especialmente en las áreas del bosque tropical, son increíblemente ricas: el Amazonas, por ejemplo, cuenta con unas 80,000 especies. El conocimiento de las propiedades de estas plantas está desapareciendo antes incluso de que muchos de los árboles que se están sacrificando sean nombrados o científicamente estudiados. Ha llegado la hora de salvar lo que queda de este conocimiento antes de que sea para siempre enterrado con la cultura que lo vio nacer. Su Alteza Real, el Príncipe Felipe, lo ha expresado claramente: "Los bosques tropicales y sus habitantes están sometidos a una presión muy severa motivada por la intrusión del hombre, y es tristemente inevitable que muchas de estas valiosas especies vegetales y las tribus que conocen su uso, están desapareciendo rápidamente para siempre". La conservación etnobotánica debe situarse en lugar preferente de las prioridades conservacionistas. Incrementar esta actividad, entrenar más etnobotánicos capaces de salvar el máximo patrimonio posible y proporcionar apoyo financiero para los estudios de campo deben ser las principales directrices a seguir en el campo de la conservación en las próximas dos o tres décadas. Pronto será demasiado tarde.

**PALABRAS CLAVE:** Conservación, etnobotánica, biodiversidad.

**SUMMARY:** One of the most important aspects of environmental conservation is ethnobotanical conservation. People in primitive societies, from earliest times of human existence, have had to depend on their ambient vegetation for survival. For many millennia, they have by curiosity and experimentation become extraordinarily knowledgeable about the properties and uses of their plants. It can be vitally important to all of mankind today, including those living in advanced agro-industrial nations who have usually become isolated from the world's floras. This intimate acquaintance with plants has been orally passed down from father to son. It is rapidly being lost with the unyielding acculturation and "westernization" of primitives societies or even the extinction of many aboriginal peoples. With increased road-building, dam construction, commercial activity, growing missionary penetration, wars, tourism and other aspects of modern existence this precious knowledge is fast disappearing, often in a single generation. This is particularly evident in the natives use of medicinal plants: when modern medicines, effective and easy to use, become available, complete acceptance of western remedies occurs.

intimate familiarity with the biological diversity of plants -a valuable adjunct of botanical wealth among many indigenous peoples and of great value to science- is doomed to extinction. There are perhaps half a million species of plants in the world. Many regions, especially in rain forest areas, are incredibly rich: the Amazon, for example, has an estimated 80,000 species. Knowledge of the properties of these plants is disappearing faster even than many of the trees which are being sacrificed often before they can be named or scientifically studied. The time has come to salvage what is left of this knowledge before it is forever entombed with the culture that gave it birth. His Royal Highness, Prince Philip, has expressed it succinctly: "The tropical forests and their traditional inhabitants are under very severe pressure from human encroachment, and it is sadly inevitable that many of these valuable plant species and the tribes which understand their use, are rapidly disappearing forever". Ethnobotanical conservation must be placed near the top of conservational priorities. Every effort to increase its activity, to train more ethnobotanists capable of saving as much of this heritage as possible, to supply financial support of field studies must be the guiding goals of conservation efforts in the next two or three decades. It will soon be too late.

KEY WORDS: Conservation, ethnobotany, biodiversity.

There are numerous definitions of ethnobotany. The widely employed and simplest definition explains it as the study of the knowledge and use of plants in primitive societies in the past and present.

In view of the many fast-developing specific subdivisions of this interdisciplinary field—archaeoethnobotany, ethnopharmacology, ethnoecology, ethnomycology and many others—it seems necessary to adopt a wider definition. A more inclusive definition might be the following: the study of the uses, technological manipulation, classification, agricultural systems, magico-religious concepts, conservation techniques and general sociological importance of plants in primitive or pre-literate societies.

Ethnobotany is certainly not new. The earliest humans must have been incipient ethnobotanists. It began when man first, of necessity, classified plants: those of little or no utility; those which were useful in many practical ways; those alleviating pain or otherwise ameliorating illness; and those that made him ill or killed him outright. He must have wondered at the unworldly effects of the few psychoactive or hallucinogenic species, and he could explain their extraordinary properties only by assuming that they were endowed with spiritual power from supernatural sources. It has even been proposed that man's early experience with hallucinogens

was a principal factor leading to the origin of religious concepts.

It was not long before the knowledge and manipulation of the properties of plants became associated mainly with certain individuals, and the early medicine man or shamans ultimately acquired great powers, an endowment that continues to-day in most, if not all, primitive societies where this specialist is the repository of vast knowledge of plants and their properties and is secret to the superstitious rituals connected with their use. However, many members of the general population in primitive societies are likewise conversant with the properties of their food, medicinal and other plants of daily use. Many indigenous groups around the world -the Indians of the Amazonian regions, for example- are literally masters of their ambient vegetation as a result of inherited knowledge.

As a consequence of the Indian familiarity with the properties of the plants with which he lives there are, at least in the northwest Amazonia, two systems of medicine: that of the medicine man or *payé* including the use of hallucinogens which, he believes, are sacred, allowing him through visions to communicate with the spiritual realms from which all illness, misfortunes and death are presumed to come; and, failing a diagnosis through this medium, he has recourse to the prescribing of medicinal plants, of which he usually has a vast

knowledge. The other system of medicine is that based wholly on the familiarity in the general population of medicinal plants and their properties, knowledge amassed by experimentation over many millennia and passed on orally from generation to generation.

This knowledge —of great potential value to humanity as a whole— seems unfortunately to be doomed to extinction with the rapid acculturation and westernisation in many parts of the globe where indigenous peoples can still live peacefully without disruption from road-construction, airstrips, missionary pressure, warfare, tourism, industrial penetration, dam-building, local greed on the part of settlers or various governmental efforts to "civilise" the natives. The loss of this knowledge and of the natives themselves will be a grave hindrance to progress in many aspects of environmental conservation. Realisation of the seriousness of this impending loss has given rise in recent years to the urgent need for ethnobotanical conservation.

Examples of the value to conservation of ethnobotanical knowledge of the natives are evident in the natives' acquaintance with the properties of bioactive plants and in recognition of their numerous subspecific variants or ecotypes. Although techniques of ethnobotanical research will differ according to the kind and condition of culture of the aboriginal people and the type of ecology in which they live, there seems to exist an underlying similarity in the relationship of ethnobotany to environmental conservation. I shall use examples from my own work in the past 47 years in the Colombian Amazonia, since this relationship is clearly manifest in my studies of the medicinal, toxic and rubber-yielding plants of this northwestern corner of the great Amazon Valley.

The Amazon basin supports the world's largest rain forest.—2.700.000 square miles, with an estimated 50.000 to 80.000 species of higher plants probably 15% of the world's flora. The number of species and their diversity increases

towards the westernmost part of the hylaea. The Colombian sector, protected from easy penetration because of rapids and waterfalls in most of its rivers, has not suffered the extensive acculturation and wanton environmental devastation that many other parts of the basin have had and are experiencing. Furthermore, the Colombian government have wise and stringent programmes directed towards environmental and cultural conservation. The 70.000 Indians in 50 ethnic groups in the Colombian Amazonia speak a mosaic of languages classified into more than 12 linguistic families. Their knowledge and use of medicinal and toxic plants is outstanding; during my field work since 1941, I have identified 1.553 species in 596 genera in 145 plant families employed as medicines or poisons; and I am certain that I missed many.

Only a minute fraction of these 1.550 species have ever been chemically studied. In fact, an outstanding Brazilian chemist has stated that fewer than 10% of the plants of the Brazilian Amazon have even superficially been analysed for active compounds.

If phytochemists must procure sufficient material for a thorough analysis of 80.000 species from such remote areas of difficult transportation the task —obvious a random sampling— will undoubtedly never be finished. Ethnobotany can help. Concentrating on those plants which the natives have by long experimentation found to be bioactive and which they have bent to medicinal use would be a kind of "short cut": for if a plant has any physiological effect when ingested or otherwise applied to the human body, it means that it has at least one active chemical compound. We should know what the active compounds are: they very possibly may not be useful in our society; they perhaps could be employed for a completely different purpose; or they might, on rare occasions, be valuable for the same purpose. There are two excellent examples: the principal source of curare, *Chondrodendron tomentosum*, is used to prepare one of the numerous arrow poisons to kill animals, but an extract of this plant is the

source of tubocurarine, a valuable adjunct of our own modern pharmacology as a muscle relaxant before deep surgery. The other good example is rotenone, a complex ketone from species of *Lonchocarpus*, an easily degradable pesticide that can be spread over hundreds of acres of cultivated land but which several days after doing its pesticidal work.

I recently examined the issues of five chemical journals of the past five years and counted 210 alkaloids new to science from Amazonian plants. This figure indicates what a wealth of new chemicals lie hidden and waiting for discovery - especially when alkaloids are only one of many types of secondary organic compounds found in plants.

A major contribution that ethnobotanical research offers concerns biodiversity. Many, if not most plants, have local variants or ecotypes. Botanists seeking diversity find it advantageous to utilise the perspicacity of the Indians in recognising slight, often hidden, differences in these variants. Several examples of cultivated plants may be cited, although the same criteria may be cited for wild species.

The peach palm —*Guilielma speciosa*— produces highly nutritious fruit. Unknown in the wild, it is widely cultivated throughout tropical America. Recently, a programme of germplasm collection disclosed an extraordinary range of diversity. In one region of the Colombian Amazonia, for example, Tanimuka and Yukuna Indians of the Río Piraparaná cultivate clones with unusually large and seedless fruits and with the trunks lacking the normal stout spines, thus making harvesting much easier. The great value of these clones of the Indians must be obvious and extremely valuable to genetic programmes. Yet these clones have not yet been collected and employed in scientific programmes, perhaps because of the inaccessibility of the Río Piraparaná.

The pineapple (*Ananas comosus*) is another example. The Witotos of the Colombian

Amazonia cultivate and have names for more than 12 clones with fruits of varying sizes but with exceedingly tender and sweet flesh. I have never tasted such delicious pineapples, even in Hawaii. The pineapple-growing industry might well make collections of this unusual biodiversity in the Río Igarapará.

In 1876, the British domesticated *Hevea brasiliensis*, the world's principal source of natural rubber. Prior to this domestication, the world's supply came from wild trees in the Amazon forests produced by native labour—often slave labour—of defenseless Amazon Indians. The first seeds introduced into plantations yielded 450 lbs. of dry rubber per acre per year; there are now clones yielding more than 3,000 lbs. per acre per year. Most of the extraordinary improvement in yield has been made in these 115 years on clonal material in plantation.

There are many local ecotypes of *Hevea brasiliensis* in the wild, some of which are, in many characters, superior to the eastern ecotype which was domesticated. Ethnobotanical knowledge from native rubber tappers has been of extreme value to botanists seeking biodiversity for genetic programmes now under way in the rubber plantation institutes.

There are nine other species of *Hevea*, each with its different type of latex. Modern programmes of hybridisation might well utilise some of the subspecific variants of these other species. The expanding plastics industry, for example often needs what they call "fillers" new types of latexes to mix with new synthetic plastics to alter their physical characteristics.

There are real enigmas which botanists cannot easily explain in the Indian recognition of "kinds" or "strains" of wild species which offer no morphological or otherwise tangible differences but which are well established and named in the native classifications.

And this skill on the part of the aborigines is manifest not only in their useful and

cultivated species but also in wild plants, even many which are devoid of utilitarian significance. Two examples —yoco and yajé— will illustrate this extraordinary native ability to distinguish what we may call "hidden" diversity in wild plant species.

Yoco (*Paullinia yoco*) is a large, sapindaceous forest liana of the westernmost Amazonas of Colombia and Ecuador. Numerous tribes use a drink prepared from its bark as a strong stimulant. It has a high content of caffeine: 3% caffeine. A gourdful of the drink is taken upon rising in the early morning, and no food is eaten until 10 or 11 o'clock. The stimulant effect is rapidly felt. Pieces of the liana may be taken on fishing or hunting trips instead of food.

There are at least 14 different named variants of the yoco plant. The most common are called yoco blanco ("white yoco") and yoco colorado ("reddish yoco"), but some of the others are yoco del tigre ("wild cat yoco"), yoco del brujo ("medicine man yoco"), yoco del yajé ("yajé yoco"). The natives can, with no hesitation, name a liana at a distance without cutting, feeling, smelling or tasting the bark, without looking at the leaves which are usually high in the tree tops; several variants growing nearby show that the differences cannot be ascribed to soil or other ecological factors, such as shade or sunlight; age or size of the trunks of the liana seem not to be an element. I have tested the perspicacity of the Indians from different tribes and have rarely found them hesitant, doubtful or in error. And natives living at appreciable distances from one another will identify these many minor variants with amazing consistency.

The forest liana *Banisteriopsis Caapi* of the Malpighiaceae, source of a potent hallucinogen widely employed in the western Amazonia in native ceremonies, is a drink prepared from the bark

The hallucinogen is known as yajé, caapi or ayahuasca. The name ayahuasca translated, means "vine of the soul." These natives consider

inebriation to be a sacred condition, during which the soul leaves the body and, when the effects of inebriation wear off, the soul has returned to the body from its travels to visit the supernatural realms.

The plant is often cultivated in medicine men's garden, but the enormous liana growing wild is considered to be stronger in its effects and is preferred.

Little was known of the source of this important hallucinogen, until Richard Spruce, the famous British plant explorer of the Amazon and Andes during the last century identified its source with voucher specimens in 1853.

We have a list of some 30 epithets designating the recognised variants of this plant known to the Indians by name. Each name indicates a special ecotype of the liana, most of which the natives can identify at a distance, but with no morphological differences that a botanist might use for subspecific or ecotypical determination. Some studies of this peculiar aboriginal ability have been offered, but no satisfactory explanation seems to be acceptable.

What is even more significant from the viewpoint of biodiversity is their ability to use these "kinds" of the liana to prepare drinks of different strengths or in connection with the varieties of ceremonies, dances or magico-religious needs or for whatever animal the partaker wishes to kill in the hunt.

There is a further and much better example of Indian perspicacity of plant diversity in connection with the use of hallucinogens. The drink prepared from *Banisteriopsis Caapi* alone is certainly psychoactive without additives, as the plant contains beta-carboline alkaloids, especially harmine, harmaline and tetrahydroharmine, it induces visual hallucinogens usually in dull colours blues, greys, purples. Many other plants may frequently be added to the drink to increase the bioactivity, lengthen the intoxication or for other purposes. There are two most often employed as additives: the leaves of *Diplopterys*

*Cabrerana*, locally known as oco-yajé or chagropanga and those of *Psychotria viridis*, called chacruna; the former belongs to a malpighaceous genus allied to *Banisteriopsis*; the second is a member of the Rubiaceae. Each of these two additives contain another type of bioactive alkaloids, the tryptamines. Tryptamines are bioactive only when ingested with a monoamine oxidase inhibitor. The bark of the main ingredient *Banisteriopsis Caapi*, has in its beta-carboline alkaloid content the needed monoamine oxidase inhibitor!

How did these natives with not even minute knowledge of plant chemicals find in 80.000 species these two additives which are able to exert this interesting biochemical reaction?

Perhaps these few examples of the intensely detailed indigenous familiarity with the extremely complex individuality of species in one of the world's richest floras may serve to encourage the use of Indian help in searching out the often hidden biodiversities from the forests. Biological diversity of subspecific categories are often not easy for specialists, even trained botanists, to discern. Ethnobotanists, taxonomists, geneticists, agronomists and others would do well to utilise this native familiarity and knowledge before it is forever lost.

Before I finish, I would like to make two pleas, both of which can directly concern ethnobotanists, particularly this group of ethnobotanists from all around the world.

The first plea is to exert our influence and pressure to train more young people in the numerous aspects of our discipline. This effort includes attempting to convince granting agencies private and governmental-pharmaceutical companies, international organisations, academies and individual to increase grants for educational training and practical field work. The need for more dedicated ethnobotanists is urgent in view of the rapidity of extinction of the precious knowledge of plant uses in aboriginal societies in many parts of the world.

The second plea concerns the ethnobotanists' duty to exert influence to correct wanton commercial and other exploitation of defenseless indigenous peoples.

We know how much natives have suffered in former periods, and we often blithely believe that those conditions have disappeared. Nothing could be more erroneous. In a number of local areas in the Amazonia, Indians are still being deprived of their land, working under near slavery conditions, subjected to introduce diseases, having their sources of water poisoned by mercury from gold mining and killing the people themselves and their sources of fish, and a number of other abuses.

It brings to my mind the powerful words of Theodor Koch-Grünberg, the German anthropologist who spent a number of years amongst the Indians of the northwest Amazon in Colombia and Brazil early in this century. Always on a friendly terms with the Indians, he was an unpretentious gentleman, a scholar of patience and understanding and an environmental conservationist long before the need to conserve natural resources was widely recognised. He respected the natives and their culture and knowledge and was quick to condemn mistreatment of these, his friends. On a return visit to the Vaupés he wrote, in 1910, the following words, extremely powerful in the original German but losing much of their vituperative character in my translation into English:

"Hardly five years have gone by since my last visit .... Whoever comes here now will no longer find the pleasant place I once knew. The pestilential stench of pseudocivilisation has fallen on the brown people who have no rights. Like a swarm on annihilating grasshoppers, the inhuman gang of rubber barons continues press forward. The Colombians already have settled in at the mouth of the Kuduyari and carry off my friends to the death-dealing rubber forests. Raw brutality, mistreatment and murder are the order of the day. On the lower Caiary, the Brazilians are no better. The Indian villages are

desolate, their homes have been reduced to ashes and their garden plots, deprived of hands to care for them, are taken over by the jungle.

Thus a vigorous race, a people endowed with a magnificent gift of bright intellect and gentle disposition will be reduced to naught. Human material capable of development will be annihilated by the brutality of these modern barbarians of culture."

We can learn a lesson for to-day from the words of Koch-Grünberg, written 80 years ago; and, as anthropologists, botanists and ethnobotanists we should be willing to come to the defense of our defenseless Amazonian natives of to-day.

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