THE ETHNOBOTANY OF BRUGMANSIA

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In 1973, Dr. Tommie Earl Lockwood presented a thesis to the Department of Biology of Harvard University in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the subject of Biology. This thesis, embodying some five years of graduate studies, including very extensive field work, was entitled A Taxonomic Revision of Brugmansia (Solanaceae). Done under the direction of Professor Richard Evans Schultes, it represents the first comprehensive and inclusive study of the biology of the solanaceous species which have usually been considered as belonging to a section or subgenus of Datura. In addition to many other biological and nomenclatural considerations, Dr. Lockwood offered convincing experimental and morphological evidence for the maintenance of Brugmansia as a genus distinct from Datura. Since all of the species are arborescent, they have frequently been referred to as the “tree Daturas”. All of the species are native to South America, although several are now widely cultivated in warm areas around the world as ornamentals because of their striking beauty.

Upon receiving his Ph.D. degree, Dr. Lockwood was named Assistant Professor of Botany and Director of the University’s herbarium in the University of Illinois at Urbana, Illinois. In 1975, while leading a botanical collecting trip with his students in Mexico, he was killed in an automobile accident. Professor Lockwood’s thesis will, it is hoped, be published in its entirety as a book. We are here offering one chapter — “Ethnobotany” — because it represents undoubtedly the most thorough and authoritative discussion available on the aboriginal uses of this group of psychoactive plants which have been and are of extreme importance in the medical, religious and magical practices of many indigenous peoples of South America.

We are deeply indebted to Mr. and Mrs. Vergil Lockwood of Proctor, Oklahoma, parents of the late Professor Lockwood, for their gracious permission to publish this section of the thesis.

In presenting for publication this portion of Professor Lockwood’s thesis, we, his former teacher and a close friend and colleague, call attention to notes on the personality and work of this promising young scientist published in Economic Botany, 29 (1975) 4 - 5.

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and

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The presence of the alkaloids atropine, hyoscyamine, and particularly the high concentration of hyoscine (scopolamine), which is highly psychoactive, accounts for the widespread medicinal and psychotropic use of Brugmansia and Datura among the American Indians. The proto-Indian Mongoloids who entered the New World during the Late Paleolithic and Mesolithic were unspecialized hunters and gatherers with a shamanistic religion (La Barre, 1972). In addition to the normal experimentation with all types of plants that is inherent in food gathering, the ecstatic-visionary nature of shamanism would have induced the seeking out of plants with psychotropic properties, plants that contained “spirit power”. Datura and Nicotiana were probably among the first plants of this nature encountered by the early Indians, and their usage was widely adopted.

It is probable that a knowledge and use of Datura from Mexico and the southwest United States was taken by Indian immigrants into South America. The morphological similarities between the flowers of Datura and Brugmansia, in addition to their similar chemical properties, would have made the latter readily accepted when encountered in the southern continent.

Pre-Conquest usage of Brugmansia in South America has not been so well documented as for Datura spp. (Safford, 1922), peyote (Lophophora williamsii), or teonanactl (hallucinogenic mushrooms, primarily species of Panaceolus, Psilocybe and Stropharia) of Mexico and Meso-America. A considerable body of information, however, has survived from the writings of missionaries, travelers and the few lucky scientists such as Humboldt and Bonpland who were able to penetrate Spanish South America. The identity of the species involved in most of these accounts is difficult to ascertain, unless the color of the flowers and something of their ecology is mentioned. Even in more recent anthropological literature, all white-flowered species are listed simply as Brugmansia arborea (Fig. 1).

Although not so widespread in its usage as tobacco, Brugmansia was known to most of the Indian groups in western South America. Cooper (1949) states that all records of Brugmansia preparations are from the Andean and Pacific fringe of the Continent extending from Colombia to southern Peru and middle Chile. Specifically, he reports its use among the Chibcha and Chocó of Colombia; the Quechua of Ecuador, Peru and Bolivia; the Mapuche-Huilliche of Chile; the Záparo, Jívaro, Canelo and Inga of the upper Amazon; and the Siona, Pioje and Omagua of the Andean Montaña. Since Brugmansia suaveolens is widely used by the Indians of the upper Amazon, it seems probable that this was also true for its lower reaches and in southeastern Brazil; however, no early records make mention of its use (Fig. 2).

Brugmansia was and is to a lesser extent today valued for both its medicinal and psychotropic properties. It is sometimes difficult to separate these two properties in a shamanistic religion, where there is a characteristic emphasis on malevolent magic and the supernatural as causes of illness. Certain patterns in usage and preparation can be discerned, however, from the older literature and from more modern anthropological and ethnobotanical studies among extant and still viable unacculturated tribes.
In the Andes at elevations above 2000 m, where Brugmansia arborea, B. aurea, and B. sanguinea occur in large populations and readily set fruits, a narcotic drink was formerly made from ground Brugmansia seeds mixed with maize chicha (a fermented beer). Infusions prepared from macerated leaves and/or flowers in cold or warm water were also taken. The use of the fruit pericarp is known from only one report (Cordero, 1911). Humboldt and Bonpland (1900) gave an account of the use of a reddish flowered Brugmansia (B. sanguinea) in the preparation of a narcotic drink which was called tonga, taken by priests of the Temple of the Sun at Sogamoza (north of Bogotá, Colombia). This drink was considered by the Indians to be more potent if prepared from B. sanguinea rather than from the white-flowered B. aurea, which is also common in the area (Figs. 3(a) and (b)).
Brugmansia suaveolens

(H. & B. ex Willd.) Bercht. & Presl.

Fig. 2. Brugmansia suaveolens (H. and B. ex Willd.) Bercht. and Presl. (Drawn by Linda Bates.)

Brugmansia, mixed with chicha and infusions of tobacco, was also administered by the pre-Conquest Chibchas of Colombia to slaves and wives of dead kings and chiefs to induce a state of stupor before being buried alive with their masters and husbands (Castellanos, 1886-1887). Another use of tonga by the Chibchas was to “test slaves with the idea that if they wandered out while unconscious, they would sooner or later try to escape” (Kroeber, 1946). Kroeber also states that before reaching puberty, children were given Brugmansia and watched to see if the boys picked up tools or weapons and if girls picked up spindles or grinding manos. If so, it was believed that these children would develop into good workers. A review of the early references to tonga and other uses of the word have been given by Santesson and Wassén (1936).
The first recorded observations on the effects of tonga were given by Tschudi (1846) from Peru. The narcotic drink was prepared from *Brugmansia sanguinea* and was believed by the Indians to allow them to communicate with their ancestors. Because of this, the natives often called the plant *huaca*, meaning "grave" or "tomb" plant. Tschudi describes the Indian after taking the drug: "falling into a heavy stupor, his eyes vacantly fixed on the ground, his mouth convulsively closed and his nostrils dilated. In the course of a quarter of an hour, his eyes began to roll, foam issued from his mouth, and his whole body was agitated by frightful convulsions. After these violent symptoms had passed, a profound sleep followed for several hours' duration and when the subject had recovered, he related the particulars of his visit with his forefathers. He appeared very weak and exhausted." The name *huaca*
or *huacacacha* may also originate from the belief of some Peruvian Indians that taking the drug will reveal to them treasures preserved in ancient graves or *huacas*. A similar idea was held by the Indians of Darien and the Chocó, where a decoction was prepared from the seeds of *B. sanguinea* with maize *chicha* and given to children to produce a state of excitement in which they were supposed to possess the power of discovering gold (Seemann, 1853).

Although many uses of *Brugmansia* were suppressed with the introduction of Christianity into South America, its use persisted with native curers and was little affected in the lowland tribes of the upper Amazon. It is from recent ethnobotanical and anthropological studies of the practices of modern shamanism and in some of the isolated and still viable tribes that some of our best information on the usage of *Brugmansia* has been obtained.

The ethnobotanical work of Bristol and his co-workers (Bristol, 1965, 1966, 1968, 1969; Bristol et al., 1969) among the Kamsá speaking Sibundoy and Inga speaking Santiagueño Indians in the Sibundoy Valley of southern Colombia has provided fresh insight into the native uses of *Brugmansia* as
well as ways in which man has practiced artificial selection to develop cultivars in one species of the genus. As Bristol, Schultes (1955, 1963a, b, 1969a, b, 1970a, b), Schultes and Hofmann (1973) and Uscátegui (1959) have noted, Brugmansias are more commonly grown and utilized in the Sibundoy Valley than anywhere else in South America (Fig. 4). The Indians of the Valley, and particularly the shamans, possess a highly sophisticated knowledge of drug usage (Fig. 5).

Two species of Brugmansia are grown in the Sibundoy Valley—Brugmansia sanguinea and B. aurea (Figs. 6(a) and (b)). The latter is by far the more common and is seen everywhere in fence rows, along drainage ditches, and in gardens. The striking feature of this species in the Sibundoy, however, is that at least nine cultivars have evolved in or near the Valley and to which
the Indians have given special names and reputed medicinal attributes. These cultivars were first discovered by Hernando García-Barriga in 1935.

The peculiar characters of the *Brugmansia aurea* cultivars in Sibundoy have resulted from artificial selection of mutations whose induction may possibly be related to virus infection. One of these cultivars, ‘Culebra’, was named by Schultes (1955) as a new genus in the Solanaceae — *Methysticodendron Amesianum* (Figs. 3(b), 6(b)). In all the Sibundoy cultivars, selection has been for leaf size, shape and color rather than for floral characters, since it is the leaf that is used in drug preparation (Fig. 7). In ‘Buyés’, which is the most common cultivar, the leaf shape and size are normal for the species. In cultivars such as ‘Munchira’ (Fig. 8), ‘Salamán’, ‘Quinde’ and ‘Culebra’, however, the leaf shapes depart radically from the normal. The leaves of the first three are deformed and/or very small; those of ‘Culebra’ are narrowly linear-ligulate, very long (20 - 26 cm), and with an undulate margin.
Although some of the cultivars, such as ‘Buyés’ and ‘Amarón’, are common throughout the Sibundoy Valley, others like ‘Culebra’, ‘Salamán’, ‘Ocre’, and ‘Munchira’ are rare and probably exist as single clones consisting of a small number of plants. These rarer cultivars are owned by and known only to the shaman. Propagation of all the cultivars is always by asexual means, usually by large stem cuttings.

According to Bristol (1969), the Brugmansias are used both for their medicinal and psychotropic properties by the Sibundoy. An investigation by Bristol et al. (1969) on the alkaloids of seven of their cultivars showed that the Indians’ estimates of the relative potency of their drug plants correlated well with the demonstrated alkaloid content in five of the seven cultivars examined. Table 1 is a list of some of the Sibundoy cultivars of Brugmansia aurea with their medicinal uses as published by Bristol (1969), with some modifications. One listing is given for B. sanguinea (Fig. 9).

The psychotropic use of Brugmansia in Sibundoy has also been documented. Schultes (1955) reports that cultivar ‘Culebra’ (culebra borrachera), in addition to being used in the treatment of chills, fevers and swollen joints,
is used in divination, prophecy, therapy, and in learning witchcraft. He
states that "certain of the medicine-man’s secrets apparently are imparted
only when the novitiate is under the protection of this narcotic". Theilkuhl
(1957), in an unpublished thesis on ‘Culebra’, also mentions medicinal uses,
such as the treatment of muscle cramps, erysipelas, swollen infections and
colds; of its psychotropic properties he says: “It seems that the médicos or
curacas take an aqueous maceration of the leaves to produce hallucinations,

**TABLE 1**

Sibundoy cultivars of *Brugmansia*

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<thead>
<tr>
<th>Cultivar</th>
<th>Description</th>
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<tbody>
<tr>
<td>'Guamuco'</td>
<td><em>(Brugmansia sanguinea)</em> — A poultice of the flowers, together with 'Culebra' leaves and the stems and leaves of <em>Phenax integrifolius</em> Wedd. (Urticaceae) is used to treat rheumatism. The leaves are sometimes heated and tied over swollen infections, or an infusion of the leaves may be used to bathe infections.</td>
</tr>
<tr>
<td>'Buyés'</td>
<td><em>(Brugmansia aurea)</em> — Leaves of this cultivar are sometimes powdered and applied topically with other drugs to relieve rheumatic pain.</td>
</tr>
<tr>
<td>'Biángán'</td>
<td>The leaves and flowers can be ground finely and mixed into a dog's food prior to a hunting expedition, supposedly to make the animal locate more game. The behavior of a dog so intoxicated would be most interesting to observe, but hunting is rarely practiced in the Valley today.</td>
</tr>
<tr>
<td>'Amarón'</td>
<td>The leaves of this cultivar are sometimes used as a suppurant and as an anti-rheumatic.</td>
</tr>
<tr>
<td>'Salamán'</td>
<td>This cultivar is the rarest, being known only in one garden, and its owner considers it the most toxic of all the <em>Brugmansia</em> s. He uses the leaves alone with those of 'Quinde' and 'Culebra' in an infusion for bathing rheumatic limbs and joints. He has also used both the leaves and flowers for their psychotropic effects.</td>
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\textbf{TABLE 1 (continued)}

<table>
<thead>
<tr>
<th>Cultivar</th>
<th>Description</th>
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<tr>
<td>'Quinde'</td>
<td>This is the most widely known of the economically important cultivars. An infusion of the leaves is employed both as an anti-rheumatic and as a vermifuge, and the leaves are applied topically as a suppurant. The leaves and occasionally the flowers are used psychotropically, probably more often than any other Sibundoy \textit{Brugmansia}.</td>
</tr>
<tr>
<td>'Munchira'</td>
<td>The minute and highly toxic leaves are employed medicinally as an anti-rheumatic, emetic, carminative, vermifuge and to treat erysipelas.</td>
</tr>
<tr>
<td>'Culebra'</td>
<td>This cultivar has received more attention from botanists because of its especially curious morphology, and because of its description by Schultes in 1955 as a distinct genus, \textit{Methysticodendron}. Despite the numerous reports on its medicinal and especially psychotropic importance, my investigation showed it to be less important to the present day Sibundoy than either 'Quinde' or 'Munchira'. I found it used against resfrio (colds), against erysipelas, and, more often than other cultivars, against rheumatism.</td>
</tr>
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\textbf{Fig. 8.} \textit{Brugmansia aurea} cv. Munchira, Sibundoy, Colombia. (Photograph by R. E. Schultes.)
during which they say they see the solution of difficult cases of divination, prophecy or diagnosis. One of the médicos questioned affirms that the *culebra borrachera* is employed in a manner similar to that of *yagé* (*Banisteriopsis* spp.), the focal point of Amazonian medical practice.”

Among the medicine men of the Inga speaking Indians of the Sibundoy Valley, the Brugmansias or *borracheras* are characterized as “calientes” (equal to fire). They distinguish more toxic and less toxic species and give preference to the latter for divinatory purposes. When they take them, they have an assistant accompany them because they produce furious intoxication beyond certain dosages (Yepes, 1953). They further assert that “in small quantity, it gives strength. Beginning by cooking three pairs of leaves or one flower, one progresses to larger dosages with time and in this form it serves to make divination, diagnosis and witchcraft” (Yepes, 1953).
Cultivars ‘Quinde’, ‘Munchira’ and ‘Culebra’, according to Bristol (1969), are the most commonly used for their psychotropic properties. He states that the juice of the leaves, or occasionally of the flowers, is taken usually alone and unheated. Depending on the size of the leaves, between one leaf and twenty-four leaves ("twelve pairs") are taken (Fig. 10). Normally, the leaves are taken in pairs and sometimes only as even numbers of pairs. The leaves are usually macerated and the expressed juices taken alone or sometimes mixed with water or trago (an alcoholic distillate), partly for convenience. Sugar may also be added to the juice to make it more palatable.

The psychotropic employment of *Brugmansia* in the Sibundoy Valley is not restricted to the shaman; few Indians, however, enjoy the hallucinations that are usually experienced. These are often described as visions of numerous large and poisonous snakes which the Sibundoy Indians fear.

Fig. 10. Indian boy of the Kamsá tribe, Sibundoy, Colombia, with flower and leaves of *Brugmansia aurea* cv. Culebra, preparatory to making a decoction to be taken as part of his instruction in shamanism. (Photograph by R. E. Schultes.)
This is probably the main reason that it is not taken more generally. Bristol (1969) described the effects of the drug as causing a loss of the senses and a disturbance of the vision such that objects appear nearer or farther away. Visual hallucinations occur, and there is a drying of the throat and mouth.

The relative isolation of the Sibundoy Valley until recent times prevented a loss of the native culture there and preserved to a great extent a living laboratory for study by botanists and anthropologists. A very different, but even more effective type of isolation, has preserved until recently another native culture, that of the Jívaro, who have also extensively employed Brugmansias.

The Jívaro of the upper Amazon in eastern Ecuador were known until recent years as the fiercest headhunters in South America; and they are the only tribe of American Indians known to have successfully revolted against the Spanish Empire and to have thwarted all subsequent attempts by the Spaniards to reconquer them. By maintaining their freedom from the Spaniards, the Jívaro were able to retain most of their cultural heritage. This has been studied in great detail by Karsten (1926, 1935, 1936, and 1964), Stirling (1938) and, more recently, by Harner (1972, 1973).

The psychotropic use of \textit{Brugmansia} by the Jívaro is intimately related to their religious beliefs and practices. "The Jívaro believe that the true determinants of life and death are normally invisible forces which can be seen and utilized only with the aid of hallucinogenic drugs" (Harner, 1972). In order to achieve success, drugs are taken to enter and utilize the souls and spirits of the supernatural, or, to them, the "real" world.

When a Jívaro reaches the age of six he seeks an \textit{arutam wakani}, an acquired soul. According to Harner (1972), \textit{arutam wakani} is perhaps best referred to as the "ancient specter" soul. The term \textit{arutam} alone means simply soul or spirit. Thus, the \textit{arutam wakani} is the particular kind of soul that produces the \textit{arutam}, or vision. To acquire an \textit{arutam} soul, the boy, usually accompanied by his father, makes a pilgrimage to a sacred waterfall where he bathes, fasts, and drinks infusions of fresh tobacco water. If no vision or apparition appears, recourse may be to drink \textit{maikua}, the juice of \textit{Brugmansia} (referred to by Harner as \textit{Brugmansia arborea}, but undoubtably \textit{B. suaveolens}).

\textit{Maikua} is prepared by the Jívaro simply by pressing juice from the raw green bark of the \textit{Brugmansia} stem. The juice is pressed out into a calabash and, according to Lewin (1964), amounts to about 200 g.

The \textit{arutam} seeker is watched over by men not taking the \textit{maikua}, in order to protect him from accidents or self-inflicted harm that might occur during the initial violent stages when the drug is taking effect. If the boy is fortunate, the \textit{arutam} will appear to him, usually in the form of a pair of large creatures, often animals such as jaguars or anacondas. Later, the soul of this \textit{arutam} will enter his body (Harner, 1972).

The hallucinogen usually taken by the Jívaro shaman in curing and witchcraft is \textit{natemä} (\textit{Banisteriopsis} spp.) rather than \textit{maikua}, since the potency of the latter is much greater and impairs the ability of the shaman
to perform the ritual singing, sucking and the accompanying social interaction (Hamer, 1972). The Jivaro also believe that repeated use of maikua leads to insanity.

Maikua is utilized also by the Jivaro to discipline children who question the knowledge and authority of their parents (Hamer, 1972). By administering maikua, it is believed that the children will see visions of the supernatural world and discover that many of the claims the father made about the nature of reality are true and they will, therefore, be more respectful. It is also hoped that the hallucinogenic experience will put the children in contact with an arutam.

The use of Brugmansia among other Indians of the upper Amazon is not uncommon, but, in general, its role is secondary to that of yagé (Banisteriopsis spp.), and it is often combined with the latter (Calella, 1944). In many tribes, its usage is restricted to the shaman. This is true of the Shipibo Indians on the central Río Ucayali in eastern Peru. Among the Shipibo, the drug is called toé, and its preparation is the same as among the Jivaro.

The Spaniards accepted many of the medicinal uses of Brugmansia, such as in the treatment of rheumatism, infections, and asthma; it was as ornamentals, however, that they truly adopted the Brugmansias, or floripondios as they generally are called. José de Acosta, writing about the New World in 1590, was the first to call attention to the beauty and fragrance of Brugmansia flowers. He stated that they were called floripondios, and were grown in the gardens of the Viceroy Francisco Toledo in Lima. Cobo (1890), writing in 1653, also mentioned their beauty and fragrance, but related that the smell of the flowers can cause headaches. This belief was substantiated during the course of my field work. The idea that the fragrance of Brugmansia induces sleep is still common among many people in southern Colombia. In this same region, it is related that some villages once had allées of floripondios through which people would walk in the evenings if they suffered from insomnia.

The idea that Brugmansias are bad or dangerous is still prevalent among many people in South America and is due probably to its former widespread association with witchcraft. Ruiz (1940) reported the belief that sleeping in the shade of Brugmansia sanguinea would induce insanity. In spite of these beliefs, Brugmansias are still widely cultivated and appreciated for their beauty.

As population density and land use has increased in the Andes, many plants such as Brugmansia are decreasing in total numbers. A more specific problem related to the decreasing number of Brugmansias in the Andes is the introduction of bee-keeping. The belief is widely held that honey made from the flowers of Brugmansia is toxic and has resulted in the destruction of all the plants in some villages. If current trends continue, it is most likely that many interesting clones will be destroyed, and the range of many species will become more restricted.
References


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