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RESEARCH REPORT

Yanomamö Hallucinogens: Anthropological, Botanical, and Chemical Findings¹

by NAPOLEON A. CHAGNON, PHILIP LE QUESNE, and JAMES M. COOK

The Yanomamö Indians of southern Venezuela and northern Brazil employ hallucinogenic snuffs made from a wide variety of feral and domestic plants. Schultes (1967:303) has recently suggested that this general geographical region represents the "center of complexity" of snuff-taking in South America. More recently, he and Holmstedt (Schultes and Holmstedt 1968:123) have suggested that the Yanomamö area itself may even represent the very region where one of the most common varieties of snuff—that made of myristicaceous substances—originated. It is not surprising, therefore, that there is a large and continually growing body of literature which describes various aspects of the area's ethnobotany and ethnopharmacology (see Wurdak 1958, Wassén and Holmstedt 1963, Seitz 1965, 1967, Holmstedt and Lindgren 1967, Schultes 1967, 1969, Schultes and Holmstedt 1968, Agurell *et al.* 1969, and Corothie and Nakano 1969). There are, however, a number of misconceptions and inconsistencies in the literature, particularly on subjects dealing with plant-collecting, ethnobotany, and ethnology. Our recent ethnobotanical, chemical, and ethnological findings will serve to clarify some of the issues and perhaps assist those fieldworkers who intend to collect additional ethnobotanical data from this region. (The chromatography techniques and microanalytical results will be published later [Chagnon, Le Quesne, and Cook n.d.].)

ETHNOBOTANICAL FINDINGS

Yanomamö drug usage involves at least four generic complexes distributed among three families: Myristicaceae, Acanthaceae, and Leguminosae. Species of Acanthaceae and Leguminosae are cultivated; species of Myristicaceae and Leguminosae are collected from the jungle in feral form.

Myristicaceae. The most commonly used product is the bast bark (and resin from this bark) of a feral species of tree belonging to the *Virola* genus. This source has been dealt with more extensively than the others and is perhaps the best known botanically, chemically, and ethnographically. There are, however, a number of pitfalls associated with its study. First, the tree, called *yakoana* (or *nyakwana* in some dialects) by the Yanomamö, is so common and so frequently used as a source of drugs that the name of the prepared snuff itself—*ebene* (or *epene*)—is often extended to the *yakoana* tree (and occasionally to the *hisioma* tree, see below), particularly in contexts where non-Yanomamö are involved. The Yanomamö have a tendency to assume that nobody could be so ill-informed as not to know what "ebene" is; they often associate the *yakoana* tree with the name *ebene* on the not always incorrect assumption that the plant-collector has insufficient command of the language to appreciate the differences between the various plants that can go into a drug preparation. Only careful questioning will reveal the botanical content of the prepared drug, since not all prepared drugs (*ebene*) are made from the bark or resin of the *yakoana* tree. Thus, collections of prepared snuffs, all called *ebene*, may vary widely in composition. Published chemical analyses of various samples of *ebene* confirm this (Agurell *et al.* 1969:906, 907; Holmstedt and Lindgren 1967:361).

The term *ebene* technically refers to any prepared snuff powder, and its composition may include bark, seeds, leaves, and resin from several different plants. In addition, the Yanomamö often mix several previously prepared powders, irrespective of their composition, and still call the resulting mixture *ebene*. It is therefore quite meaningless and potentially confusing to describe what one sees only once, twice, or several times as a "type" of *ebene* if the basis of

classification is merely the ingredients used on specific occasions (cf. Seitz 1967, Schultes and Holmstedt 1968, Wurdak 1958). In short, it cannot be assumed that any particular *ebene* mixture is the result of a culturally prescribed recipe or formula: in practice, the Yanomamö mix together whatever is immediately at hand on any occasion, and some groups have access to as many as four or five different hallucinogens (Chagnon *et al.* n.d.).

Acanthaceae. Several cultivated varieties of *Justicia* are also employed in drug manufacturing. Contrary to some reports (Seitz 1967, Schultes and Holmstedt 1968:144), they are not merely aromatic additives to *ebene* but are also used by themselves as *ebene* to produce intoxication. The possibility is also being investigated by others that some members of this genus contain alkaloids (Schultes and Holmstedt 1968:136, 156).

The *Justicia* species are perhaps the least known Yanomamö hallucinogens and potentially the most confusing to field collectors because of the plethora of native names associated with them. Some of the plants have as many as five or six names, and members of the same village may use them indiscriminately. In addition, a particular name may be used for two entirely different plants coming from different areas (Chagnon *et al.* n.d.).

In 1969 Chagnon and Ward collected six different types of *Justicia*, which we are cultivating under controlled environmental conditions at the University of Michigan Botanical Gardens. Four of these specimens were collected in a hitherto uncontacted village near the headwaters of the Mavaca River in southern Venezuela. All four specimens were "recently" derived from different Yanomamö villages, according to our informants, and were regarded as distinct entities by the present Yanomamö cultivators. One set of specimens closely resembles those shown in the photographs on pp. 136, 137, 138, and 143 of Schultes and Holmstedt (1968), which were collected by Seitz in the village of Karawatari. Our informants asserted that they had in fact obtained their cultigens from members of that village. They may have cultivated the same species in the past, since the historical migrations and relationships of this particular Yanomamö group are such that they can be identified as a splinter group of an earlier Yanomamö population (Chagnon 1966: Map C) that is claimed by other informants to have cultivated them (Chagnon *et al.* n.d.). Two of the specimens (Y1, Y3) appeared indistinguishable to the collectors in the field. The only apparent distinction made by the Yanomamö was on the

¹ A slightly different version of this report was read at the 1969 Annual Meetings of the American Anthropological Association in New Orleans. A more detailed report will appear later, tentatively in *Acta Científica Venezolana*. The senior author acknowledges the support of the U.S. National Institute of Mental Health (MH 10575-01, BEH R04) and the U.S. Atomic Energy Commission (AT[11-1]-1552) for research grants during the two years he spent among the Yanomamö. We thank Ara G. Paul, School of Pharmacy, University of Michigan, and H. Morimoto, Takeda Chemical Industries, Ltd., Osaka, Japan, for authentic samples. Finally, we thank Richard H. Ward, who was trained in botany and is currently completing his doctoral thesis in human genetics at the University of Michigan, for his assistance in collecting the botanical specimens and for botanical identifications of some of the specimens.

basis of the village from which the particular plants were obtained. The other two specimens (Y2, Y6) appeared to be distinct to us and were also distinguished by the Yanomamö. Thus far some of the specimens have not yet flowered, and we are unable to state whether the difference is varietal or specific. The differences between these three groups of plants (Y1 plus Y3; Y2; Y6) have since been maintained after subcloning, repotting, and cultivation in a controlled environment. There thus appears to be a genetic basis for the distinctions made by the Yanomamö cultivators. (Schultes and Holmstedt [1968:156] have offered a somewhat different interpretation of some specimen differences.)

Two other *Justicia* specimens were collected in a village near the Orinoco River. These appear to be two additional categories. One, called *hayakowari kä henakö*, resembles the three groups collected in the previous village and is presumably a varietal form of the same species. Zerries (1954) has also reported on this plant from a village in the same area. The other, called *sua kä henakö* ("leaves used on women"), is used only as a magical aphrodisiac. In addition, a third category of herb, called *shäri kä henakö*, is reportedly cultivated by villagers in this region and is used as a hallucinogen. We were unable to obtain specimens of this plant, but one of our informants, who saw all of our collected specimens, asserted that it was different from all of them.

Pending confirmatory identification by D. Washausen of the U.S. National Herbarium, we tentatively classify all specimens (except the *sua kä henakö*, which has a distinct habit and leaf morphology and is best considered a distinct species) as different varieties of *Justicia pectoralis*, or possibly as different forms of *J. pectoralis* var. *stenophylla*, since all bear a resemblance to this taxon. The Yanomamö classification of the four specimens from the first village was confirmed by individuals from the second village (Chagnon *et al.* n.d.), but the terms used were different in each case and occasionally in *direct conflict*. Thus, the taxonomic system used in both areas appears to accord with the biological system (plants with similar botanical attributes are put in the same group) but the taxonomic terms are variable and conflicting. Plant-collectors should not assume that there is a close correspondence between Yanomamö names for a specific plant and a biological taxon.

Leguminosae. The bark of the tree called *ama* by the Yanomamö is burned to produce an ash (*ama kä asita ushi*) that is mixed with many of the prepared snuffs. On the basis of our field observations and the description published by

Ducke (1934), we have determined that the tree called *ama* is *Elizabetha princeps*. Other fieldworkers have also come to this conclusion (Schultes and Holmstedt 1968:139). What is not generally known, however, is that the bark ash only, and *no other product* of this species, is utilized by the Yanomamö in drug preparations.

The Yanomamö use seeds of a tree called *hisioma* (*sisioma* in some dialects) in their snuff preparations. On the basis of our field observations and the description by Altschul (1964), there can be no doubt that the tree in question is *Anadenanthera peregrina*. We wish to state this with as much emphasis as possible, since Schultes has repeatedly contested the accounts of other investigators reporting the use of seeds or, more specifically, seeds from *Anadenanthera peregrina*, in Yanomamö drug preparations (1967, 1968, Schultes and Holmstedt 1968). His argument has been based largely on his conviction that this species is peculiar to savannah country, a position that is at variance with our own findings, with the earlier reports (Zerries 1954, 1955, 1964; Becher 1960; Anduze 1960; Biocca 1967 [photograph explanations]), and with the definitive monograph on the genus (Altschul 1964). Wassén (1965:98; 1967:265) appears to have accepted the reports, mentioned above, in which this species is said to be found in the Yanomamö area. Where Schultes has had an opportunity to examine specimens of *Anadenanthera peregrina* known to have been collected in Yanomamö villages, he interprets them as recent imports from a distant savannah (1967, Schultes and Holmstedt 1968).

ETHNOLOGICAL FINDINGS

Anadenanthera peregrina is currently being domesticated in a number of villages on the upper Orinoco River. Seedlings of the tree (*hisioma*) are taken from regions of tropical forest, where they are found in substantial feral groves, and are brought back to Yanomamö gardens for transplantation. Our informants assert that they have no knowledge of others who have done this in the past and feel that they are domesticating the tree for the first time. It is likely, however, that this process of plant "domestication," perhaps even involving this species, has repeatedly taken place in the past in other parts of the tribe (Chagnon *et al.* n.d.).

The immediate reasons for the attempt to domesticate the *hisioma* tree reflect an intimate relationship between trading practices (Chagnon 1968a, b), alliances (Chagnon 1968a, Asch and Chagnon 1970), and warfare among villages (Chagnon 1966, 1967, 1968a, c, n.d.).

The Yanomamö groups now domesticating the tree relied on trade networks that circulated seeds from wild *hisioma* trees, collected by Yanomamö groups living near the stands of feral trees.² In 1967–68 major shifts in the warfare patterns and alliance networks in this area disrupted the flow of the desirable seeds. A number of enterprising individuals then began bringing seedlings of the trees to their gardens. By 1969 some of the trees were mature enough to produce usable seeds and were already generating new seedlings. These were exported to members of distant villages in a new trading network. Incidentally, a number of *Justicia* plants were traded in the opposite direction in late 1968, entirely independent of the flow of *hisioma* seedlings. Thus, the ranges of both plants are now crossing and overlapping in areas that have not, at least in the very recent past, cultivated one or the other of the species in question. Between April 1968 and March 1969, four widely separated villages obtained seedlings of the *hisioma* tree for the first time. These villages had been repeatedly visited by Chagnon prior to this time and were known to have had no access to the seeds. What is more startling than the rate of dissemination of the new species, however, is the fact that all four villages obtained their seedlings from the same man.

CHEMICAL ANALYSIS

Although villages importing seeds of *Anadenanthera peregrina* have access to large quantities of *yakoana* trees, they prefer *ebene* made from *hisioma* seeds because "it is truly the strongest." Chemical analysis also clearly differentiates *hisioma* and *yakoana*. It suggests that differences in the nature and abundance of their alkaloidal constituents explains the differences between them in effect and value to the Yanomamö.

Extraction of *hisioma* seeds by the method of Culvenor and his coworkers (Culvenor *et al.* 1964) showed that the alkaloid fraction, which was present in 7.4% yield, consisted entirely of bufotenine (5-hydroxy-N, N-dimethyl-tryptamine), identified by chromatography.

² Thomas L. Pitts recently found a *hisioma* tree growing in a garden in a Yanomamö village which traditionally collects wild seeds from the *hisioma* groves nearby. It thus appears that here also the Yanomamö are beginning to cultivate *hisioma*. Because of the language difficulty experienced by all beginning anthropological fieldworkers, Pitts was only able to determine that the tree in question was "*ebene*." This underscores a point made in the section on ethnobotany above. The senior author had identical problems in his initial fieldwork.

graphy and preparation of the dipicrate derivative, m.p. 173–175° (decomp.). In marked contrast to this result, a similar extraction and analysis of a sample of prepared *yakoana* snuff showed no bufotenine, but demonstrated the presence of 5-methoxy-N, N-dimethyltryptamine and 5-methoxy-N, N-dimethyltryptamine N-oxide in approximately equal amounts, together with traces of tryptamine. The total alkaloid content of *yakoana* snuff varied between 0.15% and 2.00% for different samples.

The differences in alkaloid content between these snuffs are of considerable interest, especially since bufotenine has been observed to cause hallucination under clinical circumstances (Hoffer and Osmond 1967). It has, on the other hand, been suggested (Farnsworth 1968, Holmstedt and Lindgren 1967) that bufotenine is somewhat less effective as a hallucinogen than other related compounds, such as its 5-methyl ether, by reason of its lesser lipid-solubility. It seems clear, however, that the hallucinogenic action of *hisioma* on the Yanomamö arises from bufotenine. Although a sample of Yanomamö-prepared *hisioma* snuff was not available for analysis, extraction of extensively dried, ground *hisioma* seeds and consideration of the mode of preparation of the snuff by the Yanomamö suggest that little change in the nature or content of the alkaloidal constituents results from the preparation process itself.

A recent important paper (Agurell *et al.* 1969) describes analyses of a variety of hallucinogenic snuffs obtained from this general area of South America. The *hisioma* and *yakoana* snuffs of the Orinoco Basin Yanomamö appear markedly different from these, however. The Yanomamö of the Demini (Toototobi) River, for instance, use a pure resin extracted from heated strips of bark obtained from the *yakoana* (*nyakwana*) tree to make *ebene* (Schultes and Holmstedt 1968, Agurell *et al.* 1969), whereas the Yanomamö of the Orinoco include both bark and the associated resin in their preparation. The high bufotenine content of *hisioma* seeds from the Orinoco Yanomamö snuffs appears to be unique. The *yakoana* snuff available to us resembles the *nyakwana* obtained by other workers, but has a very much lower alkaloid content. The observation of an 11% indole alkaloid content in *yakoana* (*nyakwana*) from the Demini area and the 7.4% indole alkaloid content in *hisioma* seeds from the Orinoco area is of considerable biological interest, since the adult males of villages in these areas daily absorb a comparatively large weight of these physiologically important compounds. We are investigating the possible cytogenetic effects of this consumption.

CONCLUSION

Finally, it is worth noting that none of the hallucinogens used by the Yanomamö are habit-forming, missionary opinions to the contrary notwithstanding (cited in Wurdak 1958; cf. Wassén 1965:20). Yanomamö can and do abstain from them for weeks and do not mention it or complain about it. Tobacco-chewing, on the other hand, is habitual: they cannot go several hours without it, and the entire village is in a state of crisis when the tobacco crop fails. In this connection the Yanomamö have discovered a number of tobacco substitutes, from both domestic and feral plant sources, to rely on when they run short of tobacco. When questioned on the possible substitutes for their hallucinogens, one informant summarized the drug-tobacco situation as follows:

When we are out of tobacco we crave it intensely and we say we are *hōri*—in utter poverty. We do not crave *ebene* in the same way and therefore never say that we are “in poverty” when there is none. But *yakoana* is everywhere, and we can always find some if we want to take *ebene*.

We suggest that there is a fertile field here for other types of ethnobotanical investigation.

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