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Author(s): R. K. Siegel, P. R. Collings and J. L. Diaz

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On the Use of *Tagetes lucida* and *Nicotiana rustica* as a Huichol Smoking Mixture: the Aztec "Yahutli" with Suggestive Hallucinogenic Effects

R. K. Siegel, P. R. Collings, and J. L. Diaz [1]

INTRODUCTION

The history of tobacco in New World societies is replete with many examples of its use as an hallucinogen. In such cases, tobacco is often mixed with other substances which may contribute to the psychopharmacological effects. Recently, one such mixture was found to be used by Huichol Indians in Mexico, and the patterns of its use are discussed below.

There are more than 60 species in the genus *Nicotiana* but only two of them are cultivated for use as tobacco: *N. tabacum* and *N. rustica*. The former is the tobacco of commerce used throughout most of the world, while the latter is grown extensively in parts of eastern Europe and Asia Minor as *tombac* or *tönbeki* (Wolf, 1967). *N. rustica* also grows wild in the high Sierra Madre mountains of Mexico, where it is called *yé* (from the Aztec *yetl* meaning tobacco) or *ya* by the Hucihol Indians who use it ceremonially (Myerhoff, 1974). *Yé* is considered to be the tobacco of the fire god Tatewari and, according to Huichol folklore and mythology, was reportedly once a hawk (Furst, 1972, p. 176) and "is said to give one visions" (Myerhoff, 1974, p. 126). Myerhoff describes its exclusive use in the traditional peyote hunts. "It is sacred and used only ceremonially, when all the men smoke in unison. Rolled into maize husk cigarettes, the tobacco is carried to Wirikuta in the sacred wart gourds (yékwei) worn by older men and experienced *peyoteros*" (Myerhoff, 1974, p. 126).

Many other New World societies use tobacco in shamanistic practices. In many such practices, tobacco is often conceptually and functionally indistinguishable from true hallucinogens (Janiger and Dobkin de Rios, 1973; Wilbert, 1972). The Warao Indian of Venezuela, as part of his vision quest, smokes tobacco and fasts, falling into a trance or ecstatic dream state in which "he feels exalted and euphoric with the marvelous sound [of spirits], embarks on his initiatory journey across the celestial bridge and its rainbow of colors" (Wilbert, 1972, p. 70). Similarly, tobacco is added to the Peruvian *tabaco* liquid to give the power to "visualize" and to "clear" the mind (Sharon, 1972, p. 129). Tobacco is also used in massive doses by the Campa shaman of eastern Peru and is "credited as the general source of a Campa shaman's powers to see and communicate with the

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[1] RKS: Department of Pharmacology and Psychiatry, University of California, Los Angeles, California, 90024; PRC: Centro Coordinador Para el Desarrollo De La Region HUICHOT, Tepic, Nayarit, Mexico; JLD: Instituto de Investigaciones Biomedicas, Universidad Nacional Autonoma, Mexico, D.F.

spirits and to cure or to diagnose illness" (Weiss, 1973, p. 43). Schleiffer (1973) cites several texts on the use of tobacco by New World Indians whereby "high visions", "a long sleep filled with peculiar dreams", and "imaginations" were produced. The classic study by Lewin (1931) also contains numerous references to hallucinations induced by tobacco (p. 286 ff).

While such reports have probably generated much of the folklore concerning hallucinogenic properties of tobacco (cf. Fairholt, 1859; Folkard, 1884), notes from recreational tobacco users also indicate a wealth of visions and hallucinations. Early botanists and herbalists even described tobacco as related to the genus *Hyoscyamus* because of its "narcotic quality" and called it a "third kind of henbane" (Brooks, 1952), Arents (1937) suggests that the yellow-flowered *N. rustica* was originally called *Hyoscyamus Peruvianus* (Henbane of Peru) because of confusion with the yellow-flowered henbane. One 1574 account described tobacco as producing "visions and illusions", used by natives in the West Indies "so that they might see imaginary things and fantasies which it reveals to them" (in Dickson, 1954, p. 87). Indeed, Lane (1845) reports that tobacco, when used by certain individuals or in conjunction with alcohol, can produce visions similar to those obtained with opium: "He [the tobacco smoker] may see thousands of strange forms floating in the tobacco smoke. He may people it according to his temperature with agreeable or revolting images—with flowers and gems springing up as in dreams before him—or with reptiles, serpents, and the whole host of *diablerie,* skimming like motes in the sunshine, amid its curling wreaths" (pp. 103–104), Shaw (1849) provides an interesting account of a man overcome with tobacco fumes and "soon afterward he was harrassed by wild and frightful dreams" and, upon recovering, "he acquired a most vivid recollection of a vast variety of ideas and events which appeared to have passed through his mind, and occupied him during the time of his supposed insensibility" (pp. 31–32). Even withdrawal from chronic tobacco smoking is said to be marked by similar visions (Cowan, 1870). Zalackas (1902) reports two cases of nicotine psychoses resulting from excessive tobacco smoking. These states were characterized by vivid visual and auditory hallucinations. Pain and Schwartz (1908) report a case of a man who had visions and auditory hallucinations whenever he smoked. Larson and his co-workers (1961) review numerous other case reports of tobacco smoking and cite several symptoms which have been reported including vertigo, disturbances of sleep, transient disturbances in consciousnes, as well as specific diseases of sight and hearing, including tobacco amblyopia. In most such cases of tobacco-induced hallucinations, users adopt a method of violently inhaling and swallowing the smoke in order to induce stupor and intoxication—a method shared with the Huichols (cf. Arents, 1937).

HUICHOL USE OF *NICOTIANA RUSTICA*

Nicotiana rustica, the tobacco of the Huichols, grows wild and cultivated in Nayarit and Jalisco. The Huichols prefer to plant in soil containing the ash of burned trees or logs, although no other mineral or organic fertilizers are used. The ash is alkaline and a good source of potassium, phosphorous, and potash. During cultivation, topping and suckering practices are employed, and these result in an increase in size and thickness of the leaves. The entire plant is usually harvested at one time, but some Huichols employ the priming method in which leaves are removed at successive intervals as they mature. Nonetheless, all the leaves and some stalk material are eventually smoked as the tobacco is chronically in short supply among the people. The tobacco is cured by air or sun and used immediately without planned storage or aging.

The tobacco is usually rolled into maize husk cigarettes, although clay pipes are also employed. During ceremonial periods, smoking is done in groups and almost continuously during the daylight hours for periods up to four days. Tobacco smoking is also engaged in by the Huichols (both

men and women) for non-ceremonial or recreational purposes, including smoking after meals and in the evening while sitting around the fires. Such smoking has been observed in both solitary individuals as well as in groups. The relative extent of this recreational use is governed by the supply of tobacco, ceremonial uses during deer and peyote hunts and peyote feasts taking first priority. The pattern of smoking consists of long deep inhalations and respondents report tiredness, dizziness, and "images seen with the eyes closed".

One explanation suggested for these effects is that they are nicotine-induced, since nicotine is the principle pharmacologic agent in tobacco and markedly stimulates the central nervous system. Furst (1972) has claimed that *yé* contains nicotine in far greater amounts than domestic brands (p. 176), but his report does not provide the source of this information. We analyzed three different samples of *yé* (*N. rustica*) obtained from San Andes Coamiata (Jalisco) and Banco de Calitice (Nayarit), two Huichol communities. The San Andres sample was found to contain 3.89% ± 0.05% nicotine (% dry weight of leaf) while the Banco de Calitice samples contained 4.03% ± 0.11% and 1.89% ± 0.02% nicotine. These nicotine levels are somewhat high when compared to cigarette tobacco (*N. tabacum*) used in the United States (average 1.5%, range 0.7 to 3.0%). However, *N. rustica* usually has a higher nicotine content than *N. tabacum,* and African grown samples of *N. rustica* have averaged 4.5% to 8.6% nicotine (Watt and Breyer-Brandwijk, 1962). The samples of *yé* analyzed here are not, therefore, markedly high for its species.

Recently, Janiger and Dobkin de Rios (1973) have noted that conditions of cultivation and growth may effect changes in the chemical composition of tobaccos, in particular the Beta-carbolines which are hallucinogens present in small amounts in cured commercial tobaccos and their smoke. Pharmacologically, it would seem more reasonable to suspect psychopharmacologic activity from these substances, especially harman and norharman, rather than nicotine which has no proven hallucinogenic properties. In addition, among the 900 identified constituents in tobacco smoke (Wakeham, 1972), there are other compounds with known hallucinogenic effects including carbon dioxide, myristicin, and trace amounts of nitrous oxide and related nitrites. Also, several deliriants are present in the smoke, and these include acetone, benzene, cyclohexane, hexane, toluene, and various ketones (Wynder and Hoffman, 1967). However, all of these compounds appear to be present in such small amounts, at least in commercial tobaccos, that the suggestion of endogenous hallucinogens present in tobacco in behaviorally active amounts must be viewed with caution. Alternatively, a particularly attractive, albeit speculative, notion is that unknown ingredients are mixed with the tobacco, and these might contribute to the observed effects.

TOBACCO MIXTURES

The practice of mixing tobacco with other substances is common to shamanistic rituals in several New World societies. For example, the Warao Indians mix their black tobacco with the fragrant resin of the *Curucay* or *Tacamahaco* (*Protium heptaphyllum*) tree (Wilbert, 1972); the shaman of the Jivaro Indians of the Ecuadorian Amazon drink tobacco juice in large quantities mixed with the extract of another drug, *natemä* (*Banisteriopsis caapi*) as well as with *pirípiri* (Harner, 1973); San Pedro cactus (*Trichocereus pachanoi*) is often added to tobacco and several other ingredients to produce *tabaco,* a liquid used ceremonially in Peruvian folk healing (Sharon, 1972); tobacco is drunk along with beverages of *B. caapi* and *Datura* by the Campa *sheripiari* or "tobacco shaman" of South America (Wilbert, 1973); in areas of South America tobacco snuff is sometimes mixed with coca (*Erythroxylon coca*) or *Anadenanthera peregrina* (Wilbert, 1973); and in Mexico, the leaves of *Ephedra nevadensis* are mixed with tobacco and smoked for relief of headaches (Heffern, 1974).

Kamen-Kaye (1971) described an unusual

form of tobacco in Venezuela called chimó which is chewed, smoked, and sniffed to prevent hunger and fatigue and for medicinal purposes as well. Chimó has a variety of additives including tonka bean (*Dipteryx odorata*) for vanilla flavoring; anise (*Pimpinella Anisum*) to reduce the harshness; cloves (*Eugenia caryophyllata*), cocui liquor (from *Agave Cocui*); nutmeg (*Myristica fragrans*)—an hallucinogen; vanilla (*Vanilla planifolia*); crude brown sugar (*Saccharum officinarum*) for sweetening; opium; and leaves of *Palicourea Chimó* and those of at least two other rubiaceous species. Chimó is also used with plant ash, an alkalizing agent which accelerates and intensifies the action of nicotine in man.

In North America, the medicine pipe used by the Shoshone Indians contained a mixture of tobacco and Desert Trumpet (*Eriogonum*), while the Paiutes used a smoking mixture of tobacco and "Kinni-Kinnick"—the latter being a mixture itself of several plants including Quinine Bush (*Garrya elliptica*), Bear Berry (*Arctostaphylos uva ursi*), Prince's Pine (*Chimaphila umbellata*), and Sandwort (*Arenaria* spp.) (Van Allen Murphey, 1959), Other North American Indians frequently mixed tobacco with nutmeg for medicinal purposes (Dickson, 1954, p. 103). Still others, particularly the Delaware Indians, mixed tobacco with sumac leaves (*Rhus glabra*) for pleasure, relaxation, and because its distinctive scent acted as a territorial marking for members of the tribe (Weslager, 1973). Schultes (1937) reports that sumac leaves were believed to make the tobacco smoke more potent as a purifying agent and this was used among American Indians in peyote ceremonies as well as in recreational settings.

Arents (1937) reports that American Indians, as well as Australian aborigines, chewed tobacco mixed with lime. This practice is similar to that observed in India where *N. rustica* and *N. tabacum* are often chewed together with lime, betel nut, and betel leaf (*Areca catechu* L.) which contains the active alkaloid arecoline. Other tobacco additives used in New and Old World societies and reviewed by Arents include: vinegar, amber, rosemary, cinnamon, milk, oil (to bind the dust), incense, coltsfoot and yarrow, elephant feces, cow feces, woodshavings (when tobacco is scarce in Argenina), sugar saffron, sassafras, calamus aromaticus, sage, lavander, cubeb, leave of berry bushes, hemp (in Africa), inner bark of the cherry tree, anise oil, pepper, marjoram, and aloes. Lewin (1931) reports that the following substances have been used with tobacco or as a substitute for it: *Aristolochia triangularis* and *A. galeata, Anthurium oxycarpum, Carica papaya, Leonotis Leonurus, Vaccineum stamineum, Salix purpurea, Cornus stolonifera, Arctostaphylos glauca, Kalmia latifola, Chimpahila umbellata, Cestrum parqui (palguin), Caltha palustris, Arbutus uva ursi, Polygonum orientale,* cane; fibres of *Hibisus, Curatari guayensis,* and *Lecitnys ollaria;* and, flowers of *Emacipata fumans vulgaris.*

HUICHOL USE OF *TAGETES LUCIDA*

In 1973, one of us (PRC) found that the Huichols smoke another substance they call *tumutsáli* or *yahutli. Tumutsáli* is smoked either by itself or in 50% mixtures with *yé* and is used both recreationally and ceremonially. However, since *tumutsáli* is always in more abundance than *yé,* it is often used exclusively by the Huichols.

We identified *tumutsáli* as *Tagetes lucida* Cav., a member of the Compositae. Another member of this family is *Calea zacatechichi,* a popular Mexican folk medicine with reported hallucinogenic effects (McDougall, 1967; Schultes, 1970). The genus *Tagetes* is native to the New World and the use of its flowers for religious ceremonies in Mexico and Guatemala appears to date back to pre-Columbian origin (Kaplan, 1960). Such uses most commonly involve ceremonies for the dead. It has been suggested that *T. lucida* is the *"yahutli"* of the ancient Aztecs (Reko, 1919; Thompson, 1933). The evidence is based on abundant early descriptions of *yahutli* which are remarkably similar to *T. lucida.* In addition, we have found that at least one tribe of Huichols use the word *yahutli* in reference to this plant, although *tumutsáli* is

more common. *Yahutli* was an important plant for the Aztecs and it is mentioned in the three major sources of medical botany for 16th Century New Spain. The Badianus Manuscript contains a figure (Plate 34) and description of a plant called *yyahhitl* (de la Cruz, 1964), a name that appears to be derived from the word *ujana* which means to offer incense in sacrifices (Emmart, 1940). This suggests that the plant had a pungent and fragrant odor. Hernández (1959) describes *yyahutli* or *hierba de nube* (cloud shrub) which "stimulates veneral appetite, alleviates crazy people and those astonished and frightened by the thunder". Sahagún (1959) mentions that the powder of this plant was thrown in the faces of captives to "dull their senses" before being sacrificed to Heuheuotl.

T. lucida has also been referred to as Yerbanis, Santa María, and pericón by von Reis Altschul (1973), while other species carry the names "Flor de Muerto" or "Rosa de Muerto". Martínez (1944) describes pericón as *T. florida* Sw. and lists the other vulgar names as Anisillo, Hierba anis, and Flor de tierradentro, among others. This latter reference describes the various species which grow in Nayarit as Cempoal and adds that a "Flor de Muerto" is narcotic and mildly toxic".

Popular Mexican uses of *T. lucida* include use as a bath additive for fragrance and rheumatism; as a tea for relaxation, sleep, and slight ailments; as a juice for relief from the itching and pain of insect bites; and as a fumigant and insect repellant. The latter use probably evolved from the strong licorice smell of *Tagetes* flowers (von Reis Altschul, 1973). In Texas, the Navajo Indians use the Little Marigold (*Tagetes micrantha* Cav.) for colds, fevers, summer complaints, and stomach troubles (Burlage, 1968).

In many communities in Mexico, the *"Fiesta del pericón"* takes place on September 28 and 29. *Pericón* is at the peak of its flowering cycle at this time and the women and children collect the plant on the first day of festival. In the afternoon and evening they tie together two handfuls of the plant in the form of a cross and nail it to the upper part of their doors. The cross remains there all year, until a new one replaces it. On the next day, a procession goes to sacred places or to the church where *pericón* is offered in altars and burned. This ceremony is based on a belief that an evil spirit or a devil "gets loose" during the night and roams around until dawn, when he is defeated by St. Michael. It is believed that the cross is protection against the devil and prevents him from entering one's house. One of us (JLD) has found this *"Fiesta del pericón"* in the valley of Cuernavaca (Morelos) and in the Mixteca Alta region south of Tlaxiaco (Oaxaca). However, the ritual use of *pericón* in modern Mexico is not restricted to this celebration. For example, in Tlaxiaco we have found that it is also used in baptisms as a fragrant, ornamental and ceremonial flower. In Morelos it is present among other plants in the magic ceremonies of the *limpia del aire*. Interestingly, the shaman who performs this ceremony knows about the psychotropic effects of "excesses" of *pericón* (Scott Robinson, personal communication).

Tagetes lucida grows well throughout Mexico and is in particular abundance in the states of Nayarit and Jalisco. In the Huichol communities in San Andres Coamiata (Jalisco), the plant grows at about 2100 meters and begins to bloom in July and reaches abundance in October. The Huichols break off the top six inches containing the flowers and small leaves, tie them into bundles and hang them up to dry in the houses. The plant is also picked by the Huichols and the fresh leaves and flowers crushed and held against the face for hours at a time as an aromatic inhalant. The bundled plants are used as religious offerings in temples, government benches, and sacred shrines.

When the bundled plants to be used as smoking material are dry, the leaves and flowers are crushed and smoked in long thin maize cigarettes or clay pipes. The Huichols also mix it with *yé* and claim that it reduces the harshness of *yé,* facilitates deep inhalations, and facilitates intoxication. The intoxication itself is

marked by quiescence, lying down, a fixed gaze, and frequent periods of closed eyes. Often, the smoker would turn away from the night fire and face the darkness, a behavior reminiscent of the mara'akame shielding his eyes from the fire in order to facilitate visual imagery. Several Huichols reported visions and images with closed eyes and these were said to be similar to their experiences with peyote. Such visions were usually accompanied by nausea and vomiting.

In ceremoniel uses, the Huichol smoking of the *yé/tumutsáli* mixture is frequently accompanied by ingestion of peyote, *tesquino* or *nawa* (fermented maize drink) *cái* or *sotól* (cactus distillate), and tepe (another alcoholic beverage). Such combinations inevitably produce extremely vivid hallucinations, but less intense visions are obtainable with the smoking mixture alone. Even when other drugs are not used in the peyote ceremonies, the Huichols will continually smoke the mixture throughout the entire night as the mara'akame sings.

CONCLUSION

While the psychoactive properties of the *N rustica/T. lucida* mixture must await further chemical and psychopharmacological identification, it remains possible that the mixture is not hallucinogenic *per se*. Rather, it may be speculated that the smoke itself is inherently evocative of visions and mystery—a natural medium for shamanistic practices. This thesis was originally stated by Brooks (1952): "Tobacco fully met the conditions which primitive people required of a plant set aside at first for magic or ritualism. It contained an element which could induce a form of trance, it was readily consumed by the cleansing power of fire, its perfumed smoke arose subtly to the abode of the gods, and it had other virtues of magic. From the immaterial, visible substances of smoke, dreams could be materialized" (p. 21). Other virtues of magic may have included tobacco smoke's use as a "smoke-screen" to conceal the movements of shamans (Arents, 1937). Mason (1924) notes that in Mexico and South America the smoke could also be blown to cardinal points or onto affected parts of people undergoing curing. The white clouds of tobacco smoke are also suggestive of and associated with rain clouds and play an important part in many ceremonies for securing rainfall (Mason, 1924, p. 8).

The Huichol ceremonial use of tobacco may have arisen from similar customs elsewhere. Their practice of mixing *yé* with *T. lucida* may have evolved from the Aztec use of *yahutli*. Or, perhaps the mixture evolved from the Aztec practice of mixing tobacco (*yetl*) with many aromatic substances, principally *Liquidarbar stryraciflua* (Mason, 1924). According to the 1790 edition of Hernandez (cited in Guerra, 1971, p. 138), *liquidambar* or *Xochiocotzoquahuitl* was mixed with tobacco to strengthen the head, induce sleep, and mitigate headaches. Another possibility is that the well known properties of *T. lucida* as as an insect repellant may have become attached to spiritual matters and used to cleanse the body through smoking, thus functioning as it does as a bath additive or symbolically in the *Fiesta del pericon*. Such curative uses of smoking mixtures are not uncommon in New World societies. For examples, the Tarahumara shamans mix tobacco with the dry blood of *sope-chi* (bat) and the dried meat of the *muri* (turtle) to purify and protect against the evil of witchcraft.

It also is possible that there were or are several distinct *yahutli* plants which could account for the wide range of alleged effects. Flores (1886) lists 12 separate medicinal uses for *yyauhtli* (pp. 96, 198, 223, 234, 235, 237, 240, 241, 247, 252, 256, 259) and only three appear in lists with tobacco and only one in a list with *cempoalxochitl* (*Targetes erecta* L.). The de la Cruz-Badiano Aztec herbal of 1552 (1939) lists a number of *yauhtli* plants, including *quauhyyauhtli,* which is identified as absinthe. And Soustelle (1955) actually identifies one such *yauhtli* as *Cannabis:* "The fire-god's victims, anaesthetized by *yauhtli* (hashish), were thrown into the blaze". Such a use of *yauhtli,* if actually effective, is better understood as an action of the tetrahydro-

cannabinols in *Cannabis* preparations rather than the apparently subtle, albeit unknown, pharmacologic principles in *Tagetes* spp. Since *Cannabis* was not in the New World in Aztec times, still other psychoactive substances must have been used as *yahutli*. A particularly attractive notion is that some species of *Datura* or *Solandra* was used. The relatively potent amounts of scopolamine and atropine in these latter species could account for the anaesthetic effects, and North American Indians, especially the Algonquin, have an ancient practice of mixing *Datura* with their tobacco and experiencing hallucinogenic effects (Smiley, 1975). Furthermore, the Huichol use of *Kiéri,* identified as *Solandra* or *Datura,* shows an historical familiarity with these compounds. Yet another *yauhtli* may be simply a potent tobacco with high nicotine levels. We have recently assayed two tobaccos reserved for Huichol special occasions in San Andres Coamiata (Jalisco) as *N. rustica* with 18.76% ± 2.6% and 12.-71% ± 1.76% nicotine. These concentrations are perhaps the highest nicotine levels recorded and represent doses which could produce hallucinations and catatonia. Thus, it is possible that other *yauhtli* plants existed but have become linguistically grouped as one.

It may be speculated that yet another set of circumstances led to the use of the *N. rustica*/*T. lucida* mixture. Just as the yellow flowers of *N. rustica* caused early botanists to confuse tobacco with yellow-flowered henbane, so the yellow flowers of *T. lucida* or *N. rustica* may have prompted early Huichol man, who was perhaps already using one of them to experiment with the other. Such notions attempting to account for the origins of this Huichol smoking mixture, are, of course, highly speculative. The maintenance of the practice through reinforcement by a less harsh and more pleasant-smelling smoke than tobacco alone seems more certain.

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