

# HALLUCINOGENIC SNUFF FROM NORTHWESTERN ARGENTINA: MICROSCOPICAL IDENTIFICATION OF *ANADENANTHERA COLUBRINA* VAR. *CEBIL* (FABACEAE) IN POWDERED ARCHAEOLOGICAL MATERIAL<sup>1</sup>

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**Pochettino, M. L.; A. R. Cortella** (LEBA Facultad de Ciencias Naturales y Museo, UNLP, Paseo del Bosque s/n, 1900 La Plata, Argentina) and **M. Ruiz** (UNJu, Avda. Bolivia 1239, 4600 S.S. de Jujuy, Argentina). HALLUCINOGENIC SNUFF FROM NORTHWESTERN ARGENTINA: MICROSCOPICAL IDENTIFICATION OF *ANADENANTHERA COLUBRINA* VAR. *CEBIL* (FABACEAE) IN POWDERED ARCHAEOLOGICAL MATERIAL. *Economic Botany* 53(2):127–132, 1999. Two mummified bodies have been recovered from the Alero I or La Matanza site (15 km from Cusi-Cusi, Dpto. Santa Catalina, Puna of Jujuy, Argentina) in association with characteristic snuffing paraphernalia. The purpose of this work is to identify the powdered material contained in one of the tubes in order to confirm the hypothesis generated from ethnographical sources, that the rapé (snuff) complex was associated with the consumption of *Anadenanthera colubrina* var. *cebil*, Fabaceae, the *cebil*, or, if not, which materials were inhaled. Following analysis with a light microscope, petrographic microscope and scanning electron microscope the unknown material was identified as *cebil* by comparison with reference material and specialized literature.

RAPÉ ALUCINÓGENO DEL NOROESTE DE ARGENTINA: IDENTIFICACIÓN MICROSCÓPICA DE *ANADENANTHERA COLUBRINA* VAR. *CEBIL* (FABACEAE) EN MATERIAL ARQUEOLÓGICO PULVERIZADO. En 1991 se recuperaron dos cuerpos momificados en el Alero I La Matanza (distante 15 km de Cusi-Cusi, Dpto. Santa Catalina, en la Puna de Jujuy, Argentina) en asociación con el ajuar característico del complejo del rapé o complejo alucinógeno. Uno de los tubos de hueso hallados contenía material pulverizado. El objeto de este trabajo es identificar esta muestra con el objeto de contrastar la hipótesis generada a partir de estudios etnográfico que asocia el complejo del rapé con el consumo de *Anadenanthera colubrina* var. *cebil*, Fabaceae, el *cebil*, o en caso negativo, identificar el material empleado. Mediante análisis con microscopio fotónico, microscopio petrográfico y microscopio electrónico de barrido se identificó la muestra como *cebil* por comparación con material de referencia y bibliografía especializada.

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In March 1990 two mummified human bodies were accidentally found at a rock shelter over the left margin of Matanza river, 15 km from Cusi-Cusi, a small village in the Department of Santa Catalina, province of Jujuy, northwestern Argentina (Fig. 1).

The site, Alero I La Matanza, is a shelter 7 m wide and 2 m deep, with a height from 2.05 m in the entrance to 0.60 m in the bottom. The desiccated bodies were found on the right half of the site. Both of them had been buried with the legs in flexed position (according to Ubelaar 1978:14). They were covered with two mantles of very fine wool of Camelidae and showed

skull deformation. In association with the bodies, artifacts related to the hallucinogenic snuff complex or rapé complex (Fig. 2) were recovered.

In the consumption of hallucinogens a complex of distinctive artifacts as described by González (1977:367–370) was used in the south-central Andes. This artifact complex consisted of a usually cylindrical container of wood, bone, or shell, a small, delicately engraved spoon made of wood or bone, used to extract a measured quantity of the powder from the container. The powder was deposited on a wooden or stone tablet from which it was inhaled by means of a decorated wooden or bone tube.

The most important period for hallucinogenic snuffing seems to have coincided with the Ti-

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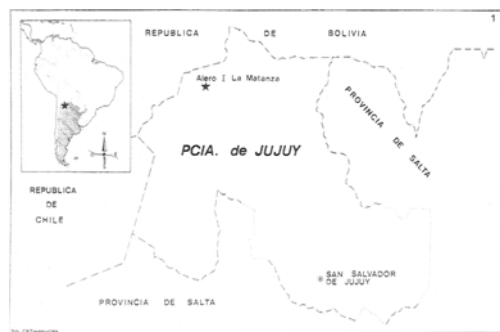


Fig. 1. Study area.

wanaku expansion (ca. A.D. 600–1000). Nevertheless, artifacts of the hallucinogenic complex are more frequently found in archaeological records from peripheral areas of Tiwanaku, such as the area of San Pedro de Atacama and northwestern Argentina. After A.D. 500, San Pedro de Atacama became one of the most important centers of the snuffing complex in south-central Andes as a result of its relationship with Tiwanaku. These elements appeared in northwestern Argentina several centuries later (A.D. 900–1000) and they persisted until Inca occupation in the fifteenth century (Pérez Gollán and Gordillo 1993). Furthermore, in northwestern Argentina the presence of these elements is recorded from the beginning of Late Period (A.D. 850–1480).

The characteristic elements of this complex found at the Alero I or La Matanza site are: a wooden tablet (13 cm × 4 cm) with a feline zoomorphic motif in the handle, a cylindrical vessel made of wood (6 cm long × 3 cm diam.) with a high relief ring in the middle, two bone tubes. The first bone tube (9 cm long × 2.5 cm diam.) has a leather cover only in one end. The other bone tube (11.5 cm long × 2.5 cm diam.) has both ends covered with a leather sheath and contains powdered material.

This complex has been related to the consumption of cebil or vilca [*Anadenanthera colubrina* var. *cebil* (Griseb.) Altschul, *Fabaceae*] in ethnographic and historic records in areas, such as the Chaco, peripheral to the Andean region. Several authors have observed that, in the Chaco, the seeds of cebil previously powdered in a tablet were snuffed by means of tubes (Ambrosetti 1967:226–227; Pardal 1936; Serrano 1934). Therefore the practice of snuffing hallucinogens in the Andean region has been inferred from the archaeological artifacts (Berenguer R.

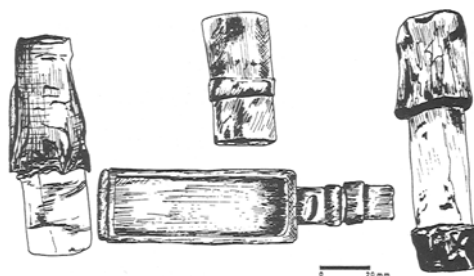


Fig. 2. Paraphernalia of snuffing complex found in Alero I La Matanza.

1987). But remains of the snuff powder seldom have been found (Altschul 1972:60) and never identified.

Archaeological evidence has shown that the smoking of a variety of substances was common in northwestern Argentina. In the eastern sector of northwestern Argentina, the use of pipes to smoke cebil is very old. It was probably adopted from peoples of the Chaco region, and then acquired by the inhabitants of valleys and gorges, and in the puna all the way to the Puna of Atacama, beyond the Andes (Pérez Gollán and Gordillo 1993). Aguerre et al. (1975) cite the presence of cebil seeds in preceramic levels (2130 B.C.) at Incacueva, a site in the northwest of the Department of Humahuaca in the Puna border of the Province of Jujuy, Argentina. The carbonized substance from the interior of two bone pipes has been found to be similar in chemical reaction to *N,N*-dimethyltryptamine (Fernández Distel 1980). This alkaloid is also present in cebil and other *Anadenanthera* taxa, as well as in hallucinogens of such other families as *Myristicaceae* (*Virola* spp.) (Evans 1991: 811; Schultes and Hoffman 1980:135).

Other possible hallucinogens have been reported from northwestern Argentina: leaves of tobacco (*Nicotiana* spp., *Solanaceae*) and the root of coro (possibly *Trichoclina* sp., *Asteraceae*). Both of these are usually smoked, mixed, rather than being snuffed (Pérez Gollán and Gordillo 1993).

The purpose of our study is to identify the powdered material contained in one of the tubes in order to confirm the hypothesis generated from ethnographical sources, that the rapé (snuff) complex was associated with the consumption of *Anadenanthera colubrina* var. *cebil* or, if not, which materials were stored in the tube for inhalation.

## MATERIALS AND METHODS

The powdered sample found in one of the bone tubes from Alero I La Matanza site was sent to the Laboratorio de Etnobotánica y Botánica Aplicada (LEBA) at the Facultad de Ciencias Naturales y Museo de La Plata. The sample was observed both hydrated and dehydrated and was compared with samples from voucher specimens from LEBA collections and Museo de La Plata herbarium (LP) and relevant literature (Corner 1951; Esau 1982:431–433; Mauseth 1988:434; Winton and Winton 1935:295). According to anthropological literature cited above, the plants and plant parts that could be the source of the powder were: leaves of *Nicotiana tabacum*, seeds of *Anadenanthera colubrina* var. *colubrina* and var. *cebil* and coro root.

Seven samples of the archaeological powder and eight samples of reference material have been analyzed using stereomicroscope, light microscope, petrographic microscope, and scanning electron microscope as outlined by Cortella and Pochettino (1994). The inorganic fraction was analyzed using infra-red microspectroscopy.

## RESULTS

The components of the powder within the tube included what appeared, under low magnification, to be crystals. Their crystalline structure was confirmed their birefringence in the polarized light of the petrographic microscope. Infra-red microspectroscopy revealed two spectra which correspond to the different particles present in the sample: Spectrum 1: mostly bands of an inorganic sulfate (possibly an alcalinoterreum metal); Spectrum 2: weaker bands superimposed on other bands of unknown origin and water.

Fragments of brown seed coat, probably toasted, and amorphous masses of storage parenchyma were found in association with these crystals by means of a stereomicroscope. No evidence of vegetal structures that could be associated with *Nicotiana tabacum* and coro were found.

As the seed integuments were macroscopically very similar to those of *cebil*, comparison (both optical and scanning electron microscopy) between the archaeological material and fresh seeds of both *Anadenanthera colubrina* var. *colubrina* (although its area of distribution was far from the site of its recovery, see Discussion) and var. *cebil* was carried out.

The seed coat of *cebil* (the variety *cebil*)

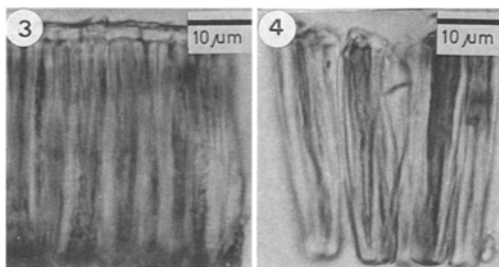


Fig. 3. Seed coat of *Anadenanthera colubrina* var. *cebil*: reference material, optical microscope.

Fig. 4. Seed coat of *Anadenanthera colubrina* var. *cebil*: archaeological material, optical microscope.

shows the characteristic structure of the Fabaceae. The outer layer is formed by one row of palisade cells (macrosclereids or columnar cells) of about 40–45  $\mu\text{m}$  long, with an enlarged internal end. An inner layer (subepidermis) of isodyametric cells with thin walls can be observed (Fig. 3, 5). The variety *colubrina* shows the same structure but the columnar cells are much smaller (of ca. 15–17  $\mu\text{m}$  long).

The characteristic macrosclereids can be observed in the archaeological material (Fig. 4, 6) showing a length that corresponds to the variety *cebil*. It was hard to find the internal layer because of the hydrolysis of laminae media which produces the disintegration of the tissues.

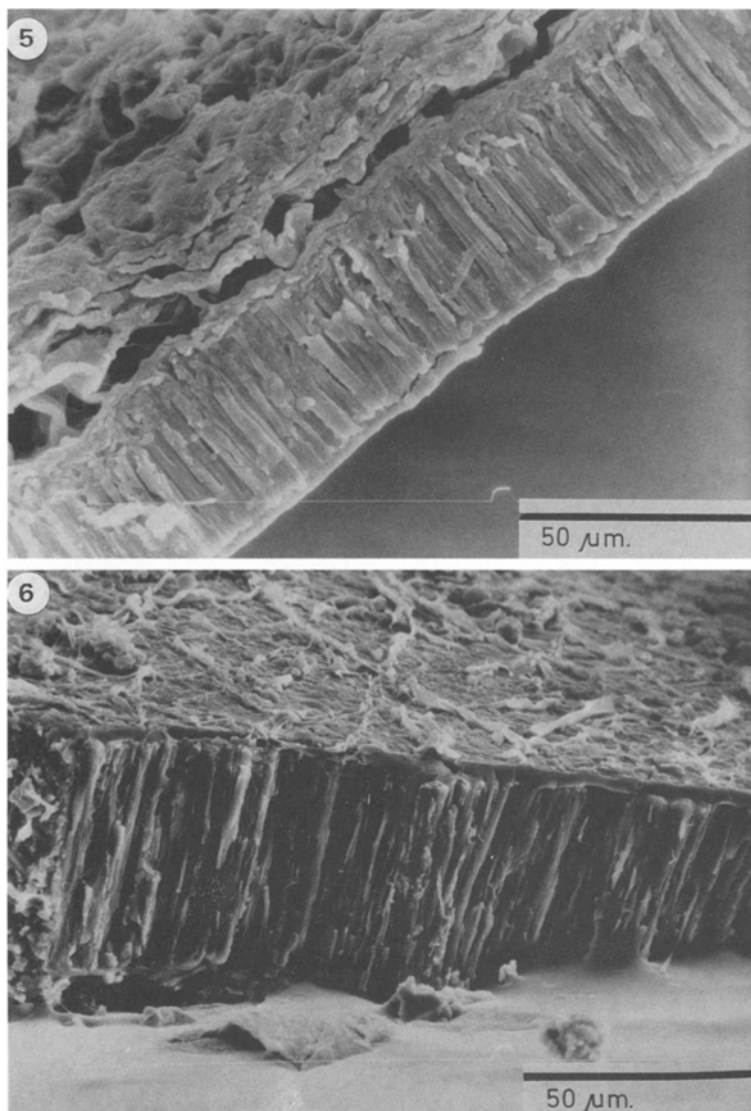
The different layers of cellulose which form cell walls can be observed in dehydrated material, both present and archaeological (Fig. 5, 6), but this feature is not observed in rehydrated material where the walls are swollen.

Therefore, we identify these seeds as *Anadenanthera colubrina* var. *cebil*.

## DISCUSSION

The genus, *Anadenanthera*, endemic to South America and the Caribbean Islands comprises two species and four varieties (Altschul 1964).

1. *Anadenanthera peregrina* (L.) Speg.  
var. *peregrina* (yopo or cohoba) occurs in Northwestern Brazil, Guyana, Colombia, Venezuela and West Indies.  
var. *falcata* (Benth.) Altschul is found in Southern Brazil and Paraguay.
2. *Anadenanthera colubrina* (Vell.) Brenan.  
var. *colubrina* (curupay) grows in Northeastern Argentina and Southeastern Brazil.



**Fig. 5.** Outer layer of the seed coat of *Anadenanthera colubrina* var. *cebil*: dehydrated reference material, SEM.

**Fig. 6.** Outer layer of the seed coat of *Anadenanthera colubrina* var. *cebil*: dehydrated archaeological material, SEM.

var. *cebil* (Griseb.) Altschul (cebil or vilca) occurs in Northern Argentina, Bolivia, Brazil, Paraguay and Peru.

All of these have been used by various ethnic groups as hallucinogens (Altschul 1972; Schultes and Raffauf 1990). The ground seeds are used in different ways: they may be snuffed, drunk mixed with chicha or administered as enemas. The high degree of association of *Anadenanthera* with inhalation is illustrated by an-

other common name recorded for all the taxa, paricá, which means snuff (Schultes 1967).

Little information is found about cebil preparation in the ethnographic literature. Nonetheless, there is a considerable number of descriptions of snuffs made of yopo. The seeds may be used either dried or toasted, with or without the addition of lime or ashes. In some cases the pods are allowed to ferment before the seeds are used. Apparently, other plant ingredients are not em-

ployed in elaborating yopo snuff, except for the occasional addition of cassava flour to make a kind of cake (Cooper 1963; Schultes and Hofmann 1980:142).

The snuff made of *Anadenanthera* seeds is taken as a stimulant or an hallucinogen for such purposes as magic or religious ceremonies and the diagnosis of illness by means of divination (Cooper 1963; Schultes and Raffauf 1990:230–231).

At present, in some areas of northwestern Argentina the seeds of cebil are used to prepare an infusion taken mostly for disorders said to be of supernatural origin (Martínez and Pochettino 1992).

Schultes and Hofmann (1980:148–149) mention the presence of bufotenin and other related tryptamines in the genus *Anadenanthera*. According to Duke (1985:34) the active agents of *Anadenanthera colubrina* var. *cebil* are N,N-dimethyltryptamine and related tryptamines, which like bufotenin are closely related to serotonin. He states that active tryptamines apparently reach the brain from the nasal mucosa without a general circulation through the blood stream. Bufotenin was isolated from seeds of *Anadenanthera peregrina* collected by Richard Spruce among the Guahibo Indians of the Upper Orinoco Valley in 1854 (Schultes et al. 1977) and in the seeds of an *Anadenanthera* species collected in Brazil by the zoologist Johann Natterer between 1817 and 1835 (de Smet and Rivier 1987). Schultes et al. (1977) reported that all tryptamines except bufotenin disappeared in seeds of *Anadenanthera* sp. after two years storage. Until now the identification of the substances employed as hallucinogens in the central-southern Andes has been attempted with the snuff complex only once in connection with pipes and then only by means of residue chemical analysis, which reacted in the same way as N,N-dimethyltryptamine (Fernández Distel 1980). The presence of this alkaloid is not conclusive because it is present in other hallucinogens (Evans 1991:811; Schultes and Hoffman 1980: 135).

### CONCLUSIONS

Our finding, along with ethnographic evidence, supports the identification of cebil as the substance which has occasionally been found with the archaeological snuffing complex.

Species different from *Anadenanthera* such as

tabacco and coro, also said to be hallucinogenic, can be eliminated on micromorphological evidence. Although microscopic evidence is not conclusive at the infraspecific level, it is assumed that the taxon employed is *Anadenanthera colubrina* var. *cebil* because this variety is the one observed by ethnographers and historians as consumed in areas peripheral to the Andean region. Furthermore it grows spontaneously in the lowest level of the forest on the eastern slopes of the Andes, from Peru to Argentina. Therefore it could have been available to the populations of highland northwestern Argentina and northern Chile by means of exchange. The northwest of Argentina seems to be a connecting zone in the exchange of material and symbolic goods with western regions. In addition to providing hallucinogenic plants, northwestern Argentina passed the knowledge of their use in the religious context to populations of the eastern lowlands, forming a circuit that Pérez Gollán and Gordillo (1993) named “the route of cebil.”

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