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# PREHISTORIC REEDGRASS *(Phragmites)* "CIGARETTES" WITH TOBACCO *(Nicotiana)* CONTENTS: A CASE STUDY FROM RED BOW CLIFF DWELLING, ARIZONA

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ABSTRACT.—Tubular culm (stem) segments of a hollow, robust grass (Gramineae), one end filled with plant material, have preserved in caves and rockshelters representing a variety of cultural traditions in the Greater Southwest. These items, commonly referred to as "reedgrass cigarettes," are generally presumed to represent ritual smoking. A study of twelve cigarettes from Red Bow Cliff Dwelling in Arizona provided the impetus to summarize anatomical and morphological criteria for distinguishing *Phragmites* from *Arundo* culms, as well as to delineate features that permit segregation of some species of tobacco *(Nicotiana)* when only stem fragments are recovered. The body of each Red Bow cigarette was formed from a stem of *Phragmites australis* (reedgrass). Broken stems similar to *Nicotiana attenuata,* a native tobacco, comprised the filling material of at least four specimens.

RESUMEN.—Segmentos huecos de un culmo tubular (tallo) de un zacate robusto (Gramineae), una terminación llena con material vegetal, lue preservado en unas cuevas y lechos de roca representando una variedad de tradiciones culturales en el gran Suroeste americano. Estos articulos comunmente son referidos como "cigarros de carrizo," se piensa generalmente que representan rituales de fumar. Un estudio de doce cigarros del Red Bow Cliff Dwelling en Arizona proveen de impétu para resumir criterios anatómicos y morfológicos para distinguir los culmos de *Phragmites* de *Arundo,* asi como para delinear caractertísticas que permitan separar algunos especies de tabaco. El cuerpo de cada cigarro de Red Bow fue formado del tallo de *Phragmites australis* (carrizo). Un tallo roto similar a *Nicotiana atteniuata,* un tabaco nativo, comprendio el material de relleno de por lo menos cuatro especimenes.

RESUME.—Quelques segments tubulaires des tiges creux robustes gramineés, avec un bout bourré d'herbage, se sont préservés dans les cavernes et les abris rocheux d'un gran variété de traditions culturels du Grand Sud-ouest. Cettes choses, communément appellées comme les "cigarettes de roseaux," se présument généralement comme des appareil de fumer rituellement. Une étudie de douze spécimens du Red Bow Cliff Dwelling en Arizona nous a inspiré à résumer des critères anatomiques et morphologiques por distinguer des tiges de *Phragmites* de ceux de *Arundo.* Nous discoutons aussi les traits qui permittent que l'on distingue entre quelques espèces du tabac *(Nicotiana)* quand on ne recouvre que des fragments des tiges. Le corps de chaque cigarette de Red Bow s'est formé d'un tiges du roseau *(Phragmites australis).* Des tiges rompés semblables à ceux d'un tabac natif *(Nicotiana attenuata)* comprend la tripe d'au moins quatre spécimens.

## INTRODUCTION

Large numbers of "reedgrass cigarettes," alternatively referred to as "cane cigarettes," "ceremonial cigarettes," "tubular pipes" or "prayer tubes," have preserved in prehistoric caves and rock shelters representing a diversity of cultural traditions and geographical locations in the Greater Southwest. Their presence in Mogollon, Anasazi, Hohokam, and Salado sites, and from prehistoric locations in the Great Basin, the Trans-Pecos area and Mexico has been summarized by Grange (1952:353–354) and Switzer (1969). Grange suggested that Mogollon groups were the first to utilize these items, and pointed out that each cultural group employed distinctive methods to embellish and decorate them.

This study reviews the literature on reedgrass cigarettes and adds a botanical dimension to the cultural, geographical and chronological information already available. While there is no reason to suspect that the majority of previous identifications of this artifact class are incorrect, this research contributes a set of anatomical and morphological criteria that enhances replicability in identification. In an attempt to recognize the material of cigarette body construction, criteria were established in which the robust, hollow stems of reedgrass (*Phragmites australis* (Cav.) Trin. ex Steudel. as *Phragmites communis* Trin.)[1] could be distinguished from those of the giant reed (*Arundo donax* L). An ethnobotanical summary of diverse taxa and parts smoked in historic times provided a starting point for an attempt to identify the cigarette filler material. One contribution has been to delineate some of the differences between stems of two native (*Nicotiana attenuata* Torr., *N. trigonophylla* Dunal.) and one domestic species of tobacco (*Nicotiana rustica* L.).

*Typical Construction.*—Regardless of affiliation or location, "reedgrass" cigarettes are similarly constructed (Fig. 1). In most cases the body has been formed from

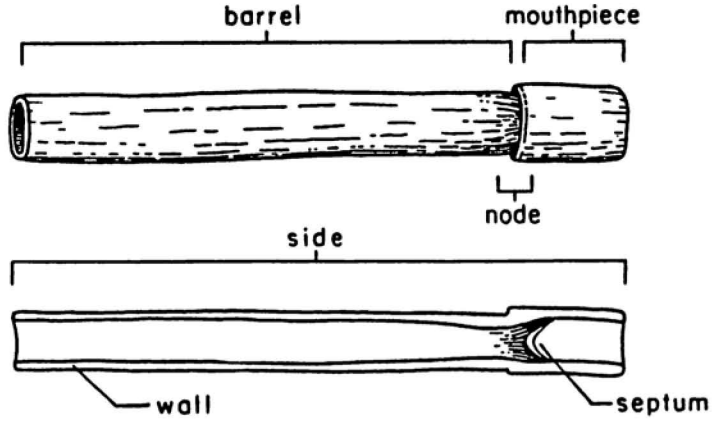


FIG. 1.—Features of cigarette body, adapted from Switzer (1969:37). The "barrel" is sometimes referred to as the "bowl."

the stem (culm) of a robust, hollow grass by first pulling off the leaves, and then by making two right angle cuts to detach a segment. The resulting hollow chamber is divided into a longer "barrel" and a shorter "mouthpiece" by the presence of a natural internal septum (a partition or cross wall) nearer one end. The size range of cigarettes can vary considerably. For example, metric data available on over half (n=752) of a very large (n=1200+) collection of specimens from Red Bow Cliff Dwelling in Arizona reveal they range from 15–205 mm in length and from 4–19 mm in diameter (Gifford 1980:78).

*The Cigarette Body.*—Specific criteria of identification for the cigarette body have not been reported in the literature. When a scientific name for the grass is noted, it is almost invariably *Phragmites* or *Phragmites australis* (as *Phragmites communis),* a robust, hollow stemmed reedgrass that grows in riparian habitats in the West. In one location, however, the cigarettes from Fate Bell Cave along the Pecos River in Texas were said to be constructed from lengths of *Arundo donax* (Switzer 1969:43), an Old World species presumably introduced into the Americas in historic times (Gould 1951:93).

Variation in the condition of these cigarettes is notable (summarized in Grange 1952:351–354). Some have had a small hole pierced through the septum, apparently to permit the passage of air. Many others remain unpierced. Some have been burned on the "barrel" end, or all along the length, yet many remain unburned. Others were painted or wrapped with woven cotton sashes and sometimes tied together in groups (Haury 1945:195), or had small beads attached or were tied to miniature bows (Grange 1952:351–354).

*The Cigarette Contents.*—The broken or pulverized plant material present in the longer "barrel" portion of many specimens has been the subject of great interest, but of few detailed analyses. As with the material of cigarette body construction, the anatomical and morphological criteria of identification of the contents are not given. Hough (1914) commented that the contents of cigarettes in the Upper Gila region were composed of fragments of aromatic herbs, such as "artemisia," and other plants not determined. Haury noted that the chief substance in cigarettes of Double Butte cave was of a woody nature, highly charged with pitch, and possibly representing the scaly bark of "ocatilla" (1945:194). Smoking materials listed for other locations include "red willow" (Bandelier 1890:49–50), *Larrea* (Jones 1935:289) and "cedar" (Coffin 1932:32).

Identifications of the cigarette contents as native species of tobacco (e.g. *Nicotiana)* can also be found. In the Hohokam area, Fewkes noted early in this century that "A small dish containing native tobacco *(Nicotiana attenuata)* was found in one of the rooms" at Casa Grande pueblo (1912:143). Jones later (1935:289) identified *Nicotiana attenuata* in ceremonial cigarettes from this same site. For the Mogollon region, Grange (1952:418) listed small dried stems of *N. attenuata* in a few reed cigarettes from Tularosa Cave, and Cosgrove reported similar material from caves in the Gila and Hueco areas (1947:121). An extensive Anasazi record of *Nicotiana* use (though not specifically in reedgrass cigarettes) has been summarized by both Winter (1990) and Adams (1990).

There are limited records to the recovery of domesticated species of tobacco in Southwestern sites. Some of the Double Butte Cave specimens in Arizona were noted to have highly pulverized and oxidized leaves of *Nicotiana tabacum* (Haury 1945:194), though this identification seems problematical since *N. tabacum* was presumably unknown north of Mexico in aboriginal times (Setchell 1921:401). The seeds of *Nicotiana rustica,* previously known from Middle and Late Woodland agricultural contexts in the eastern United States (Ford 1981:19; Asch and Asch 1985:195), have also been reported from ancient Hohokam sites in Arizona (Miksicek 1983a, 1983b, 1983c, 1984, 1986; Miksicek and Gasser 1989), although these records lack detailed identification criteria.

*Cigarette Function.*—Different opinions as to the function of reedgrass cigarettes have been offered. A primary opinion is that they served ceremonial needs through time and across space (Jones 1944:455). This suggestion is based not only on the fact that none (Haury 1945:194) or few (Gifford 1980:78) of the cigarettes at some prehistoric sites show any evidence of having been smoked, but also on the associated sacred paraphernalia that often accompanied them (Gifford 1980:11). Support for this idea comes via reports that reedgrass cigarettes have often been used by Southwestern U.S. historic groups to provide smoke to make a path for prayer to the gods, or to provide for the general good of the tribe (Bohrer 1962:87). Such cigarettes, often deposited in shrines, were barely touched with a live coal as an offering for supernaturals (Switzer 1969:40); such a practice might leave many reeds uncharred except for the end.

An alternative view of cigarette function was expressed early in this century by Linton (1924:9). He suggested that some of the prehistoric reedgrass cigarettes with completely charred barrels probably represented smoking for personal pleasure. Personal satisfaction is listed as the reason why the Seri in Sonora, Mexico currently smoke parts of native plants, including *Nicotiana,* in reedgrass pipes (Felger and Moser 1985:165).

Use of reedgrass for alternative purposes would not produce items with precisely the same characteristics as cigarettes. For example, flutes and gaming pieces require stem segments with multiple or no septa, and are often embellished with additional perforations and designs (Russell 1975:166, 176). Arrowshafts might display characteristics such as tapering, notches, or reinforcement with additional pieces of reed or wood (Coffin 1932:31–32).

*The Problem.*—Detailed analyses of this class of artifacts has been neglected, in part because of the difficulties involved in identification of fragmented barrel contents. Nevertheless, it would be valuable to know something about the range of materials conceived useful as the filling for reedgrass cigarettes, and to know if only one type of robust grass was routinely chosen to form the cigarette body.

## METHODS AND RESULTS

A pilot study employing morphological and anatomical criteria has been undertaken to these ends. A small sample of twelve uncharred cigarettes were chosen from the hundreds recovered from the Red Bow Cliff Dwelling, an A.D.

1325–1400 Mogollon/Pueblo site in the Point of Pines region 65 miles east of Globe, Arizona (Gifford 1980). Red Bow is a 5-room cliff dwelling with evidence of both ceremonial and domestic activities. The cigarettes chosen for this study were all from Room 4, which contained numerous items considered to represent ceremonial paraphernalia (Gifford 1980:24).

*Description of the Body of Red Bow Cigarettes.*—In all cases, the cigarette body consists of two hollow internodes linked at a node (with internal septum) which is located nearer one end than the other. The longer end will be referred to as the "barrel" and the shorter internode the "mouthpiece," according to terminology suggested by Switzer (1969:37). The twelve specimens vary in length from 3.0–11.1 cm, range from 0.9 to 1.3 cm in diameter, and are generally round in cross section (Table 1).

TABLE 1.—*Red Bow "cigarette" body dimensions and data. Organized from longest to shortest specimen.*

| Cigarette No. | Length (cm) | Diameter (cm) | # pieces in barrel | No. of cuts Distal | Proximal | U.A. Number |
|---|---|---|---|---|---|---|
| 1 | 11.1 | 1.0 x 1.1 | 2 | 3 | 3 | A-17021x |
| 2 | 9.6 | 1.0 x 1.0 | 4 | 8 | 8 | A-17025x |
| 3 | 9.0 | 1.0 x 1.1 | 4 | 8 | 7 | A-17025x |
| 4 | 8.3 | 1.2 x 1.3 | 3 | 12 | 5 | A-17021x |
| 5 | 8.0 | 1.1 x 1.1 | 4 | 2 | 2 | A-17046x |
| 6 | 7.9 | 1.3 x 1.4 | 3 | 4 | 3 | A-17020x |
| 7 | 4.4 | 1.3 x 1.4 | 3 | 6 | 7 | A-17025x |
| 8 | 3.8 | 1.1 x 1.1 | 7 | 4 | 5 | A-17021x |
| 9 | 3.8 | .9 x .9 | 7 | 2 | 2 | A-17025x |
| 10 | 3.8 | .9 x 1.0 | 5 | 3 | 1 | A-17020x |
| 11 | 3.0 | 1.0 x 1.1 | 5 | 8 | 6 | A-17021x |
| 12 | 3.0 | .9 x 1.0 | 7 | 1 | 2 | A-17017x |

For eleven specimens the "mouthpiece" of the cigarette corresponds to the proximal end of the stem, and the "barrel" comprises the distal end; the reverse is true only for specimen #8. The nature of both the proximal and distal ends revealed that the common method of preparation was to make a series of small cuts around the circumference of a stem, then apply pressure to snap the specimen free. In two specimens (#10 and #12) a single continuous cut was made, perhaps by rolling the stem on a hard surface while applying pressure with a cutting implement. The septum of each specimen has been pierced to produce a round, small (1–2 mm diameter) hole.

*Identification of the Body of Red Bow Cigarettes.*—The cigarette body of all 12 specimens represents stem material with the parallel veining and bundled arrangement of vascular tissue characteristic of plants known as monocotyledons. The sturdy stems have solid nodes (a node is a point where a leaf or bud arises) and hollow internodes. A small, raised elliptical area above the node in each specimen may represent an undeveloped bud.

The characteristics listed above suggest the Red Bow cigarettes were made from a species of grass belonging to the Festucoideae (Pooideae) subfamily, or to an additional smaller group of grasses including some in the subfamily Arundinoideae, all of which are characterized by large, hollow internodes (Brown *et al.* 1959:120). Within these subfamilies I believe there are only two species of grasses in the Southwest with sturdy stems over 1.0 cm in diameter. These include *Phragmites australis* (=*Phragmites communis)* and *Arundo donax.* Native *Phragmites* is widely distributed in the Southwest in moist locations below 6000' (Gould 1951:93–94). Introduced *Arundo* grows best along irrigation ditches and watercourses in the southern portion of the United States and in Mexico (Gould 1951:93). Although considered a recent addition to New World flora, *Arundo* was included in this study for two reasons: (1) Southwestern rockshelters can contain organic materials of diverse age, and the Red Bow specimens have not been directly dated, and (2) on occasion archaeological deposits have revealed that taxa commonly considered to have been introduced historically were in fact present in an area in prehistoric times (Betancourt *et al.* 1984; Chapman *et al.* 1974).

A comparison of the Red Bow specimens to modern *Phragmites* stems of similar diameter revealed close correspondence between them. Both had an elliptical bud scar above each node. Transverse (cross) section comparison of internodal segments reveal vascular and support tissue that occupies approximately ⅓ of the volume of the stem (Fig. 2a). The epidermis is subtended by a zone of clear (translucent) cells with thick lignified walls (sclerosed tissue). Interior to this clear zone, the vascular bundles are spaced in two-three rather irregular rows within a background of large, thin-walled parenchyma cells (see also Metcalfe 1960:386–387 and Stant 1953).

A comparison of the Red Bow specimens to modern *Arundo donax* culms was less satisfactory. The primary reason lies in the arrangement of vascular bundles in *Arundo,* which are in up to four or more irregular rows (Fig. 2b). *Arundo* grass also usually develops prominent side branches above many of its nodes, and in transverse section displays a much less prominent translucent layer of support tissue beneath the epidermis (see also Metcalfe 1960:48).

These anatomical and morphological criteria suggest that *Phragmites* is more likely the material of Red Bow cigarette body construction. It was gratifying to eliminate *Arundo* on the basis of anatomy and morphology, rather than to depend solely on its reputation as an historically introduced taxon. One might be able to further support this conclusion by evaluating phytoliths (microscopic mineral particles deposited within and around the cells of certain plants) that occur in the stems of both *Phragmites* and *Arundo;* at least one study (Ollendorf *et al.* 1988) reveals that phytoliths deposited in the leaves of these two genera are distinguishable.

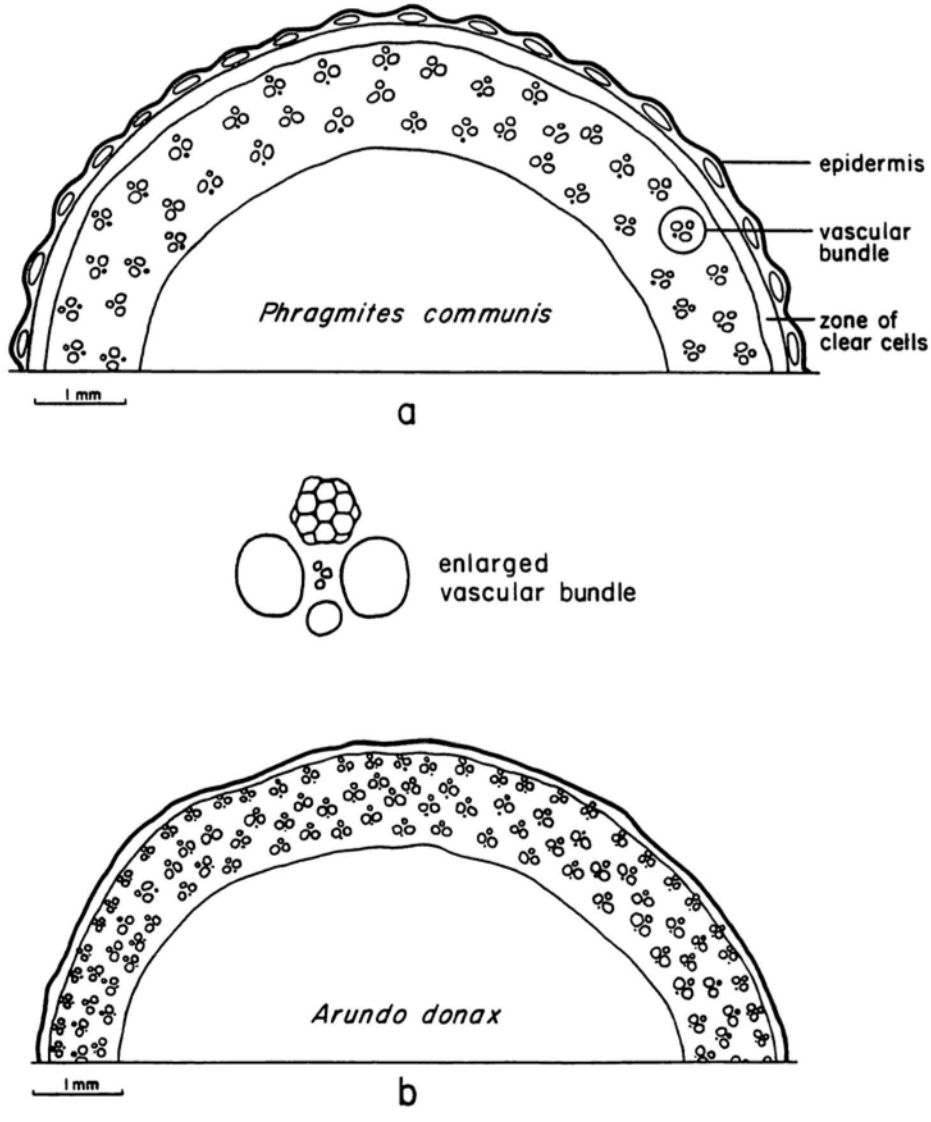


FIG. 2.—Transverse section of culms of equal diameter of a) *Phragmites australis* (Cav.) Trin. ex Steudel. (=*Phragmites communis* Trin.), and b) *Arundo donax* L., showing general arrangement of vascular bundles.

Apparently the relative strength of *Phragmites* stems can be influenced by harvesting (Stant 1953:237–238). Repeated cutting of reedgrass beds induces improvement in the strength of culms via increased lignification of cell walls, development of fewer internal air cavities, and increase in the length of fibers. These characteristics would tend to promote both rigidity and increased resistance to infiltration by decay organisms. It is within the realm of possibility that

prehistoric peoples were aware of the structural changes in *Phragmites* fostered by occasional management of a reedgrass stand.

*Description of the Contents of Red Bow Cigarettes.*—The contents of each barrel end of all 12 cigarettes were carefully extracted and examined. Care was taken in this endeavor, since five of the prehistoric tubular reed pipes identified by Jones (1935:289) were apparently filled in a certain order. In the case of the Red Bow specimens, from two to seven pieces of a single type of coarse material as long as the barrel had been packed parallel to the stem axis. The method of filling seems to have consisted of inserting a bundle of material into the barrel until it reached the septum, then breaking off any extra that lapped out over the end. This sole mode of packing applied to all twelve specimens.

Insect activity had extensively damaged the material inside most cigarettes. Insect body parts and frass (combination of plant debris/insect excrement) were observed in nearly every specimen. Often the frass had piled up against the septum, appearing to the naked eye like a fine powder. It might be possible to mistake this debris for minced plant material intentionally packed inside.

The following composite description generally characterizes the barrel contents of all twelve specimens examined at 50x magnification. No mature reproductive parts (fruit, seeds) or diagnostically valuable leaves or flowers were present. Rather, only stem segments and broken stem fragments were recovered. Pieces that are complete in circumference have a thin epidermis, a relatively narrow section of what appears to be xylem tissue, and a large interior area that is often empty but occasionally composed of large irregularly-shaped cells (Fig. 3). This pith region in many specimens has been replaced with insect frass. The xylem tissue contains round, thick-walled cells (fibers) where it joins the pith, and some larger conducting (?) vessels irregularly scattered among the background of small rectangular cells. The xylem ranges from 0.23–0.84 mm in width, comprising roughly one-tenth of the diameter of the stem. Phloem tissue cannot be distinguished. Narrow rays are present and abundant.

On a number of specimens there is clear evidence that the stems had an alternate branching pattern. The thin and narrow branches barely diverge from the main portion of the stem, but this appressed appearance may be partly due to the effects of packing. Occasionally two stuctures emerge simultaneously at a branch point; it is possible that the outer of these structures represents a long and narrow leaf petiole, while the inner structure is a side branch that has developed in the leaf axil.

The exterior surface of the barrel content material is diverse. Four specimens (#1, #2, #3 and #9) display short, glandular hairs (trichomes). These hairs are abundant in specimen #3, but have preserved only in a protected axil area in the other three. The contents of the remaining cigarettes have surfaces that are generally slightly wrinkled, but without hairs or other notable features.

*Identification of the Contents of Red Bow Cigarettes.*—The anatomical characteristics described above suggest that all the barrel contents represent herbaceous dicotyledons in a somewhat advanced state of growth (Esau 1977:306–309). The material

lacks the multiple growth layers typical of stems older than one growing season in age. It is likely the specimens derive from robust annual plants, or represent young growth in perennials.

To provide a starting point for the identification of the Red Bow cigarette contents, the modern ethnographic literature was surveyed for some of the materials smoked by historic groups. A variety of taxa and materials were gathered (Table 2), and the literature is especially rich in references to cultivation (Table 3) and use (Table 4) of *Nicotiana* species (for an extensive survey of North American tobacco use, see Winter 1990). Of the items listed in Table 2, parts such as conifer needles and minute feathers were easily eliminated from consideration. By direct comparison to herbarium material, the remainder of the Table 2 taxa were also eliminated because they were opposite-branching, lacked the appropriate proportion of pith, displayed no trichomes, had sessile or clasping leaves, or differed in other ways.

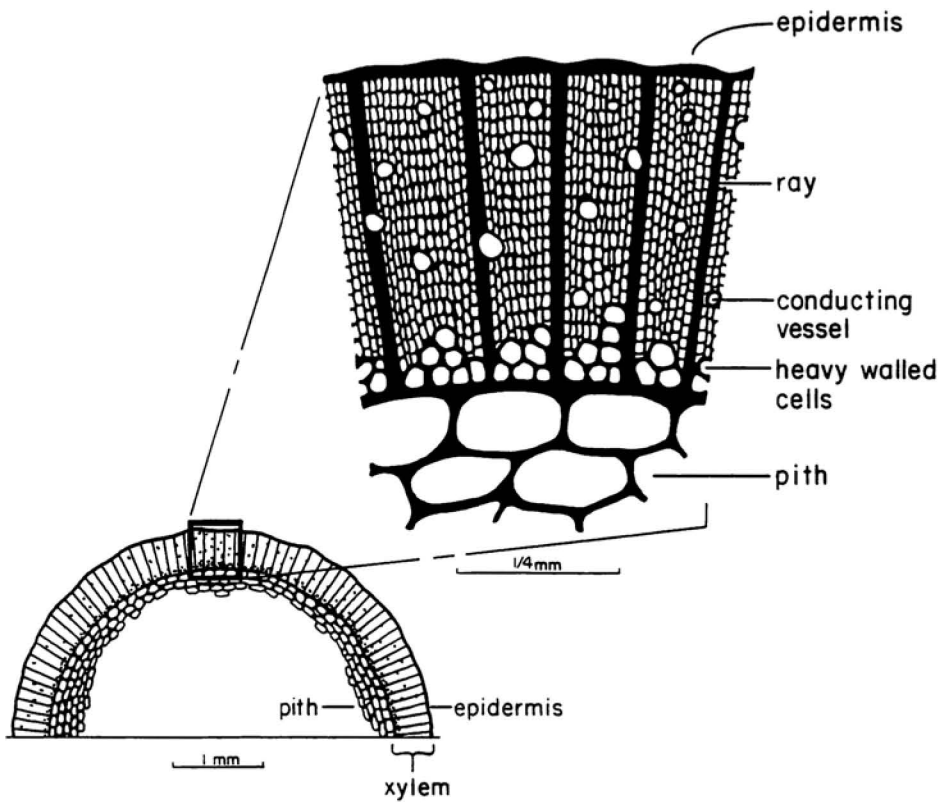


FIG. 3.—Composite drawing of the transverse section of stem segments that comprise the contents of Red Bow cigarettes.

TABLE 2.—*Smoking materials of some historic North American groups. Data on Nicotiana species are summarized in Tables 3 and 4.*

| Taxon | Part | Group | Reference |
|---|---|---|---|
| *Abies* (fir) | needles | Hopi | Whiting 1966:62 |
| *Arctostaphylos* (manzanita) | leaves | S. Paiute | Bye 1972:94 |
| | | Cochiti | Lange 1968:149 |
| | | Ramah Navajo | Vestal 1952:38 |
| *Eupatorium* (thoroughwort) | leaves | Cochiti | Lange 1968:149 |
| *Mentha* (mint) | plant | Kayenta Navajo | Wyman and Harris: 1951:40 |
| *Mirabilis* (four o'clock) | | Acoma/Laguna | Swank 1932:54 |
| *Oenothera* (evening primrose) | flowers, roots, leaves, seed pods | Ramah Navajo | Vestal 1952:37–38 |
| *Onosmodium* (false gromwell) | leaves, stems, flowers | Hopi | Whiting 1966:88 |
| *Pinus* (pine) | needles | Hopi | Whiting 1966:63 |
| *Populus* (cottonwood) | | Hopi | Whiting 1966:71 |
| *Portulaca* (purslane) | leaves | Tewa | Robbins, Harrington and Freire-Marreco 1916:72 |
| *Rhus* (sumac) | leaves | Cochiti | Lange 1968:150 |
| | | Comanche | Carlson and Jones 1940:536 |
| | | Kiowa | Vestal and Schultes 1939:139–140 |
| | | Santa Ana | White 1945:563 |
| *Salix* (willow) | leaves | Kayenta Navajo | Wyman and Harris 1951:18 |
| *Thalictrum* (bedstraw) | plants | Spanish-Americans | Curtin 1965:177 |
| Unknown | minute yellow bird feathers | Hopi | Stephen 1936:75, 172 |

The comparison of the Red Bow cigarette contents to modern *Nicotiana* plants provided the best match. Similarities in transverse section, branching, and the nature and distribution of trichomes suggested that at least some of the prehistoric

material represents tobacco stems, so detailed comparisons to modern tobacco species were considered appropriate. Of the four native species of *Nicotiana* listed for Arizona (Kearney and Peebles 1960:761), two of them (*N. palmeri* Gray and *N. clevelandi* Gray) grow lower than 3000 feet in elevation, and would not be found naturally in the Red Bow area. The annual *N. attenuata* Torr. and annual-perennial *N. trigonophylla* Dunal. grow throughout the state up to 6000′ and 7000′ respectively. Domesticated *Nicotiana rustica* L. was included in these comparisons due

TABLE 3.—*Historic references to tobacco cultivation in the west and southwestern United States.*

| Group | Species | Methods | Reference(s) |
|---|---|---|---|
| Havasupai (AZ) | *N. trigonophylla*, *Nicotiana* sp. | Cut down mesquite tree, burn it; throw tobacco seeds in ashes | Spier 1928:105 |
| Hopi (AZ) | *N. attenuata*<br>*N. trigonophylla* | Scatter seeds on a favorable spot | Whiting 1966:16, 90 |
| Papago (AZ) | *N. tabacum*? | Planted in desert wash; much care given | Castetter and Bell 1942:211 |
| Pima (AZ) | *N. rustica* | Cultivated | Castetter 1943: 322-323 |
| Coahuilla (CA) | *N. attenuata* | Sprinkled over an acre | Barrows 1900:74-75 |
| Tubatulabals (CA) | *N. bigelovii*<br>*N. attenuata* | Pruned and weeded plants on sandy flats | Voegelin 1938: 36-38 |
| S. Dieguenos (CA) | *N. attenuata* | Cultivated near houses on newly burned ground | Setchell 1921:411 |
| Acoma, Isleta, Jemez, Picuris, Santo Domingo, Taos (NMEX) | *N. rustica* | Cultivated | Castetter 1943: 322 |
| Cochiti (NMEX) | *N. rustica* | Grown in garden plots by people important in native ceremonial life | Lange 1968:96-97 |
| Santa Ana (NMEX) | *N. rustica* | Cultivated | White 1941:64-65 |
| Tewa (NMEX) | *N. attenuata* | Formerly cultivated | Robbins, *et al.* 1916:103 |
| N. Paiute (various states) | *Nicotiana* spp. | 12 of 14 bands burned prior to planting | Stewart 1941:376 |

TABLE 4.—*Select southwestern United States references to historic uses of wild tobacco. For an extensive survey of North American groups that have utilized wild tobacco, see Winter (1990).*

| Group | Species | Notes | Reference(s) |
|---|---|---|---|
| Hopi (AZ) | *Nicotiana* spp. | "Cloud-tobacco" a mixture of wild tobacco, other plants, corn pollen, and minute yellow bird feathers | Stephen 1936: 172, 599 |
| | *N. attenuata* | Harvested as "weeds" from garden of other crop(s) | White 1941:65 |
| Pima (AZ) | *N. trigonophylla*, *N. attenuata*, *N. bigelovii* | Smoked; *N. trigonophylla* traded from Papago | Russell 1975:119 |
| Yuma (AZ) | *N. trigonophylla* | Smoked | Goodspeed 1954: 386 |
| Zuni (NMEX) | *N. attenuata* | Clan name | Stevenson 1915: 86 |
| Washoe (NV) | *N. attenuata* | Smoked | Setchell 1921:411 |
| S. Paiutes (various states) | *N. attenuata* | Leaves smoked | Bye 1972:95 |

to recent reports of its presence in prehistoric Hohokam contexts (as previously cited).

The similarity in stem transverse (cross) section between the contents of all 12 Red Bow cigarettes (Fig. 3) and modern *Nicotiana* plants is notable. When stems of equal diameter are compared, the relative proportion of pith to stem wall, the spacing and abundance of rays, and the general arrangement of xylem cells of both *N. attenuata* and *N. trigonophylla* correspond well. However, it is not known to what extent other herbaceous dicotyledons might have stem cross-sections that are confusingly similar.

Specimens #1 and #3 have preserved enough evidence of the alternate-branching pattern to suggest that a smaller side branch from a main stem arose in the axil of a long-petioled leaf. Such an arrangement is characteristic of *Nicotiana attenuata* and *N. rustica* which both display distinctly petioled leaves, at least near the base of their stems, as opposed to the sessile, almost clasping leaves of *N. trigonophylla* (Goodspeed 1954:352, 385, 429).

The presence of trichomes (hairs) of various types, studied in detail on worldwide *Nicotiana* by Goodspeed (1954:102–135), is considered a very useful character in attempts to specifically identify tobacco. At 200x magnification, the

contents of Red Bow cigarettes #1, #2, #3 and #9 have widely-spaced glandular trichomes ranging from 0.12–0.20 mm in length. Such trichomes, composed of short stalks topped with amber-colored glands of one–many cells, are characteristically found on modern *N. attenuata* stems (Goodspeed 1954:133). In contrast, the stems of *N. trigonophylla* are densely covered with longer (0.30–0.40 mm) trichomes, the majority of which are highly branched and lacking amber-colored glands (see also Goodspeed 1954:117, 133). The abundant trichomes on stems of *N. rustica* L. are glandless branched and simple hairs; they also seem a poor match to the four Red Bow specimens.

In sum, the contents of two cigarettes (#1 and #3) have (1) similar stem cross-sections, (2) the pattern of a side branch emerging from the axil of a long-petioled leaf, and (3) the diagnostic glandular trichomes characteristic of *Nicotiana attenuata*. Specimens from two additional cigarettes (#2 and #9) have also retained the glandular trichomes common to *N. attenuata*. Although the remaining 8 specimens lack hairs, possibly because of extensive insect damage, they do display the general stem cross-section appearance noted on all the *Nicotiana* species included in this study. This leaves open the possibility that the Red Bow inhabitants utilized multiple tobacco species, or possibly even other herbaceous dicotyledons, for cigarette filler material.

*Future pursuits.*—Identification of the contents of four Red Bow cigarettes as the broken stems of *Nicotiana attenuata* might be strengthened in two ways, both of them destructive in nature. Scanning Electron Microscope (SEM) preparations of stem epidermis (where remaining) and vascular tissue could be compared to similar preparations of modern *Nicotiana* material and to established descriptions (Goodspeed 1954:102–106). Also, the material could be tested chemically for nicotine or nicotinic acid, but these compounds may not remain stable over the long run (Dixon and Stetson 1922; Jones and Morris 1960).

## SUMMARY

Archaeologists and botanists may well have been correct when writing that ancient groups placed "tobacco" (e.g. *Nicotiana)* inside reedgrass (e.g. *Phragmites)* cigarettes. Anatomical and morphological criteria of four uncharred cigarettes from Red Bow Cliff Dwelling in Arizona suggest this to have been the case. However, it might be unwise to assume that the cigarettes from other locations will reveal identical construction material, or the same filling components. Such a broadly distributed and well-preserved class of artifacts should be thoroughly evaluated to establish the cultural dimensions of ancient cigarette manufacture, and to determine the range of materials placed inside.

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## NOTES

[1]*Phragmites australis* (Cav.) Trin. ex Steudel. is considered to have priority over *Phragmites communis* Trin. (Clayton 1968).

## LITERATURE CITED

ASCH, DAVID L. and NANCY E. ASCH. 1985. Prehistoric Plant Cultivation in West-Central Illinois. Pp. 149–203 *in* Prehistoric Food Production in North America, Richard I. Ford (editor) Anthropological Papers 75, Museum of Anthropology, University of Michigan.

ADAMS, KAREN R. 1990. A Review of Ancient Tobacco *(Nicotiana)* Use in the Prehistoric Southwestern United States. Paper presented at the 13th Annual Ethnobiology Conference, Tempe, AZ, March 21–24, 1990.

BANDELIER, ADOLF F. 1890. The Delight Makers. Dodd, Mead and Co., New York.

BARROWS, DAVID PRESCOTT. 1900. The Ethno-Botany of the Coahuilla Indians of Southern California. The University of Chicago Press.

BETANCOURT, JULIO L., A. LONG, D.J. DONAHUE, A.J.T. JULL and T.H. ZABEL. 1984. Pre-Columbian Age for North American *Corispermum* L. (Chenopodiaceae) Confirmed by Accelerator Radiocarbon Dating. Nature 311(5986): 653–655.

BOHRER, VORSILA L. 1962. Nature and Interpretation of Ethnobotanical Materials from Tonto National Monument. Pp. 75–114 *in* Archaeological Studies at Tonto National Monument, AZ, by Charlie R. Steen, Lloyd M. Pierson, Vorsila L. Bohrer, and Kate Peck Kent: Southwestern Monuments Association Technical Series 2.

BROWN, WALTER V., WILLIAM F. HARRIS and JOSEPH D. GRAHAM. 1959. Grass morphology and systematics I. The Internode. The Southwestern Naturalist 4(3): 115–125.

BYE, ROBERT A., JR. 1972. Ethnobotany of the Southern Paiute Indians in the 1870s: with a note on the early ethnobotanical contributions of Dr. Edward Palmer. Pp 87–103 *in* Great Basin Cultural Ecology, A Symposium, Don D. Fowler (editor), Desert Research Institute Publications in the Social Sciences, No. 8.

CARLSON, GUSTAV G. and VOLNEY H. JONES. 1940. Some notes on uses of plants by the Comanche Indians. Papers of the Michigan Academy of Science, Arts, and Letters, Vol. XXV, 1939. Published 1940.

CASTETTER, EDWARD F. 1943. Early Tobacco Utilization and Cultivation in the American Southwest. American Anthropologist, new series 45:320–325.

_____ and WILLIS H. BELL. 1942. Pima and Papago Indian Agriculture. Inter-Americana Studies I. The University of New Mexico Press.

CHAPMAN, JEFFERSON, ROBERT B. STEWART and RICHARD A. YARNELL. 1974. Archaeological Evidence for Precolumbian Introduction of *Portulaca oleracea* and *Mollugo verticillata* into Eastern North America. Economic Botany 28:411–412.

CLAYTON, W.D. 1968. The Correct Name of the Common Reed. Taxon 17(2):168–169.

LITERATURE CITED (continued)

COFFIN, EDWIN F. 1932. Archaeological Exploration of a Rock Shelter in Brewster County, TX. Indian Notes and Monographs, No. 48, Museum of the American Indian, Heye Foundation, New York.

COSGROVE, C.B. 1947. Caves of the Upper Gila and Hueco Areas in New Mexico and Texas. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 24(2).

CURTIN, L.S.M. 1965. Healing Herbs of the Upper Rio Grande. Southwest Museum, Los Angeles.

DIXON, ROLAND B. and JOHN B. STETSON, JR. 1922. Analysis of Pre-Columbian Pipe Dottles. American Anthropologist, New Series 24:245-246.

ESAU, KATHERINE. 1977. Anatomy of Seed Plants, 2nd Edition. John Wiley and Sons, New York.

FELGER, RICHARD STEPHEN and MARY BECK MOSER. 1985. People of the Desert and Sea. Ethnobotany of the Seri Indians. University of Arizona Press, Tucson.

FEWKES, JESSE WALTER. 1912. Casa Grande, AZ. 28th Annual Report of the Bureau of American Ethnology, 1906-1907.

FORD, RICHARD I. 1981. Gardening and Farming before A.D. 1000: Patterns of Prehistoric Cultivation North of Mexico. Journal of Ethnobiology 1(1):6-27.

GIFFORD, JAMES C. 1980. Archaeological explorations in caves of the Point of Pines Region, AZ. Anthropological Papers of the University of Arizona No. 36.

GOODSPEED, THOMAS HARPER. 1954. The Genus Nicotiana. Origins, Relationships, and Evolution of its Species in the Light of their Distribution, Morphology and Cytogenetics. Chronica Botanica 16(1/6).

GOULD, FRANK W. 1951. Grasses of southwestern United States. University of Arizona Bulletin, Vol. 22, No. 1.

GRANGE, ROGER. 1952. Wooden Artifacts. Pp 331-451 *in* Mogollon Cultural Continuity and Change, The Stratigraphic Analysis of Tularosa and Cordova Caves, by Paul S. Martin, John B. Rinaldo, Elaine Bluhm, Hugh C. Cutler and Roger Grange, Jr. Fieldiana: Anthropology, Vol. 40, Chicago Natural History Museum.

HAURY, EMIL W. 1945. The excavation of Los Muertos and Neighboring Ruins in the Salt River Valley, Southern Arizona. Papers of the Peabody Museum of American Archaeology and Ethnology, Harvard University, Vol. 24, No. 1, Cambridge.

HOUGH, W. 1914. Culture of the Ancient Pueblos of the Upper Gila River Region, New Mexico and Arizona, the second Museum-Gates Expedition. U.S. National Museum, Bulletin 87, Washington.

JONES, VOLNEY H. 1935. "Ceremonial Cigarettes." Southwestern Monuments Monthly Report, October, Pp. 287-292.

_____. 1944. Was tobacco smoked in the Pueblo region in pre-Spanish times? American Antiquity 9(4):451-456.

_____ and ELIZABETH ANN MORRIS. 1960. A Seventh-Century Record of Tobacco Utilization in Arizona. El Palacio 67(4):115-117.

KEARNEY, THOMAS H. and ROBERT H. PEEBLES. 1960. Arizona Flora. Second edition with supplement by J.T. Howell, E. McClintock and collaborators. University of Calilfornia Press, Berkeley.

LANGE, CHARLES H. 1968. Cochiti, A New Mexico Pueblo, Past and Present. Southern Illinois University Press.

LINTON, RALPH. 1924. Use of Tobacco among North American Indians. Field Museum of Natural History Anthropology Leaflet No. 15, Chicago.

METCALFE, C.R. 1960. Anatomy of the Monocotyledons I. Gramineae. Oxford, Clarendon Press.

MIKSICEK, CHARLES H. 1983a. Appendix B. Plant Remains from Smiley's Well (AZ U:14:73, Locus A) *in* Hohokam Archaeology Along the Salt-Gila Aqueduct Central Arizona Project, Vol. V: Small Habitation Sites on Queen Creek. Lynn S. Teague and Patricia L. Crown (editors), Arizona State Museum Archaeological Series No. 150, Tucson, AZ.

_____. 1983b. Appendix A. Flotation Results from AZ U:15:84 *in* Hohokam Archaeology Along the Salt-Gila Aqueduct Central Arizona Project, Vol.

LITERATURE CITED (continued)

VI: Habitation Sites on the Gila River. Lynn S. Teague and Patricia L. Crown (editors). Arizona State Museum Archaeological Series No. 150, Tucson, AZ.

_____. 1983c. Appendix B. Archaeobotanical Aspects of Las Fosas: A Statistical Approach to Prehistoric Plant Remains *in* Hohokam Archaeology Along the Salt-Gila Aqueduct Central Arizona Project, Vol. VI: Habitation Sites on the Gila River. Lynn S. Teague and Patricia L. Crown (editors). Arizona State Museum Archaeological Series No. 150, Tucson, AZ.

_____. 1984. Appendix B. Archaeobotanical Remains from Frogtown *in* Hohokam Archaeology Along the Salt-Gila Aqueduct Central Arizona Project, Vol. IV: Prehistoric Occupation of the Queen Creek Delta. Lynn S. Teague and Patricia L. Crown (editors). Arizona State Museum Archaeological Series 150, Tucson, AZ.

_____. 1986. Plant Remains *in* Archaeological Investigations at the West Branch Site, Early and Middle Rincon Occupation in the Southern Tucson Basin, by Frederick W. Huntington. Institute for American Research Anthropological Papers 5.

MIKSICEK, CHARLES H. and ROBERT E. GASSER. 1989. Hohokam Plant Use at Las Colinas: The Flotation Evidence *in* The 1982-1984 Excavations at Las Colinas. Environment and Subsistence, Vol. 5, Arizona State Museum Archaeological Series 162.

OLLENDORF, AMY L., SUSAN C. MULHOLLAND and GEORGE RAPP, JR. 1988. Phytolith Analysis as a Means of Plant Identification: *Arundo donax* and *Phragmites communis*. Annals of Botany 61:209-214.

ROBBINS, WILFRED W., JOHN P. HARRINGTON, and BARBARA FREIRE-MARRECO. 1916. Ethnobotany of the Tewa Indians. Bureau of American Ethnology Bulletin 55, Washington, D.C.

RUSSELL, FRANK. 1975. The Pima Indians. Re-edition, University of Arizona Press. Originally published in the Twenty-sixth Annual Report of the Bureau of American Ethnology, 1904-1905.

SETCHELL, WILLIAM ALBERT. 1921. Aboriginal Tobaccos. American Anthropologist, new series 23(4):397-413.

SPIER, LESLIE. 1928. Havasupai Ethnography. Anthropological Papers of the American Museum of Natural History, Vol. XXIX, Part III. The American Museum of Natural History, New York.

STANT, MARGARET Y. 1953. Variations in reed structure in relation to thatching. Kew Bulletin 2:231-238.

STEPHEN, ALEXANDER M. 1936. Hopi Journal of A.M. Stephen, Part I. E.C. Parsons (editor). AMS Press, New York.

STEVENSON, MATILDA COXE. 1915. Ethnobotany of the Zuni Indians. Thirtieth Annual Report of the Bureau of American Ethnology, 1908-1909, Pp. 35-102.

STEWART, OMER C. 1941. Cultural Element Distributions: XIV Northern Paiute, Anthropological Records 4(3).

SWANK, GEORGE R. 1932. The ethnobotany of the Acoma and Laguna Indians. Unpublished M.A. Thesis, University of New Mexico, Department of Biology.

SWITZER, RONALD R. 1969. Tobacco, Pipes, and Cigarettes of the Prehistoric Southwest. El Paso Archaeological Society Special Report 8.

VESTAL, PAUL A. 1952. Ethnobotany of the Ramah Navajo. Peabody Museum of American Archaeology and Ethnology, Papers 40(4):1-94.

_____ and RICHARD EVANS SCHULTES. 1939. The Economic Botany of the Kiowa Indians as it Relates to the History of the Tribe. Botanical Museum, Cambridge, MA.

VOEGELIN, ERMINIE W. 1938. Tubatulabal Ethnography. Anthropological Records 2(1), University of California Press.

WHITE, LESLIE A. 1941. *Nicotiana rustica* cultivated by Pueblo Indians. Science 94 (No. 2429):64-65.

_____. 1945. Notes on the ethnobotany of the Keres. Papers of the Michigan Academy of Science, Arts and Letters, Vol. 30:557-568.

WHITING, ALFRED F. 1966. Ethnobotany of the Hopi. Northland Press. Originally published in 1939 as Bulletin No. 15, Museum of Northern Arizona.

## LITERATURE CITED (continued)

WINTER, JOSEPH C. 1990. The Tobaccos of America. Manuscript on file, Department of Anthropology, University of New Mexico, Albuquerque.

WYMAN, LELAND C. and STUART K. HARRIS. 1951. The Ethnobotany of the Kayenta Navaho. University of New Mexico Publications in Biology No. 5.