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Lower Pecos and Coahuila peyote: new radiocarbon dates

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Abstract

Peyote, a psychoactive cactus native to the Chihuahuan Desert, has been preserved from excavations at only two archaeological sites: Shumla Caves in the Lower Pecos region of southwest Texas and shelter CM-79 near Cuatro Ciénegas in Coahuila, Mexico. We determined three indistinguishable radiocarbon ages of 5160 ± 45, 5200 ± 35, and 5210 ± 35 ^{14}C years BP, yielding a mean age of 5195 ± 20 ^{14}C years BP for the three specimens from Shumla Caves. For one of the Cuatro Ciénegas specimens we obtained the first direct radiocarbon date of 835 ± 35 ^{14}C years BP. This study demonstrates the use of peyote by inhabitants of the Lower Pecos region of the Chihuahuan Desert about 6000 calendar years ago, and confirms its use by inhabitants of the Cuatro Ciénegas region of the Chihuahuan Desert in Late Prehistoric times. The Shumla Caves' specimens are composed of an aggregate of ground peyote mixed with other plant material, i.e., they appear to be manufactured peyote effigies, and are definitely not intact peyote buttons.

Keywords: Peyote; Radiocarbon analyses; Chihuahuan Desert; Shumla Caves, Texas; Cuatro Ciénegas, Coahuila

1. Introduction

The ceremonial and medicinal use of peyote (*Lophophora williamsii*) by Native Americans in recent history has been described in numerous publications (e.g., [22,23]). We present new radiocarbon dates on three peyote specimens excavated from Shumla Caves in the Lower Pecos region of southwest Texas, placing cultural association of peyote at 5200 ^{14}C years BP. Comparative radiocarbon dates on non-pretreated material from the same three specimens provide relevant information on the implications of humic acid contamination. In addition, we present one additional radiocarbon date on an intact peyote button excavated from shelter CM-79 near Cuatro Ciénegas, Coahuila, Mexico, showing more recent prehistoric use about 835 ^{14}C years BP. Other evidence, from ceramics, textiles, ethnography, etc., shows peyote use over the last two millennia and into modern times [1,10,18,21].

Peyote is a small ($\leq$3 cm in height, $\leq$8 cm in diameter), chalky grey-green, spineless globular cactus native to the Chihuahuan Desert of northeastern Mexico and adjacent Texas (Fig. 1). The plant contains mescaline, an alkaloid that produces perceptual and other psychic effects. To our knowledge, the only two archaeological sites where peyote has been recovered, preserved in museum collections and discussed in the literature are Shumla Caves (and specifically Shumla Cave No. 5, 41VV113) in southwest Texas and shelter CM-79 near Cuatro Ciénegas, Coahuila, Mexico (Fig. 2). Peyote has also been reported by Woolsey at Fields Shelter [7], by Hicks at a shelter in Crockett County, Texas [14], and by Sayles at several Texas sites [19]. However, no specimens from any of those sites have been located in collections.

The three Shumla Caves' specimens are not simply desiccated crowns of peyote cacti as reported by previous workers [6,11], but are aggregates of ground peyote mixed with C_3

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Fig. 1. Peyote (*Lophophora williamsii*) in its natural habitat in the Chihuahuan Desert. This cluster of five mature adults is about 150 mm long.

plant materials to form flattened hemispheres vaguely resembling peyote buttons (Figs. 3 and 4). Bruhn et al. [6] demonstrated that the Shumla Caves' specimens do contain some peyote tissue, as they have a high (2%) mescaline concentration uniquely characteristic of *Lophophora*, which exceeds concentrations in other plants of this region by orders of magnitude. The morphological and $\delta^{13}C$ data supporting this finding, as well as its cultural context and significance, will be discussed elsewhere (Terry et al., in preparation).

2. Archaeological context

The two sites featured in the current study are sheltered sites containing an abundance of perishable remains; beyond that fact, there are similarities and differences worth noting. The archaeological peyote finds discussed in this paper come from the Lower Pecos River region of southwestern Texas and the Cuatro Ciénegas region of Coahuila, Mexico – both of which lie within the natural geographic distribution of the cactus (Fig. 2). While both these sites are considered to be within the Chihuahuan Desert [8], Cuatro Ciénegas lies about 350 km south-southwest of the Lower Pecos, in the Coahuiltecan subprovince of the Chihuahuan-Coahuiltecan Plateau and Ranges [9], while the Lower Pecos is near the northeastern edge of the Chihuahuan Desert, at the western edge of the Edwards Plateau. This geographic difference is reflected in differences in physiography, but calcareous soils

Fig. 2. Map showing approximate locations for Shumla Caves (in Texas, a few meters north of the Rio Grande, near the mouth of the Pecos River) and CM-79 (in Coahuila, Mexico). The region where peyote grows naturally is indicated by the shaded area.

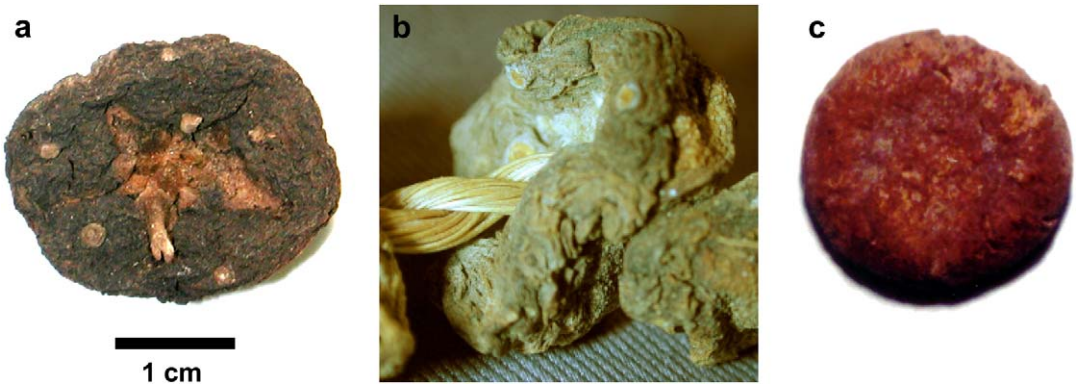

Fig. 3. Peyote morphology. Composite photograph of (a) a modern peyote button, (b) an archaeological peyote button from Cuatro Ciénegas and (c) an archaeological manufactured peyote button from Shumla Caves showing differences in structure. Preservation of organic materials in southwest Texas is excellent, and the lack of normal peyote morphology in (c) is not due to deterioration and/or the ancient age of the specimen.

and many of the plant species – including the economically important lechuguilla (*Agave lechuguilla*) and prickly pear (*Opuntia* spp.) – are common to the two regions.

Both regions contain a long and very complete record of desert-adapted foraging that persisted until European contact [25–27]. Perishable remains are common in both regions, and include the atlatl, rabbit sticks, nets, cordage, sandals, burden baskets, twined and coiled basketry, plaited matting, and middens with an abundance of desiccated plant materials [13,20,25,27].

The peyote material from the Lower Pecos was recovered from Shumla Caves, a series of nine caves located on the Rio Grande in Val Verde County, Texas. Cave No. 5 (41VV113) was excavated in 1933 by the G.C. Martin expedition [13], but the provenience for the archaeological assemblage removed from the cave was not recorded during the fieldwork. The published report of the Martin expedition, however, notes 'a single mummified example (of peyote) from Cave No. 5' [13]. Schuetz noted the presence of peyote in the Martin expedition materials in her cataloguing efforts at the Witte Museum a quarter of a century after the Martin report, but was unable to identify exact provenience for the peyote specimens from the original excavation records ([20]; Schuetz, personal communication, 2005). Although no radiocarbon dates have been reported on other materials from Shumla Caves, time-sensitive artifacts in the Shumla Caves' collections suggest that Shumla Cave No. 5 as well as the other shelters were occupied intermittently throughout the Archaic Period and continuing into the Late Prehistoric Period [13,20]. The artifact assemblage and the associated plant materials indicated that Shumla Cave No. 5 (41VV113) was a residential site containing several burials that had been excavated into midden deposits. Direct dates reported in the current study show that the Shumla Caves peyote specimens fall into the Eagle Nest subperiod of the Middle Archaic Period.

In contrast, the peyote from the Cuatro Ciénegas region was recovered from CM-79, a burial cave [25]. The new radiocarbon assay reported in this study was secured from a fragment of a single peyote button strung on a cord with (originally) eight other buttons. The string of peyote buttons was associated with three secondary burials, two of which had been disturbed. Taylor noted that the remaining undisturbed burial consisted of a skull and mandible that had been placed in a coiled basketry tray [25]. Three dates on plaited matting associated with the burials ranged from 920 ± 75 to 1200 ± 70 BP [2,25], placing this find at the transition between the Late Archaic and Late Prehistoric Periods, much more recent than the Shumla Caves material.

Fig. 4. Surface of archaeological manufactured peyote button. Randomly arranged pieces of fibrous tissue from plants other than peyote were incorporated into the specimen matrix.

3. Experimental methods

We removed approximately 10 mg of material from the interior of each specimen. An acid–base–acid pretreatment was performed on plant material: two soaks in hot (90 °C) 1 M HCl; followed by two soaks in hot 1 M NaOH; and then two additional hot soaks in 1 M HCl. Afterward, samples were repeatedly rinsed with ultrapure distilled, de-ionized water. Remaining plant material was combusted to CO_2 and converted to graphite for an accelerator mass spectrometer target. A split of the CO_2 was taken for stable isotope analysis ($\delta^{13}C$). Radiocarbon measurements were conducted at Lawrence Livermore

National Laboratory's Center for Accelerator Mass Spectrometry (CAMS).

4. Results

New radiocarbon dates on three altered peyote specimens excavated at Shumla Caves, Val Verde County, Texas, plus the first direct radiocarbon date on one of the specimens of natural peyote excavated from shelter CM-79, near Cuatro Ciénegas, Coahuila, are shown (corrected for $\delta^{13}C$) in Table 1. The three Shumla Caves' specimens have statistically indistinguishable radiocarbon ages of 5160 ± 45, 5200 ± 35, and 5210 ± 35 ^{14}C years BP, with a weighted mean of 5195 ± 20 ^{14}C years BP, calibrated to 4045–3960 BC (2σ), calculated using the "R_Combine" function of the OxCal Calibration Program [4,24]. The radiocarbon date for the Cuatro Ciénegas peyote is 835 ± 35 ^{14}C years BP, calibrated to 1070–1280 AD (2σ).

5. Discussion

5.1. Dating by inference

The antiquity of peyote use has previously been estimated from four principal types of information. (1) From a 16th Century history of Mexico [18], peyote use by the Chichimecos people was inferred to date back to 300 BC [21]. (2) Archeological ceramic artifacts with peyote motifs, from Colima, Mexico, date from 100 BC to 300 AD [10]. (3) The radiocarbon dating of other plant materials recovered from the same archeological site as peyote specimens yielded a date by association of 810–1070 uncal AD at Cuatro Ciénegas [1]. (4) More recently, examples of a particular genre (Pecos River style) of rock art found in the Lower Pecos River region of southwest Texas that sometimes incorporates peyote motifs [3] have been dated to between 2750 and 4200 ^{14}C years BP [15–17]. All these previous estimates for the antiquity of peyote use in the Chihuahuan Desert indicated time points or intervals more recent than the ages determined by our radiocarbon dating of the Shumla Caves' specimens at 5195 ± 20 ^{14}C years BP.

5.2. Previous radiocarbon dates: Shumla Caves

In a book review, Furst [11] mentioned that a direct radiocarbon date on one of the Shumla Caves peyote specimens 'unexpectedly added six millennia' to the oldest age (810–1070 uncal AD) then thought to apply to archaeological peyote ([1,5]; P.T. Furst, personal communication, 2003). Calculating back six millennia from 810 to 1070 uncal AD yields an age of about 5000 uncal BC, which agrees with Furst's more recently published date of 5000 BC [12] for peyote use. Because the original UCLA laboratory identification number had been lost and the report of the assay was effectively irretrievable from the UCLA radiocarbon laboratory archives (R.E. Taylor, personal communication, 2003), we repeated the direct radiocarbon dating of the Shumla Caves' specimens. It is unfortunate that the original radiocarbon date in years BP is unavailable, as this could have been useful for understanding the disparity between the two results. This situation demonstrates the importance of reporting radiocarbon laboratory numbers, measured and corrected radiocarbon dates, fractionation ($\delta^{13}C$ values), calibrated dates, and the program used for calibrating the dates.

Bruhn et al. [6] also recently radiocarbon dated two of the three Shumla Caves peyote specimens, but reported only 'a mean age of 5700 years. After obtaining our results, we received a personal communication in which Bruhn added the following information: the radiocarbon ages of the two samples are 5030 ± 65 and 4885 ± 60 ^{14}C years BP, with a weighted mean of 4952 ± 44 ^{14}C years BP for the two samples (J.G. Bruhn, personal communication, 2004). This is ~250 radiocarbon years more recent than the average of our three dates of 5195 ± 20 ^{14}C years BP. We do not know the reason for this discrepancy. However, we also dated each of the same three Shumla Caves peyote samples without pretreatment (i.e., without removing any humic acid contamination). These dates were 4995 ± 40, 4515 ± 40 and 4670 ± 40 ^{14}C years BP. Clearly, the contaminating humic acids are younger than the peyote samples. If Bruhn et al.'s [6] pretreatment was insufficient to remove all humic acid contamination, then that would explain the fact that their dates are more recent than ours.

5.3. Previous radiocarbon dates: Cuatro Ciénegas

The first reported date for peyote from the CM-79 site near Cuatro Ciénegas was a range of 810–1070 uncal AD [1]. The three dates constituting this range were later corrected for $\delta^{13}C$ and published as 1200 ± 70, 1000 ± 60 and 920 ± 75 ^{14}C years BP [25]. These previously reported dates were not obtained on the peyote itself, but rather on three pieces of associated matting [2,5,25]. Since the burials at CM-79 were described as secondary interments, we decided to date the peyote itself to learn whether it was part of the original

Table 1
Radiocarbon dates of archaeological peyote specimens from Shumla Caves and Cuatro Ciénegas

CAMS #	Location	Carbon (mg)	$\delta^{13}C$ (‰)	Radiocarbon age[a] (years BP)	2σ Calibrated ages
86846	Shumla Caves	0.90	−14.68	5160 ± 45	4220–3800 BC
86045	Shumla Caves	0.65	−21.7	5200 ± 35	4200–3950 BC
86046	Shumla Caves	0.91	−21.8	5210 ± 35	4220–3950 BC
Mean	Shumla Caves	–	–	5195 ± 20	4045–3960 BC
96157	Cuatro Ciénegas	0.13	−10.8	835 ± 35	1070–1280 AD

[a] $\delta^{13}C$ corrected.

assemblage or added later. Our direct radiocarbon date for the peyote was 835 ± 35 ^{14}C years BP. This indication that the three previously dated CM-79 matting specimens were, respectively, ca. one, two and four centuries older than the peyote found in the same burial cave (inferred to contain three secondary burials [25]), may reflect differences in dates of primary and/or secondary interment.

6. Conclusions

These dates (in Table 1) constitute the first properly reported direct dates on peyote specimens. They clear up some of the uncertainties about the antiquity of peyote use in the region. They also open up a new dilemma. For the last 65 years the Shumla Caves' specimens were thought to be intact examples of peyote [6,11]. Although these specimens contain 2% mescaline, they clearly lack the anatomy of a cactus. This mixture of C_3 and C_4 plants, shaped into the form of a small peyote cactus, remains an enigma.

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