

A NEWLY DESCRIBED SUBFOSSIL  
CULTIVAR OF CHENOPODIUM (CHENOPODIACEAE)

Bruce D. Smith  
Department of Anthropology  
National Museum of Natural History  
Smithsonian Institution  
Washington, D.C. 20560

and

Vicki A. Funk  
Department of Botany  
National Museum of Natural History  
Smithsonian Institution  
Washington, D.C. 20560

Chenopodium berlandieri Moq. subsp. nov. jonesianum Bruce Smith.  
Type: U.S.A., Ohio, Hocking County, 3 miles southeast of  
Bloomingville; Ash Cave (33Hol). 1876. Ebenezer Andrews s.n.  
(holotype, US # 3036256)

Pericarpio dorsalo reticulato-alveolato, testa laevi tenui  
admarginem truncata. Habitat: U.S.A. orientalis, in fossionum  
indiginarum prehistoricorum.

Dorsal pericarp reticulate-alveolate, testa smooth, thin and  
truncate margined. Found in the eastern United States in  
excavations of prehistoric Indian sites.

Using morphological, cytological, and hybridization data, Hugh  
Wilson recently demonstrated that the taxa assigned to Chenopodium  
sect. Chenopodium subsect. Cellulata do, in fact, constitute a  
relatively coherent group, distinct from other elements of sect.  
Chenopodium (Wilson, 1980).

In addition to the cultivar forms of the Mexican domesticate  
Chenopodium berlandieri subsp. nuttalliae, subsect. Cellulata  
encompasses a wide range of wild and weedy American chenopods,  
including four modern non-domesticated Chenopodium taxa of the  
eastern United States: C. berlandieri var. zschackei; C.  
berlandieri var. boscianum; C. bushianum; and C. macrocalycium  
(see appendix A. for authorities of all species).

Based on the presence of a distinctive and diagnostic  
reticulate-alveolate dorsal pericarp pattern, Chenopodium fruits  
recovered from a number of prehistoric archaeological sites in the

eastern United States also qualify for inclusion in subsect. Cellulata (Figure 1). These archaeobotanical fruits, however, are morphologically quite distinct from those of closely related present day non-domesticated chenopod taxa belonging to subsect. Cellulata. They in fact exhibit a set of interrelated morphological changes associated with the adaptive syndrome of domesticated Chenopodium, and are virtually indistinguishable from the modern Mexican cultivar C. berlandieri subsp. nuttalliae cv. 'chia' (Wilson, 1981:237) in terms of fruit morphology.

It is unlikely, however, that a prehistoric range extension of Chenopodium berlandieri subsp. nuttalliae cv. 'chia' into the eastern United States can be documented, as opposed to an independent process of domestication in the eastern United States ('chia' has yet to be demonstrated to have a time depth in Mexico comparable to that of the "chia-like" prehistoric chenopod of the eastern United States). Because of the broad temporal and geographical separation of the modern Mexican cultivar 'chia' and the prehistoric "chia-like" cultivar of eastern North America, it is appropriate to assign a distinct subspecies designation to the latter, rather than subsuming it under Chenopodium berlandieri subsp. nuttalliae cv. 'chia'. A taxonomic precedent in this regard is provided by the extinct eastern North American cultivar Iva annua L. subsp. macrocarpa.

The subspecies designation Chenopodium berlandieri subsp. jonesianum is therefore proposed to allow easier reference to the prehistoric domesticated taxon of the eastern United States. Volney H. Jones was one of the first individuals to suggest that a domesticated variety of Chenopodium might have been present prehistorically in the east, as part of the "eastern agricultural complex" (Jones, 1936).

Chenopodium berlandieri subsp. jonesianum is known primarily on the basis of large fruit assemblages (50,000 and 25,000 fruits, respectively) recovered from storage contexts in Russell Cave Alabama (1975 +/- 55 B.P., 2340 +/- 120 B.P.; Smith, 1984, 1985) and Ash Cave, Ohio (1720 +/- 100 B.P.; Smith, n.d.).

Maximum fruit diameter population statistics for the Russell Cave and Ash Cave assemblages of C. berlandieri subsp. jonesianum are comparable to 'chia', as well as conforming to modern geographical clines of variation for the two major eastern United States non-domesticated taxa belonging to subsection Cellulata (Chenopodium berlandieri and Chenopodium bushianum) (Smith, n.d.) (Russell Cave - mean maximum fruit diameter 1.32 mm., range 1.0-1.8, S.D. .13, sample size 525; Ash Cave - mean 1.87, range 1.3-2.2., S.D. .15, sample size 1,000).

Outer epiderm thickness values for Chenopodium berlandieri subsp. jonesianum are comparable to C. berlandieri subsp.

nuttalliae cv. 'chia' (Mean outer epiderm thickness values - Russell Cave 11 microns; Ash Cave 15 microns; 'chia' 16 microns; Smith, n.d.), and serve to distinguish C. berlandieri subsp. jonesianum from the thick testa modern non-domesticated taxa of eastern North America belonging to subsection Cellulata (Mean outer epiderm thickness values for seven populations of Chenopodium berlandieri and Chenopodium bushianum from the eastern United States - 43, 46, 47, 49, 50, 51, 52 and 60 microns.).

The fruits of Chenopodium berlandieri subsp. jonesianum also exhibit the truncate margin and rectanguloid cross-section characteristic of both 'chia' and the low frequency "red morph" fruits produced by modern eastern North American non-domesticated taxa belonging to subsection Cellulata (Smith 1984, 1985, n.d.). A smooth outer epiderm surface, however, serves to distinguish the fruits of 'chia' and C. berlandieri jonesianum from the thin testa "red morph" fruits produced by non-domesticated eastern North American taxa belonging to subsection Cellulata (Smith, n.d.).

Other specimens examined: U.S.A., Alabama, Jackson County, 6 miles west of Bridgeport; Russell Cave National Monument. 1956 Carl Miller s.n. (US #30362557, Fig. 1).

#### Appendix A.

C. berlandieri Moq.

C. berlandieri subsp. nuttalliae (Stafford) Wilson and Heiser

C. berlandieri subsp. zschackei Zobel

C. berlandieri subsp. boscianum (Moq.) Wahl

C. bushianum Aellen

C. macrocalycium Aellen

Iva annua L. subsp. macrocarpa (Blake) Jackson

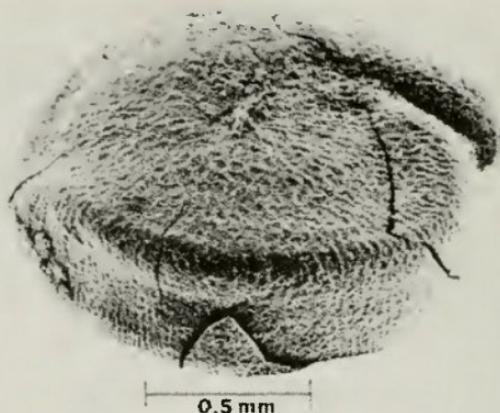


Figure 1. Photomicrograph of a fruit of Chenopodium berlandieri subsp. jonesianum from Russell Cave, Alabama, showing the reticulate-alveolate dorsal pericarp pattern and truncate margin.

#### References

- Jones, V.H. 1936 The Vegetal Remains of Newt Kash Hollow Shelter. In: Rock Shelters in Menifee County, Kentucky, by W.S. Webb and W.D. Funkhouser. University of Kentucky Reports in Archaeology and Anthropology 3:147-165.
- Smith, B.D. 1984 Chenopodium as a Prehistoric Domesticated in Eastern North America: Evidence from Russell Cave, Alabama. Science 226:165-167.
- Smith, B.D. 1985 The Role of Chenopodium as a Domesticated in Pre-Maize Garden Systems of the Eastern United States. Southeastern Archaeology 4.
- Smith, B.D. n.d. Chenopodium berlandieri subsp. jonesianum: Evidence for a Hopewellian Domesticated From Ash Cave, Ohio. Manuscript submitted, Southeastern Archaeology.
- Wilson, H.D. 1980 Artificial Hybridization among Species of Chenopodium sect. Chenopodium. Systematic Botany 5:253-263.
- Wilson, H.D. 1981 Domesticated Chenopodium of the Ozark Bluff Dwellers. Economic Botany 35:233-239.