Taxonomic Rank and Rarity of Cucurbita okeechobeensis

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Cucurbita okeechobeensis (Small) L.H. Bailey is, as the name implies, a gourd first described as endemic to the muck-laden shores and hammocks which once surrounded Lake Okeechobee. It was originally reported to be locally abundant (14), but most of this region has since been cleared for prime farmland development. The gourd though recently relocated after 7 years (12) may now be limited to remnant habitats on islands in the lake. The only evidence that this restricted range may have once been more extensive in Florida is from a journey made by William Bartram up the St. Johns River in 1774. He observed along the river between Lake George and Lake Dexter, around 150 miles north of Lake Okeechobee, "the wild squash climbing over lofty limbs of the trees; their yellow fruit somewhat of the size and figure of a large orange, pendant from the extremities of the limbs over the water" (7). He named the gourd C. peregrina, but gave no diagnosis; therefore, this name is a nomen nudum. Merrill (10) states that Bartram's gourd "seems to be the same as C. okeechobeensis". While the Okeechobee gourd is the only known non-cultivated spontaneous gourd in Florida today, Decker and Newsom (4) suggest, based on a numerical analysis of archaeological seeds, that the spontaneous gourd, C. texana (Scheele) Gray (soon to be treated as an infraspecific taxon of C. pepo) was present in the St. Johns River watershed from 500 B.C. up to Bartram's time. Thus Bartram's gourd was not necessarily C. okeechobeensis and the latter, sensu stricto, appears to have been limited historically to the Lake Okeechobee region.

Cucurbita okeechobeensis has not been given legal protection through the U.S. Endangered Species Act partly because of the uncertainty of its relationships with the cross compatible species, C. martinezii Bailey and C. lundelliana Bailey, two fairly common mesic gourds of Mesoamerica. Robinson and Puchalski (13) suggested C. okeechobeensis and C. martinezii should be considered synonymous (with the former having nomenclatural priority) after comparing their morphology, crossability, responses to disease inoculation, and preliminary isozyme results. Filov (6) listed C. martinezii as a variety of C. okeechobeensis but did not cite the basionym and therefore failed to validly publish this taxonomic change. It is unlikely that legal protection can be considered for the Okeechobee gourd if it is merely synonymous with C. martinezii, without any distinct taxonomic status. Therefore, we attempted to review the literature more comprehensively and further characterize the genetic variation and relationships between these taxa using isozyme analysis.

Considerable differences have been reported between the three compatible taxa in their seed oil and amino acid compositions (3,5) and cucurbitacin content and resistance to insect pests (11,8,9). However these results are not convincing since only one or a few accessions were analyzed per taxon; varying genotype, environmental interactions, and laboratory error need to be statistically addressed.

Using starch gel electrophoresis, Robinson and Puchalski (13) reported that C. okeechobeensis and C. martinezii were identical in their electrophoretic profiles and distinct from the other Cucurbita species. The senior author tested an additional ten isozyme systems, different from the three used by Robinson and Puchalski (13), in two accessions of C. okeechobeensis (of Florida) and ten accessions of C. martinezii (from the Mexican states of Veracruz and Puebla) and three accessions of C. lundelliana. Six to 12 plants were sampled per accession. These were compared with other species of Cucurbita.

A much more complex genetic situation than that reported by Robinson and Puchalski (13) was evident. While C. okeechobeensis showed no allozyme, or allelic, variation in any of the systems tested, presumably due at least in part to founder effects and a small sample size, C. martinezii showed considerable variation within populations including a few heterozygous individuals. Certain of the zymograms of both taxa were not distinguishable from those found in other species, particularly in the closely allied species, C. lundelliana. All three of these taxa shared identical fixed allozymes in two of the enzyme systems, triosephosphate isomerase and isocitrate dehydrogenase, which includes a minimum of six loci, yet were unique from other mesic cucurbit species.

However, for the enzyme phosphoglucoisomerase (PGI), a relatively conservative three or four loci system in Cucurbita, there was no variation within the populations and no difference between C. martinezii and C. lundelliana. But significantly, two unique fixed PGI allozymes occur in C. okeechobeensis.

We therefore provisionally propose that there is one gourd species with a cream-colored corolla, C. okeechobeensis (Small) Bailey, but recognize the following two eco-geographic subspecies[1]:

(i) Cucurbita okeechobeensis (J.K. Small) L.H. Bailey ssp. okeechobeensis; Gentes Herbarum 2:179. 1930; =Pepo okeechobeensis J.K. Small, J. N. Y. Bot. Gard. 31:12. 1930; endemic to Annona swamps in Palm Beach County, Florida; with divergence in PGI allozymes, and perhaps a high cucurbitacin content and low seed oil content. Endangered.

(ii) Cucurbita okeechobeensis (J.K. Small) L.H. Bailey ssp. to encompass what is now known as C. martinezii L.H. Bailey; widespread in eastern Mexico from sea level to about 1500 m. elevation in Veracruz and a few adjacent states including southern Tamaulipas, eastern San Luis Potosí and Puebla, and northern Oaxaca and Chiapas; almost always in the vicinity of streams, and often regarded as a weed in coffee and citrus plantations; with moderate cucurbitacin content; moderate oil seed content; and PGI allozymes undifferentiated from C. lundelliana. Locally common.

C. lundelliana though cross-compatible, appears to represent a sister species of Cucurbita okeechobeensis, endemic to calcareous soils of the Yucatan Peninsula with an orange corolla, a less lignified exocarp, and a different seed morphology including a crenulated seed margin. Both species have a high tolerance for moist conditions and saturated soils.

The divergence of the two subspecies may be related to (a) natural oceanic dispersal of intact fruits of the Florida subspecies from Mexico; (b) a splitting of a more continuous distribution since the post-glacial contraction of the continental shelf, with a relic isolate remaining in Florida; (c) prehistoric cultural diffusion by Carib or Arawak peoples to the Calusa of the Everglades; or (d) companion diffusion with C. moschata (Lam.) Poir. 'Seminole Pumpkin', with which it persisted around Indian villages (14). While the Seminole pumpkin was an important local crop, the unrelated Okeechobee gourd may have been used like the fruit of C. martinezii was, at least until the recent past, as a ball or rattle, a utensil such as a small ceremonial cup, or for its detergent quality (first author's personal observation).

Clearly these plants deserve more detailed biosystematic and genetic studies, for they have already proven themselves valuable to the breeder. Their resistance to cucumber mosaic virus and powdery mildew has practical importance: seed companies will soon be introducing cultivars from germplasm developed at Cornell University via the 3-way cross (C. moschata x C. okeechobeensis ssp. martinezii) x C. pepo (R.W. Robinson, pers. comm.). It would be short-sighted, to say the least, to let the few remaining spontaneous populations around Lake Okeechobee become extinct. At the subspecific rank, the Okeechobee gourd will remain eligible for federal protection in situ.

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[1]Formal taxonomic changes will be made in a reviewed botanical journal.

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