

# Morphological Traits of Possible Use as Species Markers in *Cucurbita moschata* and *C. argyrosperma*

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One aspect of our *Cucurbita* breeding and genetics research at the University of Puerto Rico is the study of the relationship between *C. moschata* and *C. argyrosperma* (1,4,5,6,7), two species often grown in close proximity in Mexico and Central America. Lira-Saade, et al. (2) developed a key to distinguish among the cultivated *Cucurbita* principally based on seed characteristics, followed by peduncle type and pubescence on the leaf and leaf petiole. Wessel-Beaver et al. (7) noted that it is often difficult to distinguish between inter- and intraspecific crosses in the field. The differences can be subtle and variation rather continuous, especially for key taxonomic traits like seed and peduncle type. In addition, these species markers require plants with mature fruits. We became interested in trying to identify species-specific morphological markers that could be observed without the need for fruit and seeds. In her detailed study of *C. argyrosperma* Merrick (3) mentions that the filaments of that species are fused, while the filaments of *C. moschata* are open at the base of the staminate flower. While taking a preliminary look at this trait we also noted that there appeared to be a relationship between filament color and staminate petiole pubescence and *Cucurbita* species. Our objective was to evaluate a large number of *C. moschata* and *C. argyrosperma* accessions in order to determine if these traits could serve as useful species markers in future studies of gene flow between these species.

**Materials and Methods:** A total of 287 cultivated accessions of *C. moschata* and 64 accessions of *C. argyrosperma* were grown in Isabela, Puerto Rico. The accessions were sampled from the U.S.D.A. Plant Genetic

Resource System and from the first author's own collection to represent a wide range of geographic diversity. Geographic diversity of *C. moschata* (grown world-wide) is much greater than *C. argyrosperma* (limited to Mexico and Central America). At least two staminate buds from each of three randomly chosen plants were sampled the day before anthesis. Data was collected directly in the field or buds were held in a cooler and evaluated within 24 hours. Filaments were classified as yellow, intermediate or white in color. The filament base was described as fused or open. The staminate bud petiole and receptacle were classified as glabrous or pubescent. Seven to 27 plants of two inbred lines ('Butternut' and TP411) and two open pollinated cultivars ('Verde Luz' and 'Soler') of *C. moschata* and one S2 line of *C. argyrosperma* (Arg 51-5) were evaluated to access the degree of within-accession variability. Thirty-five F1 plants of the cross *C. argyrosperma* 'Arg 51-5' x *C. moschata* 'PRLongvineSLR' were also evaluated.

**Results and Discussion:** None of the tested traits serve as species-specific markers (Table 1). *C. argyrosperma* accessions almost always had white, fused filaments inside glabrous staminate flowers. But for all three traits there was a diversity of phenotypes among accessions of *C. moschata*. Many accessions of *C. moschata* were segregating. Contrary to what Merrick (3) observed, the filament base of *C. moschata* can also be fused, although much less often than in *C. argyrosperma*. Many *C. moschata* accessions were classified as glabrous. However, because we included plants with a slight amount of pubescence in this category this may be an over-estimate. We observed that *C. moschata* was usually

very slightly pubescent while *C. argyrosperma* was nearly always completely glabrous.

No formal inheritance study was conducted, but 35 F1 plants of a cross between a white filament *C. argyrosperma* and a yellow filament *C. moschata* had light yellow filaments (data not shown) suggesting that yellow color is partially dominant over white. Among the 351 tested accessions, filament color always fell into three fairly discrete phenotypic classes: white, light yellow and yellow, suggesting simple genetic control by possibly one gene. Filament color can be influenced by environmental effects as evidenced by some phenotypic variation within lines (Table 2). Table 2 suggests that the type of filament base and degree of pubescence were less affected by the environment. However, filaments classified as “open” exhibited a wide range of variation from nearly fused to very open.

While these traits are not completely species-specific, they could be useful in controlled studies of gene flow where one uses parents having known genotypes (assuming that at least some of the traits are monogenic). We plan to conduct more formal inheritance studies in the future.

#### Literature Cited:

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Table 1. Comparison of phenotypes found in *C. moschata* versus *C. argyrosperma* for morphological traits associated with the staminate flower bud.

Trait	Phenotype	Number and % of accessions with phenotype			
		<i>C. moschata</i> (N=287)		<i>C. argyrosperma</i> (N=64)	
Filament color	yellow	146	51%	0	0%
	segregating or lt. yellow	107	37%	10	16%
	white	34	12%	54	84%
Filament base	fused	123	43%	61	95%
	segregating	107	37%	3	5%
	open	57	20%	0	0%
Pubescence on staminate flower	glabrous*	153	53%	62	97%
	segregating	97	34%	2	3%
	pubescent	37	13%	0	0%

\*plants with a slight amount of pubescence were also included in this category.

Table 2. Phenotypic variability of three morphological traits within two inbred lines (Butternut and TP411) and two open pollinated cultivars (Verde Luz and Soler) of *Cucurbita moschata*, and within a S2 line of *C. argyrosperma* (Arg 51-5).

	Butternut (N=7)	TP411 (N=25)	Verde Luz (N=24)	Soler (N=27)	Arg 51-5 (N=20)
<i>Filament color:</i>					
Yellow	7	21	24	23	0
Lt. yellow	1	1	0	4	0
White	0	3	0	0	20
<i>Filament base:</i>					
Fused	7	25	13	10	20
Open	0	0	11	17	0
<i>Pubescence:</i>					
Glabrous	7	25	24	25	20
Pubescent	0	0	0	2	0