

Resistance to Silverleaf Disorder is Controlled by a Single Recessive Gene in *Cucurbita moschata* Duchense

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Silverleaf disorder is induced by its namesake, the silverleaf whitefly *Bemisia argentifolii* Bellows and Perring. The disorder is characterized by an opaque, grey leaf color on the adaxial surface of leaves. In severe cases the entire leaf may be silvered, as well as the petioles, flowers and fruit. Silverleaf affects most genotypes of the domesticated species of *Cucurbita* (6). In Puerto Rico, foliage of all local tropical pumpkin (*C. moschata*) cultivars, including 'Soler', becomes silvered even in the presence of low whitefly populations. However, fruits of tropical pumpkin are usually not silvered. Thus, the economic impact of silvering is not as great as in *C. pepo* L. and *C. maxima* Duchense. However, if intense silvering occurs at an early stage, tropical pumpkin plants will often be slow to develop and generally unproductive.

Various sources of resistance to silvering have been identified in *C. moschata*. These include 'Butternut' and lines derived from Butternut including 'Waltham', and an apparently unrelated source, PI 162889, a Paraguayan land race (6, 7). Cultivars of *C. pepo* have also been reported to show varying levels of resistance to silvering (2, 4, 5). Carle et al. (1) concluded that two to four recessive genes might be involved in silverleaf resistance in *C. pepo*. The objective of our study was to determine the inheritance of resistance to the silverleaf disorder in *C. moschata*.

Materials and Methods: Five F₂ and two backcross (BC) populations were created from crosses between five silverleaf resistant and three silverleaf susceptible lines. Resistant genotypes included 1.) a line derived from selfing PI 162889, 2.) 'Waltham', and lines derived mainly from butternut types: 3.) BN111, 4.) E9706-4-5 and 5.) E9706-3-2. Susceptible genotypes included (1) a line derived from 'Soler', and 2.) TP411 and 3.)

TP312, both from the University of Florida. All susceptible lines are tropical pumpkin types. The parental, F₁, F₂ and BC populations were direct seeded in Isabela, Puerto Rico on 24 April 2001. A drip irrigation system was used. Observations were taken at 5, 6 and 7 weeks after planting following Paris et al. (3). Observations at 6 and 7 weeks generally agreed with those at 5 weeks. Data from week 5 was used in the chi-square analysis. Only individuals with a rating of "0" were classified as non-silvered (resistant).

Results and Discussion: Several previous attempts to study the inheritance of silverleaf in *C. moschata* gave ambiguous results that were partly attributed to variable or low whitefly populations (8 and unpublished data). Carle et al.(1) also attributed variation in expression of silverleaf in *C. pepo* to the level of whitefly infestation. Low or variable populations of whitefly result in distortion of segregation ratios because plants are misclassified as resistant. In this study, whitefly populations were high and uniform. Indicator plants of 'Soler' were planted throughout the field and were uniformly silvered (resistant lines were uniformly resistant). No counts were taken, but throughout the field leaves with many (sometimes 100 or more) adult whiteflies, as well as nymphs, could be observed. All progeny of F₁ resistant x susceptible populations were susceptible to silverleaf. The intensity of silvering was less in F₁ progeny than in the susceptible parents, suggesting incomplete dominance (data not shown). However, since classification of intensity of silvering is somewhat subjective, we grouped all levels of silvering (1 to 5) in one phenotypic class and only considered a complete dominance model. Both the F₂ and BC data fit this model, with the F₂ segregating 3 silvered to 1 non-silvered and the BC segregating 1:1 (Table 1), suggesting that a single dominant gene controls whitefly-induced silverleaf. We

propose the symbol *Sl* (*Silverleaf*) for the gene that expresses this trait (and *sl* for silverleaf resistance). When selecting for resistance it is essential to have an adequate whitefly population to prevent selection of non-resistant escapes.

Acknowledgments. The authors wish to thank Mr. Obed Román Hernández for his technical assistance. This research was supported by the Puerto Rico Agricultural Experiment Station.

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