RESISTANCE OF WATERMELON GERMPLASM TO ROOT-KNOT NEMATODES

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Root-knot nematodes (*Meloidogyne* spp.) seriously impact yields of watermelon throughout the southern U.S. (Sumner and Johnson, 1973; Thies, 1996). Pre-plant fumigation of soil with methyl bromide is the primary method for controlling these pests in watermelon. Six percent of methyl bromide used for pre-plant soil treatments in vegetable crops worldwide is used in watermelon and melon plantings (USDA, 1993). Use of methyl bromide was phased out 1 January 2005 in the U.S.; however, the U.S. nomination for critical-use exemption program currently allows growers to use specified allocations for certain crops (U.S. Environmental Protection Agency, 2006). Although host resistance would be one of the most economical and environmentally friendly alternatives to methyl bromide for managing root-knot nematodes, no root-knot nematode resistant watermelon cultivars are available (Montalvo and Esnard, 1994; Thomason and McKinney, 1959; Winstead and Riggs, 1959).

We developed a core sub-set of the U.S. Plant Introduction (PI) watermelon collection that included all accessions of *Citrullus colocynthis* (21 PI) and *Citrullus lanatus* var. *citroides* (88 PI), and approximately 10% of *Citrullus lanatus* var. *lanatus* accessions (155 PI) (Thies and Levi, 2003). We evaluated this core sub-set of PI accessions for resistance to *M. arenaria* race 1 in greenhouse tests. The check cultivars (Charleston Gray, Crimson Sweet, and Dixie Lee) and all but one of the *C. lanatus* var. *lanatus* accessions were susceptible with root gall severity indices (GI) ranging from 8.1 to 9.0 and from 4.0 to 9.0, respectively, on a 1 to 9 rating scale (1 = no galling; 5 = 26 to 38% root system galled; 9 = 81 to 100% root system galled). Likewise, all *C. colocynthis* accessions evaluated were highly susceptible (GI = 8.0 to 9.0). However, 20 *C. lanatus* var. *citroides* accessions and 1 *C. lanatus* var. *lanatus* accession exhibited moderate resistance to *M. arenaria* race 1 with root gall indices ranging from 3.0 to 4.9.

In further greenhouse tests, we evaluated the PI that were most resistant to *M. arenaria* race 1 for their reactions to *M. incognita* race 3 and *M. arenaria* race 2. Twenty-three of 26 *C. lanatus* var. *citroides* accessions evaluated exhibited low to moderate resistance to *M. incognita* race 3 and *M. arenaria* race 2, but the single *C. lanatus* var. *lanatus* accession was susceptible. Three *C. colocynthis* PI and the three check cultivars Charleston Gray, Crimson Sweet, and Dixie Lee were susceptible. The *C.*

lanatus var. *citroides* PI 482303 was most resistant (GI = 2.97 and root-knot nematode reproductive index = 0.34 for *M. incognita*). We observed significant genetic variability within *C. lanatus* var. *citroides* for reaction to *M. incognita* and *M. arenaria* races 1 and 2. Several *C. lanatus* var. *citroides* PI may be useful sources of resistance for developing improved horticulturally acceptable watermelon cultivars with resistance to root-knot nematodes.

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- **Advantages to using host resistance for managing root-knot nematodes in watermelon:** Planting resistant cultivars would be an economical and environmentally friendly alternative to methyl bromide because nematicide application would unnecessary.

- **Problems with implementation:** Although watermelon germplasm that is moderately resistant to root-knot nematode has been identified, resistant watermelon cultivars are not available yet.