

Resistance to Root-knot Nematodes

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Several root-knot nematode species can infect and reproduce on tomato causing crop damage and yield loss. The gene Mi-1 confers resistance against three important species of root-knot nematode, *Meloidogyne incognita*, *M. javanica*, and *M. arenaria*. However, it does not confer resistance against *M. hapla* or *M. enterolobii* (*M. mayaguensis*). *M. hapla* can cause damage in cooler climates and *M. enterolobii* is emerging as an important problem for tomato in tropical climates. In addition, isolates of *M. incognita*, *M. javanica*, and *M. arenaria* that circumvent Mi-1 have been found in many locations throughout the world. Such isolates have been found in at least five counties in California.

Mi-1 maps to the short arm of chromosome 6 and has been cloned and studied in detail. It appears to recognize the presence of the nematode and to act early after nematode invasion of the root to prevent the nematode from establishing a feeding site. Interestingly, Mi-1 also confers resistance against some isolates of potato aphid and white fly. Molecular markers linked to Mi-1 have been useful for following the gene in breeding programs. However, because other resistance genes that map to the short arm of chromosome 6 are also being introgressed into new cultivars, caution must be used in selecting appropriate markers.

Additional sources of nematode resistance have been identified, mostly in the wild species *Solanum peruvianum*, *S. corneliomulleri*, or *S. arcanum*, that confer resistance against some Mi-virulent nematodes or function at a higher temperature than does Mi-1. However, so far none of these has been introgressed into commercial cultivars. The *S. corneliomulleri* gene Mi-3, which confers resistance against Mi-virulent *M. incognita* and *M. javanica*, has been mapped to the short arm of chromosome 12 in the wild species. However, our attempts to introgress this gene into *S. lycopersicum* using molecular markers have not been successful due to apparent loss of the resistance phenotype during the introgression process. We have had similar problems attempting to introgress resistance against *M. hapla* from various sources. As far as I am aware, no resistance against *M. enterolobii* has been identified in any *Solanum* species.