GEMINIVIRUS RESISTANCE DERIVED FROM *Lycopersicon chilense* ACCESSIONS LA 1932, LA 1938, AND LA 2779

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A bipartite geminivirus appeared in Florida in the late 1980's and it was later termed tomato mottle virus (ToMoV). Accessions from several species were screened for resistance and the best resistance came from accessions of *Lycopersicon chilense* Dunal (Scott and Schuster, 1991). Twelve accessions were selected for introgression based on their lack of virus symptoms and larger leaf size; LA 1932, LA 1938, LA 1959, LA 1960, LA 1961, LA 1963, LA 1968, LA 1969, LA 2747, LA 2762, LA 2774, and LA 2779 (Scott et al., 1996). Interspecific crosses with embryo rescue and from *L. esculentum* pollen mixtures were equally effective but both resulted in only 1 F_1 plant per 40 crosses. No F_1's were obtained from LA 1969 (only few crosses made), LA 2747, LA 2762, or LA 2774. LA 1960 crosses were fertile and red fruited. During introgression, resistance was often associated with indeterminate plants with small leaves and orange fruit. Early in the introgression work, resistant determinate plants obtained from LA 1932 and LA 1961 were small with sparse growth. Determinate resistant plants from LA 1932 also had potato-like leaves even though no potato leaf (*c*) parents were used.

Introgressed lines with ToMoV resistance also had resistance to tomato yellow leaf curl virus (TYLCV) in the Dominican Republic (Scott et al., 1996). Further testing has shown that ToMoV bred lines often have resistance to various geminiviruses, but no one line has had resistance to all viruses tested. In contrast, most lines bred for resistance to TYLCV have been susceptible to ToMoV with a few exceptions. ToMoV resistance has been obtained from Tyking, selections from CHILTYLC 94-2 and -3, Ty 197, and a selection from Ty 34. The best resistance to ToMoV has been obtained from LA 1932 or LA 2779 alone and LA 1938 combined with Tyking. P. D. Griffiths (1998) used RAPD markers to locate ToMoV resistance genes. Three regions were located on chromosome 6 by using the *sp* and *c* loci as anchors. LA 2779 and LA 1938 had RAPD polymorphisms in a region analogous to the *Ty-1* region (Zamir et al., 1994). A second region near the *sp* locus was present in lines derived from LA 1938 and LA 1932, and a third region on the telomeric side of the *sp* and *c* loci was found in lines derived from LA 1932. Inheritance studies using LA 1932 estimated 2 effective factors with primarily additive gene action (Griffiths and Scott, 2001). Later we found that lines derived from LA 2779 selected for ToMoV resistance are susceptible to gray leaf spot despite numerous crosses to *Sm* resistant recurrent parents. Thus, it appears a fourth gene has been located on chromosome 11 linked to Sm^+.

An unusual yellow mosaic ToMoV symptom was found to be associated with tomato lines that carried tomato mosaic virus resistance at the *Tm-2* locus. More detail on this relationship is in the abstract written for the 1999 Tomato Breeder's Roundtable Meeting that is in this publication.

In summary, four additive geminivirus resistance genes derived from *L. chilense* sources have been found. For ToMoV resistance, a line requires two homozygous genes. ToMoV resistant lines are usually resistant to TYLCV and often other geminiviruses. These genes provide a high level of resistance, but plants often have slight disease symptoms. Further work is underway to determine if any of the RAPD markers are linked closely enough to be used in marker assisted selection. Markers will also be used to synthesize lines with all combinations of resistance genes so these can be tested with cooperators around the world to determine specific effects of the genes on various geminiviruses. Undesirable repulsion linkages such as the one with the *Sm* locus or the one in the *Ty-1* region with *Mi* will limit the usefulness of some geminivirus resistance genes unless these linkages can be broken.

SELECTED REFERENCES

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