

Modulating Acylsugar Level and Type, and its Effects on Whitefly Control

Martha Mutschler^{1*}, Ricardo Lobato-Ortiz¹, Darlene DeJong¹, Stephen Southwick¹ and Dave Schuster²

¹ Department of Plant Breeding and Genetics, Cornell University, Ithaca, NY

² University of Florida, Gulf Coast Research & Education Center, University of Florida, Wimauma, FL

The wild tomato *Solanum pennellii* (formerly *Lycopersicon pennellii*) is resistant to a broad spectrum of tomato pests due to the presence of acylsugars, which deter pests, reducing their feeding and/or oviposition. The initial transfer of acylsugar production to tomato produced 97FL, a line producing moderately high levels of acylsucroses, and demonstrable pest resistance, but very poor horticultural type. 97FL possesses 8 *S. pennellii* introgressions, representing 27% of its nuclear genomes. The combination of PCR based markers and selection for acylsugar production allowed creation of a series of second and third generation acylsugar lines with reduced numbers or sizes of introgressions. Significant differences in the levels of acylsugars were found among these acylsugar lines in greenhouse and field studies. All of the later generation acylsugar lines had acylsugar levels that were lower than that of 97FL. The density of acylsugar-producing type IV trichomes showed considerably less variation among the lines tested than did acylsugar levels, and did not account for differences in acylsugar level among lines. The types of acylsugar produced by the lines are very similar, and are largely restricted to acylsucroses, rather than the acylglucoses of the original source of acylsugar production, *Solanum pennellii* LA716. The cooperative 2006 and 2007 Florida field trials demonstrated the affect of different acylsugar levels on the degree of silverleaf whitefly (SLW) control. The lowest levels of SLW infestation, across developmental stages, were on 97FL, the line with the highest acylsugar level. The only evidence of SLW on 97FL in 2007 was the presence of less than one egg per sample. Infestation levels across stages were also significantly reduced for the new lines with the higher acylsugar levels. In these lines, some levels of SLW were present at all stages, but the levels of infestation were so low that they were not significantly different from that of 97FL. Increasing SWF counts are seen as acylsugar levels drop further in other lines. Acylsugar levels comparable or higher than that of 97FL lines should provide the most reliable control of SLW control. Further testing of the acylsugar lines in other locations, against a variety of insect pests, should identify the levels of acylsugars that would best control the desired spectrum of important tomato pests. Additional breeding is focused on raising acylsugar level, moderating acylsugar type, and further improving horticultural type with decreased introgression size.