Approaches for Developing Bacterial Spot Resistant Tomato Cultivars

J. W. Scott[1] , S. F. Hutton[1] , S. C. Sim[2] , D.F. Francis[2]

[1]IFAS, University of Florida, Gulf Coast Research & Education Center, 14625 CR 672, Wimauma, Florida, 33598 [2]Department of Horticulture and Crop Science, The Ohio State University, Ohio Agricultural Research and Development Center, Wooster, Ohio, email: jwsc@ufl.edu

Conventional breeding for resistance to bacterial spot (*Xanthomonas* sp.) in tomato (*Solanum lycopersicum* L.) has been difficult due to complex genetic control and the emergence of virulent races of the pathogen. There may also be unfavorable linkages of resistance with small fruit size, late maturity, and low yield. In Florida our predominant race is T4 but there is also some T3 still around. We have been interested in resistance QTL from PI 114490 because it has resistance to all four field races of the pathogen. However we have not been able to recover the level of resistance of PI 114490 in breeding lines developed from it. To rectify this, PI 114490 was crossed to two susceptible breeding lines, Fla. 7324 and Fla. 7613, and F_2 populations were developed. In Spring 2010, approximately 2600 F_2 seedlings were screened with a molecular marker at the *Sp* locus, and 500 determinate plants were planted to the field and subsequently evaluated for bacterial spot disease severity. Phenotypic evaluations and selections were carried out 500 F_2 progeny in Spring 2010, on 260 F3 progeny lines in Spring 2011 and on 200 F4 progeny lines in Fall 2012, always selecting for highest or lowest levels of resistance. Ninety highly resistant or highly susceptible F2:4 plants were selectively genotyped in Fall 2012 using the "SolCAP" SNP array, consisting of 7,720 SNPs. There were 2449 SNPs that were polymorphic between PI 114490 and both susceptible parents. Marker-trait analysis identified seven regions associated with resistance, including two previously reported QTL. Several of the lines were tested in Ohio for resistance to races T1, T2, and T3. Another approach is to develop cultivars with the ability to retain their green foliage despite bacterial spot infection, a trait we call non-blighting (NB). Our donor parent Fla. 630 was crossed to 19 recurrent parents and selections were made in

F_2 through F_4 generations over three seasons by selecting for earliness and yield along with non-blighting. We have now made the next round of backcrosses. Our goal is to identify molecular markers linked to NB to facilitate breeding of this trait. We are working with the Two Blades Foundation to test tomato inbreds and hybrids with the pepper (*Capsicum annuum* L.) *Bs2* gene. Bacterial spot resistance has been excellent and yields have been approximately twice as great for Fla. 8314 with *Bs2* over Fla. 8314 without *Bs2* and Florida 47. New hybrids with resistance to TYLCV, fusarium crown rot, and/or fusarium wilt race 3 in addition to *Bs2* performed well in Fall 2012. Possibilities of commercializing this genetically modified type of cultivar will be discussed.