Performance of hybrids combining genetic control to early blight and late blight with and without resistance to Septoria leaf spot

Martha A. Mutschler[1], Stella Zitter[1], Darlene DeJong[1], Tom Zitter[2], and Kelly Ivors[3], [1]Department of Plant Breeding and Genetics, Cornell University, Ithaca, NY 14853; [2]Department of Plant Pathology and Plant-Microbe Biology Cornell University, Ithaca, NY 14853; [3] Department of Plant Pathology, Mountain Horticultural Crops Research and Extension Center, North Carolina State University. Mills River, NC 28759. mam13@cornell.edu

Over the past few years, a series of lines were developed with *Ph2+Ph3* resistance to late blight, and with strong tolerance to early blight (LB/EB lines). Afterwards, strong resistance to Septoria leaf spot (*Septoria lycopersici*, SLS) was combined with these other disease genetic controls, resulting in lines combining *Ph2+Ph3* resistance to late blight, strong tolerance to early blight, and Septoria leaf spot resistance (LB/EB/SLS lines). These lines were used to make experimental hybrids to test the plant/fruit type possible with these lines, and to demonstrate the potential benefit of combining genetic controls for these three defoliating blight diseases.

Trials in several locations revealed which of the LB/EB/SLS lines and hybrids produced the largest fruit with the least tendencies for fruit defects such as cracks, catface, and zippers. One 2011 trial on the Freeville organic farm was intended for evaluation of the LB/EB and LB/EB/SLS hybrids for plant and fruit performance under organic production conditions and practices. Fruit weights of the LB/EB (125 to 151 g) and LB/EB/SLS hybrids (141 to 174 g) are moderate, ranging from that of Legend (131 g) to midway between Legend and Mountain Fresh Plus (246 g). Additionally, since this plot suffered natural infection by Septoria leaf spot, and to a lesser extent early blight, this trial also provided an excellent demonstration of the impact of the disease control gene on spread of these two diseases. (There was no late blight in the plot). The weather conditions from mid-July to date were more favorable to Septoria leaf spot than to early blight, and analysis of leaf samples from all entries shows that 80 to 95% of the identifiable lesions were caused by Septoria leaf spot rather than early blight. The EB/SLS susceptible control hybrids Legend and Mountain Fresh Plus had ratings of 8.1 to 8.7 on the Horsfall-Barrett scale (0 - 11), corresponding to up to 94% defoliation by Aug.23rd. Defoliation of LB/EB hybrids had ratings of 7.2 to 7.3, corresponding to up to 88% defoliation. This is not surprising, since most of the disease in this trial was due to SLS. In contrast, the least defoliation was observed in the four LB/EB/SLS hybrids, with ratings of up to 3.4, corresponding to up to only 12% defoliation. Clearly the heterozygous SLS resistance present in these hybrids was sufficient to substantially reduce defoliation in the absence of any fungicide sprays. Appearance of lesions and defoliation on the LB/EB/SLS resistant hybrids increased after Aug. 23rd, which is after considerable inoculum was generated by the many SLS susceptible entries in the field. This is in keeping with prior observations that this resistance is a reduced rate form of resistance, and that under very high levels of inoculation SLS resistant plants can suffer significant defoliation due to large number of lesions, even through lesion size is significantly reduced and the lesions on SLS plants largely lack pycnidia. Future work will test level of SLS resistance when homozygous, and when heterozygous and homozygous SLS resistant plants are not interplanted with SLS susceptible plants.