

**Powdery mildew resistant zucchini squash cultivar evaluation, 2011.**

The objectives of this study, which is part of a multi-year cultivar evaluation project, were 1) to continue to monitor adaptation in the pathogen that has been reducing the effectiveness of powdery mildew resistance, 2) to investigate the contribution of resistance to an integrated management program, and 3) to evaluate yield. Two experiments were conducted in adjacent fields at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. Controlled release fertilizer (N-P-K, 19-10-9) at 525 lb/A (100 lb/A of nitrogen) was broadcast and incorporated on 31 May. Beds were formed with drip tape and covered with black plastic mulch on 1 Jun. Seeds were sown on 31 May in the greenhouse. A waterwheel transplanter was used to make planting holes in the beds and apply starter fertilizer plus insecticide on 16 Jun. Seedlings were transplanted by hand on 21 Jun. During the season, water was provided as needed via drip irrigation lines. Weeds were managed by mowing and hand weeding. Cucumber beetles were managed with Admire Pro (7.5 – 10 fl oz/treated A) applied with the transplanter on 16 Jun and Asana XL (9.6 fl oz/A) applied to foliage on 2 Jul. The two experiments were conducted in separate treatment areas, one receiving a standard commercial powdery mildew fungicide program, and one that did not. The following products were applied to manage cucurbit powdery mildew: Quintec (6 fl oz/A) on 28 Jul, 18 Aug and 3 Sep; Procure 50WS (8 oz/A) on 20 Jul and 26 Aug; Pristine (18.5 oz/A) on 4 Aug; and Actinovate (8 oz/A) on 4 Aug. The following fungicides were applied preventively to both experiments for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): ProPhyt (4 pt/A) on 6 Aug; Ranman 400 SC (2.75 fl oz/A) on 18 Aug and 2 Sep; and Curzate (3.2 oz/A) on 26 Aug. All fungicide applications were made with a tractor-sprayer equipped with D4 nozzles at 17-in spacing that delivered and 60 gpa operated at 250-275 psi. Plots were four adjacent rows each with three plants spaced 24 in. apart. Rows were spaced 68 in. apart. One plant of Multipik, a powdery mildew-susceptible summer squash cultivar, was planted between each plot in each row to separate plots and provide a source of inoculum. A randomized complete block design with four replications was used. Upper and lower leaf surfaces were assessed for powdery mildew on 14, 21 and 26 Jul, and on 3, 10 and 17 Aug. Powdery mildew colonies were counted; severity was estimated when colonies had coalesced or were too numerous to count. Colony counts were converted to severity values using the conversion factor of 30 colonies/leaf = 1% severity. Average severity for the entire canopy was calculated from the individual leaf assessments. Area under disease progress curve (AUDPC) was calculated based on the six weekly disease severity ratings. Squash fruit were harvested and counted on 26 Jul 26; and on 2 and 9 Aug. Average monthly high and low temperatures (°F) were 79/61 in Jun, 87/68 in Jul, and 82/66 in Aug. Rainfall (inches) was 6.1, 2.35, and 10.61 for these months, respectively. There was a hurricane (28 Aug) and several atypical intensive rain events during the 2011 growing season on Long Island.

Symptoms of powdery mildew were observed at a low level on 14 Jul: 2.5% of older leaves examined had symptoms. Disease developed quickly. Symptoms were found on 21 Jul in all except one treated plot of a resistant cultivar. On that day, the proportion of older leaves examined with symptoms was 46% in both experiments. Incidence at that time was unusually high for the region. It was only 3% on 20 Jul 2010 in a similar experiment with these same cultivars. Powdery mildew incidence therefore was substantially above the action threshold of 2% on 20 Jul 2011 when the powdery mildew fungicide program was started for assessing integrated management. When genetic resistance was evaluated as a sole management practice for powdery mildew, only Amatista effectively suppressed powdery mildew and only on the lower leaf surface based on the AUDPC value. Amatista is considered to be more resistant than Envy. Based on AUDPC values, Amatista provided 76% control on lower leaf surfaces. Both Amatista and Envy provided control in a similar experiment conducted in 2010, although Amatista was also more effective in 2010. Envy contributed to control of powdery mildew in 2011 only when it was used as a component of an integrated management program that included weekly applications of a targeted fungicide for powdery mildew (Quintec, Pristine, and Procure). Based on AUDPC values, fungicide-treated Envy provided 46% control on lower leaf surfaces while fungicide-treated Amatista provided 73% control compared to the similarly-treated susceptible cultivar Spineless Beauty. The fungicide program provided limited suppression of powdery mildew in this experiment. The only significant differences in yield detected among the cultivars were for the fungicide treated plots. All cultivars had marketable fruit on the first harvest date.

Fungicide treatment	Powdery mildew severity (%) <sup>z</sup>					
	Upper leaf surface			Lower leaf surface		
Cultivar (resistance) <sup>y</sup>	10-Aug	17-Aug	AUDPC	10-Aug <sup>x</sup>	17-Aug	AUDPC
Non-fungicide treated						
Spineless Beauty (S).....	1.9	46.2 a	175.3 a	9.6	59.7 a	282.2 a
Envy (PMR).....	1.4	26.8 ab	103.9 ab	5.7	44.6 a	196.8 a
Amatista (PMR).....	0.1	6.5 b	23.9 b	4.2	10.5 b	67.7 b
<i>P-value (treatment)</i>	0.0764	0.0089	0.0045	0.1692	0.0008	0.0032
Fungicide treated						
Spineless Beauty (S).....	0	9.8	34.7	10.6 a	64.3 a	342.2 a
Envy (PMR).....	0	8.3	29.2	4.7 b	43.5 ab	186.4 b
Amatista (PMR).....	0	3.5	12.3	1.8 b	22.9 b	93.8 b
<i>P-value (treatment)</i>	0.0000	0.2837	0.2737	0.0034	0.0105	0.0066

<sup>z</sup> Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%. Area Under Disease Progress Curve (AUDPC) was calculated from 14 Jul through 17 Aug.

<sup>y</sup> PMR = heterozygous resistance; S=susceptible.

<sup>x</sup> Numbers for each fungicide treatment in each column with a letter in common are not significantly different from each other (Tukey's HSD, P=0.05).