SQUASH (*Cucurbita pepo*)
Powdery mildew; *Podosphaera xanthii*

M. T. McGrath and G. M. Fox
Department of Plant Pathology
Cornell University, LIHREC
3059 Sound Avenue, Riverhead, NY 11901

Powdery mildew resistant zucchini summer squash cultivar evaluation, 2007.

The objective of this study was to evaluate six green zucchini cultivars, three experimental cultivars, two grey zucchini cultivars (Amatista and Topazio), and one golden yellow cultivar (Sebring Premium) with resistance to powdery mildew by comparing them to a susceptible cultivar that is an industry standard (Zucchini Elite). Romulus PM is open-pollinated. Some cultivars evaluated also have resistance to several viruses. A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. Seeds were sown on 8 Jun in the greenhouse. Seedlings were transplanted into beds covered with black plastic mulch on 18 Jun. Fertilizer (N-P-K 10-10-10) at 400 lb/A was broadcast and incorporated on 16 May. Additional fertilizer (N-P-K 46-0-0) at 30 lb/A was injected through the drip irrigation system on 9 and 30 Jul. Water was provided as needed through drip irrigation. During the season weeds were controlled with Strategy (2 pt/A) applied on 1 Jun and RoundUp WeatherMax (1% solution) applied on 12 and 27 Jun between the rows of black plastic mulch with a shielded sprayer, and by hand weeding. Cucumber beetles were managed with Admire applied after transplanting as a soil drench around transplants (0.0007 fl oz/plant) on 21 Jun and with Asana XL (9.6 oz/A) applied to foliage on 16 Jul. No fungicides were applied specifically for powdery mildew. Kocide DF (2 lb/A) was applied preventively for bacterial leaf spot on 29 Jun. The following fungicides were applied preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): Forum 4.16SC (6 oz/A) on 16 Jul, Ranman 400 SC (2.75 fl oz/A) on 12 Aug, Acrobat 50 WP (6.4 oz/A) on 19 Aug, and Previcur Flex 6 F (1.2 pt/A) on 29 Aug. Neither disease was detected before the end of this experiment. Plots were two adjacent rows each with six plants spaced 24-in. apart. Rows were spaced 68-in. apart. One yellow summer squash plant of a susceptible cultivar (Multipik) was planted between each plot. A randomized complete block design with four replications was used. Upper and lower surfaces of 15 old and mid-aged leaves were assessed for powdery mildew on 26 Jul, 14 days after fruit were harvested for the first time. Ten old, 10 mid-aged, and 10 young leaves were examined on 9 Aug in each plot. Leaves were categorized based on leaf physiological appearance and position in the canopy. Powdery mildew colonies (spots) were counted; severity was assessed by visual estimation of percentage leaf area affected when colonies could not be counted accurately because they had coalesced and/or were too numerous. Colony counts were converted to severity values using the conversion factor of 30 colonies/leaf = 1%. Average severity for the entire canopy was calculated from the individual leaf assessments. A square root transformation was used when needed prior to analysis to achieve homogeneity of variance. Zucchini fruit were harvested and weighed a total of eight times on 12, 17, 20, 24, 27, and 31 Jul; and on 3 and 7 Aug. Fruit were separated into marketable and unmarketable grades based on length, then weighed. There were no unmarketable fruit with blemishes due to disease or insect feeding. Fruit characteristics were evaluated and overall appearance was rated on a scale of 1 to 9; 1= poor, 5 = marginal, 7 = acceptable, and 9 = good. Average monthly high and low temperatures (^{o}F) were 79/61 in Jun, 82/66 in Jul, and 82/65 in Aug. Rainfall (in.) was 3.37, 3.63, and 2.60 for these months, respectively.

Only Romulus PM and Amatista exhibited less severe powdery mildew on upper and lower leaf surfaces relative to Zucchini Elite on 9 Aug. The table contains the six standard green zucchini squash cultivars listed in order based on severity on lower leaf surfaces on 9 Aug, followed by the three experimental cultivars, the golden yellow cultivar (Sebring Premium), the two grey zucchinis, then the standard cultivar included for comparison. Results were substantially different in 2006 when a similar experiment was conducted with most of these cultivars. Severity on lower leaf surfaces on 9 Aug 06 was 0% to 5% for the resistant cultivars and 23% for Zucchini Elite. Other powdery mildew-resistant squash types and pumpkins evaluated in additional experiments at LIHREC in 2007 also exhibited reduced suppression. The pathogen may have evolved to overcome the main resistance gene in these cultivars. Romulus PM was less severely affected by powdery mildew than the other cultivars likely because it is homozygous resistant and has at least one modifier gene. HMX 7729 produced the greatest number of marketable fruit, but did not differ significantly in yielding ability from Justice III and RSQ6006. Romulus PM had the lowest yield, as in 2006. This was partly due to delayed fruit production: this was the only cultivar with no fruit at the first and second harvest dates. Sebring Premium also had low yield initially. Overall appearance was rated 6.4 for Romulus PM, 7.6 for Zucchini Elite, and 7 to 8.5 for the other cultivars. Paycheck was named and released for the 2008 season.

	Powdery mildew severity (%) *				Marketable fruit (12 Jul – 7 Aug)		
Zucchini	Upper leaf surface		Lower leaf surface		Number/	Weight (lb)/	Fruit
cultivar/experimental	26-Jul	9-Aug	26-Jul	9-Aug	plant	plant	weight (lb)
Romulus PM ……..……	0.00 d **	2.9 c	0.01 d	0.3 e	1.4 f	1.14 d	0.83 a
Payroll…….	0.03 bcd	22.4 ab	0.20 bcd	10.9 cd	3.8 bc	2.27 bc	0.56 ef
Justice III ……	0.00 d	28.6 ab	0.13 cd	13.2 bcd	4.0 ab	2.18 bc	0.54 f
Wildcat ……	0.01 cd	27.5 ab	0.09 cd	17.4 abcd	3.7 bc	2.19 bc	0.60 cde
Judgement III …….	0.30 a	28.7 ab	0.68 ab	19.0 abcd	3.2 cde	1.88 c	0.58 def
Envy ……	0.05 abcd	33.4 a	0.34 abc	27.9 a	3.9 bc	2.39 ab	0.61 cde
HMX 7729 …….	0.02 bcd	30.2 ab	0.32 abc	23.2 abc	4.6 a	2.74 a	0.60 cde
Paycheck (RSQ6004) …	0.10 abcd	27.9 ab	0.17 bcd	17.5 abcd	3.5 bcd	2.27 bc	0.66 bc
RSQ6006 …….....	0.03 bcd	32.5 a	0.16 bcd	24.6 ab	4.0 ab	2.54 ab	0.63 cd
Sebring Premium ……	0.20 ab	32.7 a	0.26 abcd	21.5 abc	3.8 bc	2.74 a	0.71 b
Amatista …….	0.01 cd	19.4 b	0.10 cd	9.4 d	2.8 e	0.61 e	0.25 g
Topazio ……	0.03 bcd	29.4 ab	0.09 cd	21.8 abc	2.9 de	0.69 e	0.26 g
Zucchini Elite (std) …....	0.18 abc	33.2 a	0.88 a	25.6 ab	3.6 bc	2.34 ab	0.66 bc
P-value	0.068	0.0001	0.0417	0.005	< .0001	< .0001	< .0001

* Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%. Severity data is for old leaves on 26 Jul and on mid-aged leaves on 9 Aug.

** Numbers in each column with a letter in common are not significantly different according to Fisher's Protected LSD (P = 0.05), with the exception of the first column.