

Powdery mildew resistant yellow summer squash cultivar evaluation, 2010.

The objective of this experiment was to evaluate cultivars possessing powdery mildew resistance genes. The main goal was to determine whether cultivars with homozygous resistance to powdery mildew (i.e. two copies of the powdery mildew resistance gene; PMRR), provide better suppression of powdery mildew than cultivars with heterozygous resistance (PMR). This was the case in cultivar evaluations conducted in 2007 and 2008 but not in 2006. Most commercial resistant squash cultivars have PMR. The abilities of the cultivars evaluated in 2010 to resist powdery mildew as well as their yielding ability were determined relative to Gentry, a standard cultivar lacking powdery mildew resistance. This field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. Fertilizer (N-P-K 10-10-10) at 1000 lb/A was broadcast and incorporated on 10 May. Black plastic mulch and drip tape were laid on 11-13 May. Seeds were sown on 3 Jun in the greenhouse. Seedlings were transplanted by hand into beds covered with black plastic mulch on 22 Jun, one day after a waterwheel transplanter was used to open the holes and apply starter fertilizer plus insecticide. During the season water was provided as needed via drip irrigation lines located beneath the mulch. Additional fertilizer (N-P-K 46-0-0) at 30 lb/A was injected through the drip irrigation system twice. Weeds were controlled between the rows of mulch by seeding white clover for a living mulch on 26 May after roto-tilling to prepare a seed bed and manage weeds that had already germinated. During the season, weeds were managed by mowing, hand weeding, and applying Select 2EC (8 oz/A) with 1% COC on 20 Jul to control weedy grasses. Select was applied when air temperature was 85 °F and resulted in damaged foliage. Cucumber beetles were managed with AdmirePro (7.5–10 fl oz/treated A) applied with the transplanter and Asana XL (9.6 oz/A) applied to foliage on 23 Jul. No fungicides were applied to control powdery mildew. The following fungicides were applied to preventively control downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): ProPhyt (3 qt/A) on 21 Jul; Ranman 400 SC (2.75 fl oz/A) on 7 Aug; Forum (6 fl oz/A) on 14 and 21 Aug; and Tanos (8 oz/A) on 28 Aug. Plots were four adjacent rows each with three plants spaced 24 in. apart. Rows were spaced 68 in. apart. A single plant of Multipik, a 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 27 and 30 Jul, and on 5 and 13 Aug. Initially 30 older leaves were examined in each plot. In subsequent assessments as symptomatic leaves became more common, fewer old leaves were examined. Mid-aged leaves were also assessed on 13 Aug when powdery mildew had progressed to this leaf age group. Powdery mildew colonies (spots) 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. Area under the disease progress curve (AUDPC) from 27 Jul through 13 Aug was approximated using the trapezoidal integration method. Powdery mildew severity was also assessed on stems and leaf petioles. Squash fruit were harvested and weighed on 16, 19, 23, 26 and 29 Jul; and on 2 and 9 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 also evaluated and overall appearance was rated on a scale of 1 to 9 with 1 = poor, 5 = marginal, 7 = acceptable, and 9 = best. Average monthly high and low temperatures (°F) were 81/64 in Jun, 87/70 in Jul, and 83/67 in Aug. Rainfall (in.) was 1.63, 3.46, and 2.02 for these months, respectively.

Symptoms of powdery mildew were first observed on 27 Jul in all but 2 plots of Sunray and on 19% of the older leaves examined (data not shown). Severity remained low through 5 Aug, when symptoms were observed to be covering on average less than 5% of both upper and lower leaf surfaces of the susceptible cultivars. Severity increased greatly by the next assessment 8 days later. Degree of suppression was 73-78% on upper leaf surfaces and 70-74% on lower leaf surfaces based on AUDPC values for the resistant cultivars compared to those for Gentry. This suppression was not evident at the first two assessments (27 and 30 Jul) when disease severity was very low. Resistant cultivars are listed in the table in order of disease control on lower leaf surfaces. Two susceptible cultivars were included in this experiment to investigate whether they could exhibit detectable differences in powdery mildew severity, which would be important considering the susceptible cultivar is used to estimate suppression achieved with resistant cultivars. No significant differences were detected between cultivars with homozygous (PMRR) or heterozygous (PMR) resistance. Races 1, 2, and 3 of *Podosphaera xanthii* were present with race 1 the dominant race based on severity of powdery mildew on the differentials (Hale's Best Jumbo, PMR 45, PMR 5, and MR 1) in a near-by planting. All cultivars had marketable fruit at the first harvest on 16 Jul. Sunray and Fortune produced the greatest number of fruit; PM Success produced the least. These cultivars did not differ significantly from all other cultivars. All cultivars produced fruit with acceptable characteristics, which were rated at least 7 out of 9. Cheetah was previously known as HMX 5712.

Cultivar (resistance) ^y	Powdery Mildew Severity (%) ^z						Yield		
	Upper leaf surface			Lower leaf surface			Marketable fruit		Total
	5-Aug	13-Aug	AUDPC	5-Aug	13-Aug	AUDPC	Number/ plant	lb/ plant	Number/ plant
Sunray (PMRR).....	0.45 b ^x	7.90 b	34.8 b	0.56 ab	8.27 b	40.5 b	6.13 a	3.64 a	7.07 a
PM Success (PMRR)....	0.51 b	7.98 b	35.6 b	0.07 b	10.70 b	43.6 b	3.96 b	2.47 bc	5.29 b
Cheetah (PMR).....	0.48 b	6.03 b	29.4 b	0.17 b	11.42 b	47.1 b	4.37 b	2.37 c	7.20 a
Fortune (Susceptible)....	3.20 a	18.93 a	102.3 a	1.12 ab	34.75 a	150.6 a	6.06 a	3.49 a	7.69 a
Gentry (Susceptible)....	3.67 a	23.17 a	132.1 a	1.95 a	35.30 a	157.8 a	5.30 ab	3.31 ab	6.80 a
<i>P</i> -value (treatment)	0.0002	0.0007	<0.0001	0.0060	0.0003	0.0004	0.0021	0.0017	0.0028

^zExact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1% severity.

^y PMRR = homozygous resistance; PMR = heterozygous resistance.

^x Numbers in each column with a letter in common are not significantly different from each other (Tukey's HSD, *P*=0.05).