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

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Powdery mildew-resistant acorn-type winter squash cultivar evaluation, 2009.

The primary goal of this experiment was to determine whether winter squash cultivars with homozygous resistance (e.g. two copies of the powdery mildew resistance gene; PMRR) are better protected against powdery mildew than cultivars with heterozygous resistance (PMR). This is part of a multi-year project. Ability of these cultivars to resist powdery mildew as well as their yields were determined relative to Table Ace, a standard cultivar lacking powdery mildew resistance that is commonly produced. This field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. The field was plowed on 30 Apr and conventionally tilled on 14 May and 1 Jun. A blend of 19-10-12 controlled release fertilizer (containing 65% of N as ESN, a controlled release formulation) plus Muriate Potash (0-0-60) at 100 lb/A was spread on 10 Jun and then incorporated by disking. Black plastic mulch and drip tape were laid on 15 Jun. Seeds were hand-planted on 16 Jun into holes cut into the plastic. Two seeds were placed and later thinned to one plant where needed. Water was provided as needed through drip irrigation lines located beneath the mulch. Weeds were controlled between plastic mulch strips by applying Strategy (3 pt/A) and Sandea (0.5 oz/A) on 17 Jun with a shielded herbicide sprayer and by hand weeding. Cucumber beetles were managed with Admire 2F (0.0007 fl oz/plant) applied after transplanting as a soil drench around transplants on 29 Jun and with Asana XL (9.6 oz/A) applied to foliage on 24 Jun and 1 Jul. No fungicides were applied to control powdery mildew. Ridomil Gold EC 1 pt/A + SprayHandler 8 fl oz/A were applied to soil on 8 Jun and incorporated by disking for Phytophthora blight (*Phytophthora capsici*). The following foliar fungicides were applied preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight: ProPhyt (4 pts/A) on 24 Jun; Forum 4.16SC (6 oz/A) on 27 Jul, 8 Aug, 27 Aug, 13 Sep, and 24 Sep; and Ranman 400 SC (2.75 fl oz/A) on 17 Jul, 1 Aug, 16 Aug, 4 Sep, 18 Sep, 1 Oct. Plots were three adjacent rows each with three plants spaced 24 in. apart. Rows were spaced 68 in. apart. Within each of the three rows between each plot a plant of Gentry summer squash, a susceptible cultivar, was planted to separate plots and provide a source of inoculum. A randomized complete block design with four replications was used. Upper and lower leaf surfaces of 10 to 30 leaves in each plot were assessed for powdery mildew on 15, 22, and 31 Jul; and on 4 and 14 Aug. Initially the examined leaves were selected from the oldest third of the foliage based on leaf appearance and position in the canopy. As disease progressed mid-aged and young leaves also were examined. 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%. Average severity for the entire canopy was calculated from the individual leaf assessments. Squash fruit were harvested and weighed on 5 Oct. Three representative fruit per plot were selected for measuring fruit width, fruit length, and cavity width and for assessing sugar content, which was done with a hand-held refractometer using fruit samples that were frozen and then thawed. Fruit characteristics were also evaluated and overall appearance was rated on a scale of 1 to 5 with 1= poor and 5 = best. Average monthly high and low temperatures (^{o}F) were 73/58 in Jun, 80/64 in Jul, 83/68 in Aug, and 74/58 in Sep. Rainfall (in.) was 6.43, 4.82, 2.01, and 2.39 for these months, respectively.

Symptoms of powdery mildew were first observed on 22 Jul on 1.5% of the older leaves examined. No symptoms were found on 15 Jul. Severity remained low through 14 Aug. On 25 Aug, the susceptible cultivar Table Ace was substantially more severely affected than the other cultivars, which have resistance, in the one replication that could be assessed on that date. Severity increased greatly on the resistant cultivars by the next assessment date, 1 Sep. All three cultivars with resistance from both parents were significantly less severely affected by powdery mildew on lower leaf surfaces than the susceptible cultivar whereas the cultivar with heterozygous resistance was not. Average fruit weight was lowest for Honey Bear, which was as expected because this variety was bred to produce a smaller, personal-sized fruit.

	Powdery mildew severity (%) [z]						Marketable fruit			
	Upper leaf surface			Lower leaf surface						
Cultivar (resistance) [y]	14-Aug	25-Aug	1-Sep	14-Aug	25-Aug	1-Sep	Number / plant	Weight/ plant (lb)	Weight/ fruit (lb)	Sucrose (%)
Honey Bear (PMRR) …….	0.02	0.20	10.7	0.10	0.00	17.8 b [x]	2.19	2.08	0.94 b	11.9
Table Star (PMRR) ……...	0.05	0.10	29.2	0.07	0.03	19.0 b	3.00	3.85	1.29 a	11.2
Sweet REBA (PMRR) …..	0.04	0.00	19.2	0.49	0.30	23.6 b	2.89	3.72	1.28 a	9.4
Tay Belle PM (PMR) ……	0.12	0.73	39.0	0.16	0.07	31.8 ab	2.75	3.82	1.40 a	10.0
Table Ace (Susceptible) ...	0.25	25.07	30.7	0.43	34.77	52.8 a	2.72	3.36	1.23 ab	8.5
P-value (treatment)	0.4423	NA	0.1228	0.6372	NA	0.0027	0.1772	0.0419	0.0109	0.1176

[z] Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%.
[y] PMRR = homozygous resistance; PMR = heterozygous resistance.
[x] Numbers in each column with a letter in common are not significantly different according to Fisher's Protected LSD (*P* = 0.05).