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

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Powdery mildew-resistant acorn-type winter squash cultivar evaluation, 2010.

The main goal of this experiment, which is part of a multi-year project, was to determine whether winter squash cultivars with homozygous resistance to powdery mildew (i.e. two copies of the powdery mildew resistance gene; PMRR) are more resistant to powdery mildew than cultivars with heterozygous resistance (PMR). The ability of these cultivars to resist powdery mildew as well as their yields were determined relative to Table Ace, a commercial standard cultivar lacking powdery mildew resistance that is commonly grown. 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. Seedlings were transplanted by hand into beds covered with black plastic mulch on 23 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 ^{o}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 Black Beauty, a susceptible zucchini 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 20 and 28 Jul, and on 4, 11 and 18 Aug. Initially 30 older leaves were examined in each plot. In subsequent assessments as symptomatic leaves became more common, fewer old leaves were examined per plot and other age groups of leaves were also 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% severity. Average severity for the entire canopy was calculated from the individual leaf assessments. Squash fruit were harvested and weighed on 14 Sep. 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. Flesh color, cavity size and other 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 81/64 in Jun, 87/70 in Jul, 83/67 in Aug, and 77/62 in Sep. Rainfall (in.) was 1.63, 3.46, 2.02, and 2.87 for these months, respectively.

Symptoms of powdery mildew were first observed on 20 Jul in 10 of 16 plots on 3% of the older leaves examined. Severity remained low, even on the susceptible cultivar, until the last assessment on 18 Aug. The resistant cultivars were significantly less severely affected by powdery mildew than the susceptible cultivar on 4 Aug and numerically less on both leaf surfaces on 11 Aug (data not shown) and 18 Aug. Honey Bear was not significantly less severely affected by powdery mildew than the susceptible cultivar. Based on severity on lower surfaces on 18 Aug, Sweet REBA and Tay Belle PM provided 59-68% control of powdery mildew. Heterozygous resistance was as effective as homozygous resistance in this experiment. No significant differences were detected in number or weight per plant of marketable or estimated total yield. Individual weight per fruit reflected the fact that Honey Bear was developed to produce small, personal-sized fruit.

Cultivar (resistance) [y]	Powdery mildew severity (%) [z]						Marketable fruit		
	Upper leaf surface			Lower leaf surface			No./ plant	Wt/fruit (lb)	Sucrose (%)
	4-Aug	18-Aug	AUDPC	4-Aug	18-Aug	AUDPC			
Sweet REBA (PMRR)…..	0.06 b [x]	14.10	54.0 b [x]	0.06 b	7.54 c	28.48 b	2.15	1.15 ab	7.01
Tay Belle PM (PMR)….....	0.18 b	17.17	68.1 ab	0.01 b	9.53 bc	35.77 b	1.77	1.61 a	5.96
Honey Bear (PMRR)..…...	0.01 b	19.06	71.1 ab	0.00 b	17.27 ab	61.14 ab	1.50	0.73 b	8.88
Table Ace (S)……..…..	2.11 a	20.41	101.0 a	1.21 a	23.41 a	95.30 a	1.69	1.36 a	6.35
P -value (treatment)	<.0001	0.3141	0.0148	0.0009	0.0014	0.0008	0.7256	0.0091	0.4262

[z] Exact 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; S=susceptible.

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