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

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

The goal of this experiment was to determine whether hybrids with homozygous resistance to powdery mildew (i.e. two copies of the powdery mildew resistance gene; PMRR), provide better suppression of powdery mildew than hybrids with heterozygous resistance (PMR). PMRR experimental hybrids were obtained from two plant breeders. 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 28 May in the greenhouse. Seedlings were transplanted by hand into beds covered with black plastic mulch on 15 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 applying Strategy (3 pt/A) plus Sandea (0.5 oz/A) on 7 Jun and Roundup at 16 fl oz/A. and Select 2EC (8 oz/A) with 1% COC on 20 Jul to control weedy grasses, and by hand weeding. 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 preventively to 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. Two plants of Multipik, a susceptible summer squash cultivar, were 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 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 leaf age groups 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. Marketable squash fruit were harvested, weighed, and measured on 15 Sep. Damaged, immature, and rotten fruit were counted. Total potential yield was estimated for all fruit produced. Analysis was done for only two replications due to a mix up of fruit from the others. Three representative fruit per cultivar 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. Average monthly high and low temperatures (°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 4 Aug on 1 to 6 of the 30 older leaves examined in all plots. Severity remained low through 11 Aug, when symptoms were observed to be covering on average less than 1% of both upper and lower leaf surfaces of even the susceptible cultivar. The 2010 summer season was unusually hot and dry, which may have affected development of powdery mildew through 11 Aug. Severity increased greatly by the next assessment 7 days later, exceeding 15% on upper leaf surfaces and 26% on lower leaf surfaces for all cultivars. Significant differences in powdery mildew severity were only detected among cultivars on the last assessment date. Only Bugle, a PMRR cultivar, was significantly less severely affected by powdery mildew than Waltham, the susceptible cultivar. No significant differences were detected in number or weight per plant of marketable yield but were seen in the individual weight per fruit. Honey Nut was selected to produce small, personal-sized fruit. Significant differences were measured in BRIX levels between cultivars with the lowest seen in Honey Nut (7.32) and the highest in Geneva (10.53).

| | Powdery mildew severity (%) [z] | | | | | | Yield | | |
| | Upper leaf surface | | | Lower leaf surface | | | No./ plant | lb/ fruit | Sucrose (%) |
Cultivar (resistance) [y]	11-Aug	18-Aug	AUDPC	11-Aug	18-Aug	AUDPC			
Bugle (PMRR)…………...	0.44	37.27	55.0	0.20	26.68 b [x]	100.0 b	2.39	1.79 d	9.51 ab
JWS 61119 (PMRR)……	0.61	24.33	36.9	0.88	54.10 ab	199.3 ab	1.78	2.40 abc	9.47 ab
JWS 61120 (PMRR)…….	0.31	42.08	44.1	0.51	56.42 a	203.8 ab	2.92	1.76 d	9.66 ab
JWS 61121 (PMRR)……	0.73	34.38	49.0	0.64	39.44 ab	148.4 ab	2.64	2.26 bc	7.62 ab
WSXP1040 (PMRR)……	0.37	15.64	41.9	1.61	57.22 a	212.6 a	2.36	2.11 cd	8.18 ab
Geneva (PMRR)...............	0.27	34.28	54.4	0.66	52.11 ab	189.9 ab	1.53	2.81 a	10.53 a
Butterfly (PMR)………...	0.49	38.14	39.8	0.15	58.07 a	207.7 ab	1.89	2.12 cd	9.07 ab
Honey Nut (PMR)…….....	0.46	41.88	40.7	0.37	62.95 a	225.4 a	3.70	0.85 e	7.32 b
Betternut 401 (PMR)……	0.41	35.60	33.2	0.14	55.49 a	196.2 ab	2.53	1.78 d	8.19 ab
Waltham (S)…………….	0.43	29.92	65.6	0.26	67.36 a	242.4 a	2.56	2.58 ab	10.27 ab
P-value (treatment)	0.9602	0.3060	0.6210	0.2471	0.0046	0.0075	0.0756	<.0001	0.0177

[z] Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1% severity.

[y] PMR = heterozygous resistance. PMRR = homozygous resistance; S=susceptible.

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