

Powdery mildew resistant pumpkin cultivar evaluation, 2009.

There are many pumpkin cultivars now commercially available that are advertised as having resistance to powdery mildew. Previous experiments have demonstrated that the level of resistance can be highly variable among these cultivars and can in fact be low resulting in limited suppression of powdery mildew. The goal of this experiment was to confirm these results and extend the study to include new cultivars. Growers need to know the degree of expected control from genetic resistance in their management program, and there is concern that this pathogen could be adapting to the major resistance gene in use. A field experiment was conducted at the Long Island Horticultural Research and Extension Center on Haven loam soil. The field was plowed on 10 May and tilled on 11 Jun. A vacuum seeder with the closing wheels removed was used to open a seed furrow and to apply fertilizer in a band about 2 in. away from the seed. A blend of controlled release fertilizers, consisting of 300 lb/A 15-18-12 and 100 lb/A ESN, was used. Seeds were placed in the furrows on 16 Jun by hand with two seed per plant at 36-in. plant spacing within rows. Seed were also planted for a plant of Multipik summer squash, a susceptible cultivar, between plots in each row at 24-in spacing from the adjacent pumpkins to separate plots and to serve as a source of inoculum. Furrows were raked to close. After seedlings were established, doubles were thinned to one plant and in the rare case that none emerged a seedling was transplanted from a small group of greenhouse-grown seedlings of each variety. Plots contained a total of 12 plants in three rows spaced 68 in. apart. Plant vines were moved as needed to maintain plot separation. A randomized complete block design with four replications was used. The herbicides Strategy (3 pt/A) and Sandea (0.5 oz/A) were applied over the entire plot area on 17 Jun, which was followed by 1.1 in. of rain. During the season, weeds were controlled by cultivating, roto-tilling, and hand weeding as needed. Red clover at 10 lb/A was planted with a grain drill to establish driveways on 12 Jul. Cucumber beetles were managed by applying Admire 2 F (20 fl oz/A) in a narrow band over the planted rows immediately after the herbicide application on 17 Jun and applying Asana XL (9.6 fl oz/A) to foliage on 1 Jul. No fungicides were applied specifically for powdery mildew. To manage damping-off, Ridomil Gold EC (1 pt/A) was broadcast applied and incorporated mechanically on 10 Jun. A soil penetrant to increase water penetration, SprayHandler (0.5 pt/A), was applied with Ridomil. The following fungicides were applied to foliage preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): 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, and 1 Oct. Plots were inspected for powdery mildew symptoms on upper and lower leaf surfaces on 23 and 31 Jul; 4 and 17 Aug; and 3 Sep. Initially the examined leaves were selected from the oldest third of the foliage based on leaf physiological appearance and position in the canopy. Mid-aged and young leaves were also assessed on 17 Aug and 3 Sep. Ten leaves per age group were examined in each plot. Powdery mildew colonies were counted; severity was assessed by visual estimation of percent leaf area infected when colonies could not be counted accurately because they had coalesced and/or were too numerous. Average severity for the entire canopy was calculated from the individual leaf assessments. Pumpkin fruit were harvested and weighed on 14 Oct. Rotten and immature fruit were counted. Fruit quality was assessed. Average monthly high and low temperatures (°F) were 73/58 in Jun, 80/64 in Jul, 83/68 in Aug, 74/58 in Sep, and 62/47 in Oct. Rainfall (in.) was 6.43, 4.82, 2.01, 2.39, and 5.78 for these months, respectively. Overhead irrigation was used as needed to supplement rainfall when less than 1 in. per week.

Powdery mildew severity remained low from 31 Jul, when first observed, through 17 Aug, when no symptoms were found in 11 of the 44 plots, for all cultivars except Sorcerer (2 of 4 plots on 17 Aug), then severity increased substantially for all. No significant differences were detected in powdery mildew severity on lower leaf surfaces on 3 Sep, which ranged from 24% on Trophy to 74% on Sorcerer, the susceptible standard cultivar. Trophy was the only resistant Jack-o-lantern pumpkin type that was significantly less severely affected by powdery mildew on upper leaf surfaces than Sorcerer. Gold Dust and Gold Speck, the two miniature pumpkin cultivars tested, had severity similar to Trophy. Only Gold Dust was bred to have resistance. In previous pumpkin cultivar evaluations these two also have exhibited similar low severity compared to Jack-o-lantern pumpkin type cultivars, with no significant differences detected between these two. Other miniature pumpkin cultivars evaluated have had similar relatively low severity. Thus this study confirms previous observations that mini-fruited cultivars are naturally less susceptible to powdery mildew. Limited suppression of powdery mildew with resistant cultivars that occurred in this study confirms results from previous evaluations. No advantage was detected in having resistance from both parents (PMRR vs PMR) nor was there greater suppression with cultivars having the putative new resistance gene from Hollar Seed Company. However, it is possible that different conclusions would have been reached if an assessment could have been done in late Aug. Significant differences were detected among cultivars in yield. Mustang produced the largest fruit. Greatest weight of fruit per plant was obtained with Magic Lantern, Camaro, Magician, Field Trip, HSR 4721, and Sorcerer.

Cultivar (resistance) ^y	Powdery mildew control (%) ^z		Yield of mature fruit		
	Upper surface	Lower surface	#/plant	lb/plant	lb/fruit
Trophy (PMR)	70.9 b ^x	67.8	0.9 bcd	3.8 abc	4.5 c
Mustang (PMR)	58.5 ab	58.0	0.3 d	4.4 abc	12.9 a
Gold Dust (PMR)	61.1 b	48.1	3.9 a	1.6 bc	0.4 d
Millionaire (PMR)	48.1 ab	53.9	1.5 bc	5.4 ab	3.7 c
Camaro (PMR)	39.9 ab	52.3	0.6 bcd	7.5 a	11.8 ab
Field Trip (PMRR)	44.4 ab	43.1	1.5 b	5.9 a	4.0 c
Magician (PMRR)	38.2 ab	47.1	0.8 bcd	7.1 a	9.2 b
HSR 4721 (PMR)	34.1 ab	35.7	0.5 d	5.6 a	11.4 ab
Magic Lantern (PMR)	22.4 ab	17.7	0.7 bcd	8.1 a	11.6 ab
Gold Speck (S)	59.6 b	55.1	4.3 a	1.5 c	0.3 d
Sorcerer (S)	0.0 a	0.0	0.5 cd	5.5 a	10.5 ab
<i>P</i> -value (Treatment)	0.0106	0.121	< .0001	< .0001	< .0001

^z Exact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%. Data were transformed from percentages by a square root transformation when needed to obtain normality of variance before analysis of variance was performed. The table has de-transformed means.

^y Cultivars listed based on the sum of AUDPC values for both leaf surfaces. PMR = resistance from one parent, PMRR = resistance genes from both parents, and S = susceptible to powdery mildew.

^x Means followed by the same letter are not statistically different from each other according to Tukey's HSD ($P=0.05$).