

Powdery mildew resistant pumpkin cultivar evaluation, 2006.

The objective of this study was to compare cultivars of pumpkin with a range of powdery mildew resistance. Previous experiments have demonstrated that the level of resistance among these cultivars is highly variable. In this study twenty-seven Halloween-type pumpkin cultivars and experimental lines plus two specialty-type decorative squashes, One Too Many and Sweet Lightning, were evaluated for their ability to resist powdery mildew relative to two standard pumpkin cultivars without known genes for resistance, Howden and Sorcerer. Sweet Lightning is edible as well as ornamental. A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. The field was tilled on 1 May and fertilizer (N-P-K 10-10-10) at 400 lb/A was broadcast and incorporated on 24 May. All pumpkin seeds were planted on 24 May in the greenhouse and were transplanted on 12 Jun. Four rows of black plastic spaced at least 11.3 ft apart were laid on 25 May. During the season weeds were controlled with one application of Select 2EC (8 fl oz/A) on 31 Jul, hand weeding, and mowing between the rows of black plastic mulch. Water was provided as needed through the drip irrigation lines placed beneath the mulch. Additional fertilizer (N-P-K 34-0-0) at 29.4 lb/A was injected through the drip irrigation system on 12 and 28 Jul, 10 and 17 Aug. No fungicides were applied specifically for powdery mildew; however, copper fungicides applied for control of bacterial leaf spot (*Xanthomonas campestris* p.v. *cucurbitae*) would have also provided some suppression of powdery mildew on upper leaf surfaces. Champ 2000 (2 lb/A) was applied on 29 Jul; Cuprofix Disperss (2.5 lb/A) was applied on 12 Jul, and 5, 13, and 23 Aug; and Kocide 2000 (1.5 lb/A) was applied on 31 Aug. The following fungicides were applied preventively for downy mildew (*Pseudoperonospora cubensis*) and Phytophthora blight (*Phytophthora capsici*): Acrobat 50 WP (6.4 oz/A) on 12 Jul, Previcur Flex 66F (1.2 pt/A) on 29 Jul, Ranman (2.75 fl oz/A) on 23 Aug, and Tanos (8 oz/A) on 31 Aug. Neither disease developed before the end of this experiment. Plots were one 20-ft row each with 8 plants spaced 30-in apart. Two Turk's Turban gourd plants were planted between each plot two weeks prior to planting pumpkin plants on 30 May. A randomized complete block design with four replications was used. Average monthly high and low temperatures (°F) were 77/62 in Jun, 84/69 in Jul, 82/67 in Aug, 73/58 in Sep, and 64/48 in Oct. Rainfall (in.) was 5.83, 3.79, 5.48, 3.66, and 5.53 for these months, respectively. Upper and lower surfaces of leaves were assessed for powdery mildew beginning on 2 Aug when fruit were starting to enlarge. Ten mid-aged and 10 old leaves were selected in each plot based on leaf appearance and position in the canopy. On 10 Aug, 10 mid-aged were assessed, and on 25 Aug 5 mid-aged and 5 old leaves were assessed. Powdery mildew colonies (spots) were counted; severity was assessed when colonies could not be counted accurately because they had coalesced and/or were too numerous. 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. These canopy severity values were used to calculate area under disease progress (AUDPC) to obtain a measure of severity over the upper and lower surfaces of leaves were assessed for powdery mildew beginning on 27 Jul when fruit were starting to enlarge. A square root transformation was used when needed prior to analysis to achieve homogeneity of variance. Pumpkin fruit were harvested and weighed on 5-7 Sep. Unmarketable fruit were counted. Average fruit weight and number of fruit per plant were calculated.

The evaluated cultivars and experimental lines of pumpkin and specialty squash are listed in order of ability to control powdery mildew on both leaf surfaces. The entries with resistance exhibited a large range in ability to suppress this disease. Generally entries with resistance from both parents (homozygous, designated as PMRR in table) suppressed powdery mildew better than those with resistance from one parent (heterozygous, designated as PMR in table). The first 13 entries listed provided a similar degree of suppression on both upper (62-83% control) and lower (73-91%) leaf surfaces based on AUDPC values relative to the average value for the two susceptible standard cultivars, Howden and Sorcerer. Wee-B-Little was included in this experiment because it has performed well when evaluated elsewhere despite lack of known genes for powdery mildew resistance. Average powdery mildew severities on lower surfaces of Wee-B-Little leaves on all three assessment dates were not only significantly lower than the two susceptible cultivars, but, more notably, were not significantly greater than the most effective entries with resistance genes. Overall control was 75% on upper and 70% on lower leaf surfaces. Degree of control provided by the next 13 entries ranged from 0% to 72% on upper and 33% to 82% on lower leaf surfaces. SSX 1012, King Midas, and 20 Karat Gold were not able to suppress powdery mildew. On upper leaf surfaces, powdery mildew was most severe on the first assessment date, 2 Aug, then decreased to less than 8% likely due to death of severely affected leaves and control provided by copper fungicides. Fruit production was reduced due to poor weed control; therefore, yield data should not be considered an indication of yielding ability but rather should be considered relative yield values.

Entry (PMS) ^y	Powdery mildew severity (% leaf coverage) ^z						Fruit weight (lbs)	Number of fruit/plant	
	Upper leaf surface			Lower leaf surface					
	2-Aug	25-Aug	AUDPC	2-Aug	25-Aug	AUDPC			
XP 8408 (R).	7	hijk ^x	0.0 i	31 i	10 hij	2 jk	59 k	4.4 bcdefg	0.1 ghi
HMX 6686 (RR).	4	k	0.1 ghi	24 i	8 ij	4 hijk	99 ghijk	7.0 ab	0.5 cdef
XP 6899 (RR).	6	ijk	0.2 fghi	29 i	10 hij	1 k	96 ghijk	3.8 defg	0.3 efghi
Magician (RR).	8	fghijk	0.1 hi	33 i	15 fghij	2 k	80 ijk	6.4 abc	0.5 cdef
Iron Man (R).	8	fghijk	0.8 cdefghi	42 fghi	11 ghij	2 jk	68 jk	2.6 fghi	0.8 cd
NY04-840 (R).	9	efghijk	0.0 i	41 fghi	14 fghij	0 k	92 hijk	1.8 hi	0.4 defghi
HMX 6685 (RR).	7	hijk	0.3 efghi	37 hi	11 ghij	5 fghijk	137 fghijk	5.5 abcde	0.5 def
NH1788 (RR).	9	efghijk	0.3 fghi	43 fghi	14 fghij	5 ghijk	119 ghijk	1.8 hi	0.4 defghi
Touch of Autumn (R).	5	jk	0.6 cdefghi	40 hi	12 fghij	5 ghijk	146 fghijk	1.9 hi	0.6 cde
Gladiator (RR).	12	defghijk	0.0 i	49 fghi	15 efghij	4 ijk	109 ghijk	4.8 bcde	0.4 defghi
Wee-B-Little.	7	hijk	0.4 defghi	36 hi	19 defghij	5 ghijk	201 fghijk	0.4 jk	0.3 efghi
Rockafellow (R).	12	defghijk	0.1 hi	55 fghi	20 defghij	2 jk	137 fghijk	1.3 ij	0.9 c
Sweet Lightning (R).	9	efghijk	0.6 cdefghi	55 fghi	15 efghij	4 hijk	181 fghijk	0.7 jk	1.4 b
Gold Dust (R).	7	ghijk	0.3 efghi	40 ghi	16 efghij	12 defghi	263 cdefgh	0.4 k	2.6 a
NH 2705 (R).	6	jk	2.6 bcde	48 fghi	8 j	15 cdefghi	236 defghij	7.0 ab	0.5 defg
Cannon Ball (R).	13	defghijk	0.5 cdefghi	59 efghi	19 defghij	11 efghij	210 efghijk	3.2 efgh	0.2 fghi
One Too Many (R).	18	bcde	0.3 fghi	95 cdefg	16 efghij	0 k	123 ghijk		0.0 i
Magic Lantern (R).	11	defghijk	0.6 cdefghi	70 defghi	21 defgh	16 bcdefg	248 defghij	8.0 a	0.1 fghi
Chrisma PMR (R).	11	defghijk	1.4 bcdefgh	70 defghi	15 fghij	19 abcde	261 cdefghi	5.2 bcde	0.6 cde
Harvest Time (R).	14	cdefghij	0.8 cdefghi	74 defghi	25 cdef	11 efghij	256 cdefghi	4.1 cdefg	0.1 fghi
Prankster (R).	12	defghijk	0.5 cdefghi	72 defghi	21 defghi	14 cdefghi	307 cdef	2.4 ghi	0.4 defghi
Gold Bullion (R).	15	bcdefghi	2.8 abc	95 cdef	20 defghij	11 defghij	234 defghijk	6.3 abc	0.4 defgh
Spartan (R).	17	bcdef	2.0 bcdefg	95 cdef	25 cdef	15 cdefgh	276 cdefg	5.9 abcd	0.5 defg
Mystic Plus (R).	16	bcdefg	0.0 hi	91 defgh	30 bcd	17 bcdef	384 bcde	2.5 ghi	0.3 efghi
Aladdin (R).	13	cdefghijk	2.1 bcdef	83 defghi	21 defghij	33 abc	449 bc	7.7 ab	0.2 fghi
Merlin (R).	12	defghijk	4.3 ab	116 abcd	23 defg	27 abcde	415 bcd	5.0 bcde	0.5 cdef
SSX 1012 (R).	15	bcdefgh	6.9 a	154 ab	29 bcde	35 ab	546 ab	6.7 abc	0.2 efghi
King Midas (R).	24	bc	0.8 cdefghi	118 abcd	45 a	45 a	707 a	7.7 ab	0.1 fghi
20 Karat Gold (R).	22	bcd	2.8 abc	147 abc	42 ab	40 a	674 a	4.6 bcdef	0.3 efghi
Howden (S).	19	bcde	2.1 bcdef	114 bcde	38 abc	42 a	676 a	6.8 abc	0.0 hi
Sorcerer (S).	34	a	2.1 bcde	172 a	47 a	28 abcd	659 a	4.7 bcde	0.4 defghi
<i>P</i> -value		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001

^zExact colony counts were made when possible and severity was estimated using the conversion factor of 30 colonies/leaf = 1%. Severity data is for old and mid-aged leaves on 2 Aug and on mid-aged and young leaves on 25 Aug.

^y'S' indicates susceptibility to powdery mildew, 'R' indicates entry has resistance from one parent, and 'RR' indicates entry has resistance from both parents. 'NY' entry was developed by Molly Jahn, Cornell University, 'NH' entries are from Brent Loy, University of NH, XP entries are from Outstanding Seed Co, HM entries are from Harris Moran Seed Company, and the SSX entry was developed by Sutter Seeds LLC.

^xNumbers in each column with a letter in common are not significantly different according to Fisher's Protected LSD (*P* = 0.05).