Powdery Mildew Resistant Pumpkin Cultivar Evaluation, New York 2006

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There are many pumpkin cultivars currently on the commercial market that are advertised as having resistance to powdery mildew. 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.

Materials and Methods:

A field experiment was conducted at the Long Island Horticultural Research and Extension Center in Riverhead on Haven loam soil. All pumpkin seeds were planted on 24 May in the greenhouse and were transplanted into black plastic mulch on 12 Jun. 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 thought drip irrigation lines placed beneath the mulch. 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 (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 a plant spacing of 30-in. Two Turk's Turban gourd plants were planted between each plot. A randomized complete block design with four replications was used.

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. Ten old leaves were selected on 27 Jul and on 8 Aug in each plot based on leaf appearance and position in the canopy. On 15 Aug 10 mid-aged 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 entire assessment period. Powdery mildew control was calculated for upper and lower leaf surfaces using AUDPC values relative to the average AUDPC value for Howden and Sorcerer.

Pumpkin fruit were harvested and weighed on 5-7 Sep. Unmarketable fruit were counted.

A square root transformation was used when needed prior to analysis to achieve homogeneity of variance.

Results and Discussion:

The evaluated cultivars and experimental lines of pumpkin and specialty squash are listed in table 1 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. Average powdery mildew severity on lower leaf surfaces on 25 Aug was 28% for Sorcerer, 42% for Howden, and ranged among the resistant entries from 0% for NY04-840 to 45% for King Midas. Wee-B-Little was included in this experiment because it has preformed 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 standard cultivars, but, more notably, were not significantly greater than the most effective entries with resistance genes. Severity on 25 Aug was 5% (this data not shown in table).

On upper leaf surfaces, powdery mildew was most severe on the first assessment date, 2 Aug, when average severity was 34% for Sorcerer, 20% for Howden, and ranged among the resistant entries from 4% for HMX 6686 to 24% for King Midas. Then it dropped to less than 8% likely due to death of severely affected leaves and control provided by copper fungicides.

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).

Fruit production was affected by poor weed control; therefore, yield data in table 1 should not be considered an indication of yielding ability but rather should be considered relative yield values.

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Table 1. Control of powdery mildew and yield for pumpkin and specialty squash cultivars and experimental lines compared on Long Island, NY, 2006.

Entry	Seed source[x]	PM Rxn[y]	Powdery mildew control (%) Upper leaf surface	Powdery mildew control (%) Lower leaf surface	Fruit wt (lb)	# Good fruit/plant	Total # fruit/plant
XP 8408	OU	PMR	78 a[z]	91 a	4.4 bcdefg	0.1 ghi	0.4 jkl
HMX 6686	HM	PMRR	83 a	85 abcde	7.0 ab	0.5 cdef	1.0 fgh
XP 6899	OU	PMRR	80 a	86 abcde	3.8 defg	0.3 efghi	0.8 ghij
Magician	HM	PMRR	77 a	88 abc	6.4 abc	0.5 cdef	1.1 efg
Iron Man	HM	PMR	71 abcd	90 ab	2.6 fghi	0.8 cd	1.5 cde
NY04-840	CU	PMR	72 abcd	86 abcd	1.8 hi	0.4 defghi	0.5 ij
HMX 6685	HM	PMRR	74 ab	79 abcdef	5.5 abcde	0.5 def	1.1 efg
NH1788	UNH	PMRR	70 abcd	82 abcde	1.8 hi	0.4 defghi	1.3 def
Touch of Autumn	RU	PMR	72 ab	78 abcdef	1.9 hi	0.6 cde	1.9 bc
Gladiator	HM	PMRR	66 abcd	84 abcde	4.8 bcde	0.4 defghi	0.8 fghij
Wee-B-Little	RU	PMR?	75 ab	70 abcdef	0.4 jk	0.3 efghi	0.5 ijkl
Rockafellow	SI	PMR	62 abcd	80 abcdef	1.3 ij	0.9 c	2.0 b
Sweet Lightning	SI	PMR	62 abcd	73 abcdef	0.7 jk	1.4 b	1.6 bcd
Gold Dust	RU	PMR	72 abc	61 defghi	0.4 k	2.6 a	3.0 a
NH 2705	UNH	PMR	66 abcd	65 bcdefgh	7.0 ab	0.5 defg	0.7 ghij
Cannon Ball	HM	PMR	59 abcde	69 abcdefg	3.2 efgh	0.2 fghi	0.7 ghij
One Too Many	RU	PMR	34 cdefg	82 abcde		0.0 i	0.1 l
Magic Lantern	HM	PMR	51 abcdef	63 bcdefgh	8.0 a	0.1 fghi	1.0 fgh
Chrisma PMR	JS	PMR	51 abcdef	61 cdefghi	5.2 bcde	0.6 cde	1.0 fgh
Harvest Time	AC	PMR	48 abcdef	62 cdefghi	4.1 cdefg	0.1 fghi	0.5 ijkl
Prankster	RU	PMR	50 abcdef	54 fghi	2.4 ghi	0.4 defghi	0.9 fghi
Gold Bullion	RU	PMR	33 defg	65 abcdefgh	6.3 abc	0.4 defgh	0.8 ghij
Spartan	SW	PMR	33 defg	59 efghi	5.9 abcd	0.5 defg	0.8 ghij
Mystic Plus	HM	PMR	36 bcdef	43 ghij	2.5 ghi	0.3 efghi	0.9 fghij
Aladdin	HM	PMR	42 abcdef	33 ij	7.7 ab	0.2 fghi	0.6 hij
Merlin	HM	PMR	19 fghi	38 hij	5.0 bcde	0.5 cdef	0.8 ghij
SSX 1012	SI	PMR	0 hi	18 jk	6.7 abc	0.2 efghi	0.5 ijk
King Midas	SI	PMR	18 fghi	0 k	7.7 ab	0.1 fghi	0.4 jkl
20 Karat Gold	RU	PMR	0 ghi	0 k	4.6 bcdef	0.3 efghi	0.5 ijkl
Howden	HM	PMS	20 efgh	0 k	6.8 abc	0.0 hi	0.1 kl
Sorcerer	HM	PMS	0 i	1 k	4.7 bcde	0.4 defghi	0.7 ghij
Trt *P-value*			0.0001	0.0001	0.0001	0.0001	0.0001

[x] Seed Source for 'CU' is Molly Jahn, Cornell University, Ithaca, NY 14853; 'UNH' entries are from Brent Loy, University of New Hampshire, Durham, NH 03824; and 'OU' refers to Outstanding Seed Company LLC, Monaca PA 15061.

[y] PMS indicates susceptibility to powdery mildew, PMR indicates entry has resistance from one parent, and PMRR indicates entry has resistance from both parents.

[z] Numbers in each column followed by the same letter are not significantly different from each other according to Fisher's protected LSD (*P*=0.05).