

PUMPKIN (*Cucurbita pepo*)
Powdery Mildew; *Podosphaera xanthii*

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Evaluation of pumpkin varieties for resistance to powdery mildew - Hancock, 2007.

Pumpkin cultivars and breeding lines were evaluated for resistance to powdery mildew in a trial conducted at the Hancock Agricultural Research Station, in central WI. Five breeding lines and one cultivar were compared to 'Howden' a commonly grown susceptible cultivar. Seeds were planted in the greenhouse on 14 Jun. Seedlings were transplanted into the field on 2 Jul and later thinned to one plant per hill. Each plot consisted of a single row containing three plants, spaced 3 ft apart in the row. Rows were 12 ft apart with 18 ft wide alleys between the ends of adjacent plots. A randomized complete block design was used for the trial with each entry replicated four times. The soil type was Plainfield sand with pH 5.8. Fertilizer consisted of 0-0-60 (250 lb/A) broadcast 3 Apr, 6-24-24 (100 lb/A) placed in the furrow 1 Jul when rows were marked for transplanting, and sidedress applications of 46-0-0, 50 lb/A, 24 Jul and 5 Aug. Insects were controlled with Admire 2F incorporated in the fertilizer at planting (16 fl oz/500 lb) and foliar application of Capture 2 EC (3 fl oz/A, 7 Aug). Plants were not inoculated; only natural inoculum of the powdery mildew fungus contributed to disease establishment. No fungicide was applied at any time during the season. Powdery mildew severity was rated on a Horsfall-Barratt scale of 0 (no symptoms) to 11 (all foliage and stems dead), and ratings were converted to percentages. Whole plot assessment was done for four areas (approximately 3 ft by 3 ft) in each plot on 13 Aug, 20 Aug, 28 Aug and 6 Sep. On 28 Aug and 6 Sep six older leaves, six middle-aged leaves, and six young leaves in each plot were chosen arbitrarily and rated. Individual leaves were rated only for powdery mildew severity but the whole plot rating included severity of powdery mildew as well as any other cause of death of foliage. Fruit were harvested 1 Oct. Weight, and quality (marketable or immature) were recorded for each pumpkin. The number of rotting fruit was recorded for each plot but these fruit were not weighed. Rainfall recorded during the growing season (in.) was: Jul (2.5); Aug (7.9); Sep (3.1). An additional 13.1 in. of water was applied as overhead sprinkler irrigation in 23 applications (1 Jul – 10 Sep).

Powdery mildew was slow to develop during the 2007 growing season; by late August less than 7% of the foliage in whole plot ratings exhibited disease symptoms. Older leaves of Gold Medallion and Howden proved to be most susceptible to disease. Between 28 Aug and 6 Sep, disease severity increased by more than 10-fold on these susceptible varieties. Lowest disease severity was observed on HMX 6685, HMX 6686 and HMX 6687. Very low relative AUDPC values were observed for all HMX plot entries. Howden and Gold Medallion were similar in their high susceptibility to powdery mildew. Highest yields of marketable fruit were associated with HMX 7691 and Gold Medallion. HMX 5683 appeared to be somewhat later in maturity than the remaining plot entries.

Table 1. Severity of powdery mildew on pumpkin lines.

Cultivar/breeding line (source) ¹	Whole plot rating ²						Individual leaf rating 28 Aug ³			Individual leaf rating 6 Sep ³			
	13 Aug	20 Aug	28 Aug	6 Sep	Older	Middle	Young	Older	Middle	Young	Older	Middle	Young
Howden – susc (HM)	0.6	2.5	4.7	46.7	17.3	4.0	0.6	98.7	58.6	7.7			
HMX 7691 (HM)	0.0	0.0	1.2	9.7	1.3	0.1	0.0	12.1	4.0	0.3			
HMX 6687 pumpkin (HM)	0.0	0.1	1.0	8.9	2.0	0.4	0.0	15.4	5.1	0.6			
HMX 6686, pumpkin (HM)	0.0	0.0	0.9	8.2	1.0	0.2	0.0	6.3	1.6	0.5			
HMX 6685 pumpkin (HM)	0.0	0.3	0.9	8.5	1.1	0.5	0.0	7.4	2.2	0.5			
HMX 5683 (HM)	0.0	0.1	2.0	10.5	3.7	0.7	0.0	33.9	12.4	1.3			
Gold Medallion (R)	0.7	3.1	6.4	47.7	39.6	5.5	0.6	99.4	72.8	7.9			
Pr > F⁴	0.06	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
LSD⁴	NS	0.06	1.3	9.3	7.4	1.9	0.5	12.7	11.3	5.7			

¹ Source of seeds: HM = Harris-Moran; R = Rupp Seeds

² On each rating date, three areas per plot were observed (approximately 3 ft x 3 ft).

Severity was rated on a Horsfall-Barratt scale of 0 (no infection) to 11 (all foliage and stems dead). Death of foliage due to any reason was included in whole plot ratings. Ratings were converted to %.

³ On each rating date, powdery mildew severity was rated on a Horsfall-Barratt scale for six older leaves, six middle-aged leaves and six young leaves in each plot. Ratings were converted to percentages.

⁴ Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated (alpha=0.05). NS = not significant at $P = 0.05$.

Table 2. AUDPC, yield and quality of pumpkin lines.

Cultivar/breeding line	Relative AUDPC ¹						Total No. of fruit/plant	Avg. weight / marketable fruit (lb) ²	Fruit quality at harvest – avg. no. of fruit/plant that were:			
	Leaves			Whole plot	Yield (t/A)	Marketable ²			Immature ³	Soft, rotting		
	Older	Middle	Young									
Howden – susc (HM)	0.348	0.175	0.023	0.182	0.113	8.5	14.1	0.8	0.1	0.3		
HMX 7691 (HM)	0.038	0.011	0.001	0.017	0.022	12.2	20.2	1.0	0.0	0.0		
HMX 6687 pumpkin (HM)	0.051	0.015	0.002	0.023	0.021	5.9	3.3	2.9	0.0	0.6		
HMX 6686, pumpkin (HM)	0.022	0.005	0.001	0.009	0.018	10.9	15.1	1.2	0.1	0.0		
HMX 6685 pumpkin (HM)	0.025	0.008	0.001	0.012	0.020	9.3	15.4	1.0	0.0	0.3		
HMX 5683 (HM)	0.108	0.036	0.003	0.049	0.027	4.8	4.0	2.0	0.6	0.0		
Gold Medallion (R)	0.461	0.220	0.024	0.235	0.123	12.9	22.5	1.0	0.2	0.3		
Pr > F⁴	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.09	0.15
LSD⁴	0.053	0.033	0.016	0.021	0.019	4.0	8.0	0.6	NS	NS		

¹ Relative area under the disease progress curve. Values for each observation date were plotted on a graph and the area under the line was calculated for each treatment providing a measure of the relative severity of disease throughout the season. A severity rating of 100% for the entire season would produce a value of 1.0. All relative AUDPC values are expressed as a proportion of this value. Either decreased disease severity or later disease development will contribute to lower relative AUDPC.

² Marketable yield excludes immature and rotted fruit.

³ More than 50% green at harvest.

⁴ Analysis of variance was performed on data, and Fisher's protected least significant difference (LSD) was calculated (alpha=0.05). NS = not significant at $P = 0.05$.

