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Pumpkin Germplasm & Disease Resistance Evaluations

Brad R. Bergefurd

The Ohio State University South Centers, bergefurd.1@osu.edu

Sally Miller

The Ohio State University, miller.769@osu.edu

Claudio Vrisman

The Ohio State University

Thomas Harker

The Ohio State University South Centers

Wayne Lewis

The Ohio State University South Centers

See next page for additional authors

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Authors

Brad R. Bergefurd, Sally Miller, Claudio Vrisman, Thomas Harker, Wayne Lewis, and Ryan Slaughter

Pumpkin Germplasm & Disease Resistance Evaluations

Brad R. Bergfeld, Horticulture Specialist and Extension Educator, South Centers
 Dr. Sally Miller, Professor Department Plant Pathology, Wooster
 Claudio Vrisman, Department Plant Pathology, Wooster
 Thomas Harker, Horticulture Research Assistant, South Centers
 Wayne Lewis, Farm Manager, South Centers
 Ryan Slaughter, Horticulture Research Assistant, South Centers

OBJECTIVES:

To screen new pumpkin variety releases (2017-2018) for their production performance under Ohio growing conditions and to evaluate yield potential and fruit quality characteristics for the southern Ohio area.

MATERIALS and METHODS:

This trial evaluated twenty replicated pumpkin cultivars for their production suitability, performance and quality attributes under southern Ohio growing conditions. Cultivar selections were new releases along with industry standard varieties. Input was received from seed companies, growers, and industry personnel regarding variety selection and standard comparison. Seeds were direct seeded to the field on June 7th. A randomized complete block design with three blocks and five plants per variety per plot was used in the study. Rows were spaced 8 ft apart with seeds planted 3 ft apart in the row and row length was 12 ft. This study was conducted at the Ohio State University (OSU) South Centers/Piketon Research & Extension Center at Piketon, Ohio (lat. 39.07° N, long. 83.01° W), elevation 578 feet. The experimental soil is designated as a DoA—Doles silt loam, with 0–3% slopes. It is a deep, nearly level and somewhat poorly drained soil. Typically, the soil surface is a brown, friable silt loam about 20 cm deep and beneath this the subsoil is about 18.5 m. 578 pounds of 19-19-19 fertilizer per acre were applied prior to planting. Fungicides were applied following recommendations from the Midwest Vegetable Production Guide for Commercial Growers (ID-56). Sandea pre-emerge herbicide was applied to the trial. Weeds were also controlled with cultivation and hand hoeing.

Two separate trials were planted using the same cultivars; one was sprayed for downy mildew alone and the other for both powdery and downy mildew. There were six fungicide applications made over the 2018 growing season. See Figure 1.

Figure 1. Fungicides applied to pumpkin trials.

<i>Spray Date</i>	<i>Chemical Applied</i>	<i>Application Rate</i>	<i>Sprayed for Downy Mildew Only</i>	<i>Sprayed for Powdery and Downy Mildew</i>
7/16/2018	Presidio	4 floz./acre	x	x
8/2/2018	Ranman	2.75 floz/acre	x	x
8/2/2018	Rally	5 oz/acre	-	x
8/2/2018	Quintec	6 floz/acre	-	x
8/9/2018	Presidio	4 floz/acre	x	x
8/9/2018	Brigade 2EC	6.4 floz/acre	x	x
8/20/2018	Tanos	8 oz/acre	x	x
8/20/2018	Quintec	6 floz/acre	-	x
8/27/2018	Ranman	2.75 floz/acre	x	x
9/14/2018	Presidio	4 floz/acre	x	x

Midwest Vegetable Trial Report for 2018

Table 1. Yields from replicated Pumpkin Cultivar Performance Trial, no powdery mildew fungicides applied.

<i>Cultivar</i>	<i>Pounds per Plant</i>	<i>Fruit per Acre</i>	<i>Pounds per Acre</i>	<i>Average Fruit Weight (lbs.)</i>
<i>Miniwarts</i>	12.78 ABC	33275 A	23199 ABC	2.74 E
<i>JPN 62005R</i>	11.99 ABC	5445 CD	21773 ABC	16.65 ABC
<i>Specter</i>	13.14 ABC	6050 CD	23854 ABC	10.7 BCDE
<i>Warty Gnome</i>	17.52 ABC	39930 A	31808 ABC	3.21 E
<i>Ares</i>	19.49 ABC	7260 CD	35388 ABC	19.43 AB
<i>Cronus</i>	14.94 ABC	6050 CD	27133 ABC	13.36 ABCDE
<i>Kratos</i>	14.15 ABC	6050 CD	25693 ABC	11.26 BCDE
<i>Rhea</i>	9.95 ABC	4840 CD	18070 ABC	10.91 BCDE
<i>Zeus</i>	5.35 C	3630 CD	9727 C	6.28 CDE
<i>Orange Sunrise</i>	25.46 A	12705 BC	46212 A	14.3 ABCD
<i>Bisbee Gold</i>	15.86 ABC	20570 B	28796 ABC	5.72 CDE
<i>Bayhorse Gold</i>	13.44 ABC	5445 CD	24398 ABC	19.52 AB
<i>Cracker Jack</i>	9.35 BC	5445 CD	16972 BC	8.35 CDE
<i>Honky Tonk</i>	21.75 AB	10890 BCD	39490 AB	14.9 ABCD
<i>Hulk</i>	17.95 ABC	6050 CD	32593 ABC	22.68 A
<i>Jason</i>	15.34 ABC	9075 CD	27842 ABC	12.65 ABCDE
<i>Secretariat</i>	16.16 ABC	7865 CD	29339 ABC	14.9 ABCD
<i>NH 4717</i>	5.76 C	3025 CD	10467 C	4.61 DE
<i>Skidoo</i>	13.15 ABC	7260 CD	23882 ABC	8.99 BCDE
<i>SPU13118</i>	5.10 C	1815 D	9263 C	12.24 ABCDE
<i>LSD</i>	15.94	10027	28939	10.98

Table 2. Yields from replicated Pumpkin Cultivar Performance Trial, powdery mildew fungicides applied.

<i>Cultivar</i>	<i>Pounds per Plant</i>	<i>Fruit per Acre</i>	<i>Pounds per Acre</i>	<i>Average Fruit Weight (lbs.)</i>	<i>Seed Source</i>
<i>Miniwarts</i>	11.8 BC	35695 A	21428 BC	2.4 G	Harris Moran
<i>JPN 62005R</i>	19.04 B	7260 DEF	34564 B	19.64 AB	Johnny's
<i>Specter</i>	18.94 B	9680 CDEF	34390 B	14.53 BC	Harris Moran
<i>Warty Gnome</i>	13.31 BC	33880 A	24165 BC	2.84 G	Harris Moran
<i>Ares</i>	13.39 BC	6050 DEF	24304 BC	15.53 ABC	Harris Moran
<i>Cronus</i>	9.3 BC	3025 EF	16880 BC	14.38 BC	Harris Moran
<i>Kratos</i>	20.01 B	10285 CDE	36329 B	13.49 BCD	Harris Moran
<i>Rhea</i>	15.13 BC	9075 CDEF	27472 BC	11.81 CDE	Harris Moran
<i>Zeus</i>	9.4 BC	4235 DEF	17066 BC	16.61 ABC	Harris Moran
<i>Orange Sunrise</i>	16.14 B	7865 DEF	29308 B	14.38 BC	Harris Moran
<i>Bisbee Gold</i>	14.96 BC	21175 B	27169 BC	5.15 FG	Rupp
<i>Bayhorse Gold</i>	35.21 A	15730 BC	63915 A	16.26 ABC	Rupp
<i>Cracker Jack</i>	8.64 BC	6655 DEF	15686 BC	6.3 EFG	Sakata
<i>Honky Tonk</i>	19.57 B	10285 CDE	35530 B	13.53 BCD	Sakata
<i>Hulk</i>	10.56 BC	3630 EF	19171 BC	21.75 A	Sakata
<i>Jason</i>	12.48 BC	5445 DEF	22665 BC	16.22 ABC	Seedway
<i>Secretariat</i>	10.44 BC	5445 DEF	18962 BC	14.37 BC	Seedway
<i>NH 4717</i>	15.88 B	9075 CDEF	28828 B	12.71 CDE	Johnny's
<i>Skidoo</i>	18.88 B	11495 CD	34272 B	11.69 CDEF	Rupp
<i>SPU13118</i>	3.72 C	2420 F	6762 C	7.45 DEFG	Sakata
<i>LSD</i>	11.96	7773.00	21721	6.64	-

Midwest Vegetable Trial Report for 2018

RESULTS:

Overall plant and fruit quality was good in the no powdery mildew fungicide portion of this year's trial. Even with no powdery mildew spray applications applied to the trial during the growing season there was very little powdery mildew present. Overall fruit yield was good for this trial. Marketable pounds per acre ranged from a high of 39,490 (Honky Tonk) to a low of 9,727 (Zeus) pounds per acre. Average fruit weight ranged from a high of 22.68 pounds (Hulk) to a low of 2.74 pounds (Miniwarts).

Overall plant and fruit quality was good in the powdery mildew plus downy mildew portion of this year's trial. Overall fruit yield was good for this trial. Marketable pounds per acre ranged from a high of 63,915 (Bayhorse Gold) to a low of 6,762 (SPU13118) pounds per acre. Average fruit weight ranged from a high of 21.75 pounds (Hulk) to a low of 2.40 pounds (Miniwarts).

Fruit quality rating was taken at the time of harvest. We rated the fruit and stems on a scale of 0-5. The following scale illustrates the amount of Powdery Mildew and Plectosporium lesions on the stems and fruit at harvest. See Tables 3 and 4.

- 0 being no disease present.
- 1 being 1% - 19% disease present.
- 2 being 20% - 39% disease present.
- 3 being 40% - 59% disease present.
- 4 being 60% - 79% disease present.
- 5 being 80% - 100% disease present.

Table 3. Fruit quality ratings at harvest for pumpkins sprayed with powdery mildew fungicides.

<i>Variety</i>	<i>Powdery Mildew on stem</i>	<i>Plectosporium Blight on Stem</i>	<i>Plectosporium Blight on Fruit</i>
<i>Miniwarts</i>	1.33 AB	3.33 ABC	0 B
<i>JPN 62005R</i>	0 B	4.33 AB	2.33 AB
<i>Specter</i>	0 B	3.66 ABC	0 B
<i>Warty Gnome</i>	0 B	2.66 BC	0 B
<i>Ares</i>	0 B	5 A	0.33 AB
<i>Cronus</i>	0 B	2 CD	0 B
<i>Kratos</i>	0 B	5 A	1 AB
<i>Rhea</i>	0 B	5 A	1.33 AB
<i>Zeus</i>	0 B	4.33 AB	1.667 AB
<i>Orange Sunrise</i>	0 B	5 A	1 AB
<i>Bisbee Gold</i>	0.66 AB	4 AB	1.66 AB
<i>Bayhorse Gold</i>	0 B	2.66 BC	0.66 AB
<i>Cracker Jack</i>	0 B	3.33 ABC	2.33 AB
<i>Honky Tonk</i>	1.66 A	5 A	0.33 AB
<i>Hulk</i>	0 B	0.33 D	0 B
<i>Jason</i>	0 B	4.66 A	1 AB
<i>Secretariat</i>	0 B	4.33 AB	0 B
<i>NH 4717</i>	0 B	3.66 ABC	1.33 AB
<i>Skidoo</i>	0 B	5 A	2.66 A
<i>SPU13118</i>	0 B	3.33 ABC	1.33 AB
<i>LSD</i>	1.36	1.98	2.66

Midwest Vegetable Trial Report for 2018

Table 4. Fruit quality ratings at harvest for pumpkins not sprayed with powdery mildew fungicides.

Variety	Powdery Mildew on stem	Plectosporium Blight on Stem	Plectosporium Blight on Fruit
Miniwarts	0 B	3 ABC	0 D
JPN 62005R	0 B	4 AB	1.66 ABCD
Specter	0 B	3.66 AB	0 D
Warty Gnome	0 B	3.33 ABC	0 D
Ares	0.66 A	3.66 AB	2 ABCD
Cronus	0 B	3 ABC	0.33 CD
Kratos	0 B	4 AB	3.66 A
Rhea	0 B	3 ABC	0 D
Zeus	0 B	1.66 BC	0.33 CD
Orange Sunrise	0 B	4.66 A	1 BCD
Bisbee Gold	0 B	4 AB	1 BCD
Bayhorse Gold	0 B	3.33 ABC	0 D
Cracker Jack	0 B	4.33 A	0.33 CD
Honky Tonk	0 B	3.33 ABC	1.33 ABCD
Hulk	0 B	1 C	0 D
Jason	0 B	1 C	1 BCD
Secretariat	0 B	4 AB	3 AB
NH 4717	0 B	3.33 ABC	1.66 ABCD
Skidoo	0 B	4.66 A	1.66 ABCD
SPU13118	0 B	3.33 ABC	2.66 ABC
LSD	0.43	2.6	2.46

Table 5. Chroma Meter rind color results from three pumpkin fruit sampled.

Variety	L (defines lightness)	A (denotes the red/green value)	B (defines the yellow/blue value)
Miniwarts	39.21	9.06	39.1
JPN 622005R	49.3	27.48	41.72
Specter	77.08	-0.61	32.78
Warty Gnome	61.33	10.77	55.15
Ares	46.82	21.16	39.76
Cronus	51.08	23.33	47.69
Kratos	48.92	24.13	44.24
Rhea	51.13	27.34	45.75
Zeus	49..29	27.43	44.89
Orange Sunrise	59.54	29.84	58.62
Bisbee Gold	50.41	25.29	37.73
Bayhorse Gold	55.54	30.72	51.63
Cracker Jack	45.88	26..24	40.6
Honky Tonk	47.67	24.6	44.6
Hulk	51.96	23.24	44.73
Jason	53.88	27.47	49.39
Secretariat	46.19	25.23	40.13
NH 4717	50.76	27.94	43.11
Skidoo	50.29	26.35	41.08
SPU13118	58.23	22.79	54.89

Figure 2. Exterior of top five varieties in the 2018 Pumpkin Cultivar Performance Trial (powdery mildew fungicides applied).



JPN 62005R



Specter



Kratos



Bayhorse Gold



Honky Tonk

Figure 3. Exterior of top five varieties in the 2018 Pumpkin Cultivar Performance Trial (no powdery mildew fungicides applied).



Warty Gnome



Ares



Orange Sunrise



Honky Tonk



Hulk

Midwest Vegetable Trial Report for 2018

Table 6. Powdery mildew (PM) severity (percent) in 20 different pumpkin cultivars. Ratings of 09/27/2018

Treatment and rate/A	% PM ^{zyx}	
	+ PM fungicides	No PM fungicides
Miniwarts	5.12	15.94 cd
JPN 62005R	22.95	18.35 cd
Specter	18.69	8.16 d
Warty Gnome	50.15	38.02 abc
Ares	24.90	25.44 bcd
Cronus	27.97	18.27 cd
Kratos	24.90	15.61 cd
Rhea	13.18	0.00 e
Zeus	21.02	8.16 d
Orange Sunshine	28.55	11.57 d
Bisbee Gold	30.05	47.99 ab
Bayhorse Gold	46.64	53.36 a
Cracker Jack	16.55	12.60 d
Honky Tonk	20.59	18.27 cd
Hulk	19.31	56.84 a
Jason	22.15	13.01 d
Secretariat	19.31	24.29 bcd
NH 4717	35.96	24.43 bcd
Skidoo	30.00	40.00 abc
SPU13118	29.17	18.27 cd
P-value	0.2809	<0.0001

^zDisease ratings based on a scale of 0-100% foliage affected using a rating scale that illustrates powdery mildew at 0.5, 1, 2, 4, 8, 16, 32, 64, and 80 percent foliage affected.

^yValues are the back-transformed means.

^xMeans followed by the same lowercase letter within a column are not significantly different at P<0.05. Means were separated using Fisher's least significant difference test on angular transformed data.

References

Egel, D., R. Foster, E. Maynard, R., et al. 2017. Midwest Vegetable Production Guide for Commercial Growers, 2018 (ID-56). Purdue University.