

Annual Report for the Pennsylvania Vegetable Research and Marketing Board

Keeping PA Vegetable Growers Profitable: Statewide Cultivar Trials

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Selecting which cultivar to grow is critical to successful commercial production. When a cultivar suited to an area and having high yield and quality for market is grown, growers can make a profit. In 2016 we evaluated 15-25 lb orange, smooth-faced pumpkins. Pumpkins are an important crop for diversified vegetable operations in Pennsylvania. They are grown on 1330 of Pennsylvania's 3968 vegetable farms, ranking 1st in the US (2012 Census of Agriculture).

The study was conducted in central Pennsylvania at Pennsylvania State University's Russell E. Larson Research Center in Pennsylvania Furnace, in southeastern Pennsylvania State University's Southeast Research and Extension Center in Manheim and in southwestern Pennsylvania. Results from the central and southeastern sites are reported here.

Twenty-four pumpkin cultivars (see Table 1 below) were evaluated in a conventional system. All seed was treated with Farmore except 'Camaro' seed which was untreated.

At both sites, pumpkins were direct seeded in rows spaced 8 feet apart with 4 feet between plants in a row. Four plots of each cultivar was planted with each plot consisting of 6 plants. Data were collected from all 6 plants.

Pests were managed following recommendations in the 2016 Commercial Vegetable Production Recommendation guide.

The standard used was 'Gladiator' based on conversations with growers.

Table 1. Cultivars, seed sources, maturity date of cultivars evaluated in 2016.

Cultivar	Source	Maturity^z
Ares	Harris Moran Seed Co., Davis, CA	115
Bayhorse Gold	Rupp Seeds Inc., Wauseon, OH	100
Bellatrix	Enza Zaden, San Juan Bautista, CA	95
Camaro	Hollar Seeds, Rocky Ford, CO	110
Cargo	Johnny's Selected Seeds, Winslow, ME	100
Challenger	Hollar Seeds, Rocky Ford, CO	100
Eagle City Gold	Rupp Seeds Inc., Wauseon, OH	100
Earlipak	Sakata Seed America, Morgan Hill, CA	95
Early King	Abbot & Cobb	90
El Capitan	Sakata Seed America, Morgan Hill, CA	105
El Toro		95
Gladiator	Harris Moran Seed Co., Davis, CA	115
Gold Challenge	Rupp Seeds Inc., Wauseon, OH	105
Hannibal	Hybrid Seed Co., Feasterville, PA	105
Honky Tonk	Sakata Seed America, Morgan Hill, CA	105
Kratos	Harris Moran Seed Co., Davis, CA	100
Magic Lantern		110
Magic Wand		115
Mr. Wrinkles	Sakata Seed America, Morgan Hill, CA	100
Orange Rave	Rupp Seeds Inc., Wauseon, OH	105
Rhea	Harris Moran Seed Co., Davis, CA	105
Solid Gold	Rupp Seeds Inc., Wauseon, OH	100
Spartan	Sakata Seed America, Morgan Hill, CA	100
Zeus	Harris Moran Seed Co., Davis, CA	110

^zBased on seed catalogs.

At the central site, based on soil test recommendations, 60 lb/acre potash and 50 lb/acre nitrogen were broadcast preplant on 23 May 2016. An additional 25 lb/acre nitrogen was fertigated throughout the growing season. At this site a plasticulture system using a single line of drip tape (T-Tape model 508-12-450; John Deere, Moline, IL) placed on the center of the bed and black embossed plastic mulch (Sigma Plastic Groups, Allentown, PA) was used. Beds were pulled and plastic and drip tape were installed on June 10th. Plants were provided with 1-1.5 acre-inches of water each week through drip irrigation. Herbicide was also applied on June 10th. Planting holes were punched and direct seeding occurred on June 13th.

Pumpkins were harvested on September 16th and 20th. Pumpkins were counted and weighed in these categories: fully orange, turning orange or mature green (full sized and dark green) and unmarketable. Immature green fruit were left in the field.

At the southeastern site pumpkin seed were planted in a no-till system into rye residue on June 7th. A single line of drip tape (T-Tape model 508-12-450; John Deere, Moline, IL) was placed in the center of each row. Plants were provided with 1-1.5 acre-inches of water each week through drip irrigation. Based on soil test recommendations, phosphate and potash were not applied. Nitrogen was applied at a rate of 90 lb/acre with 50 lbs broadcast preplant and the remainder fertigated throughout the growing season.

Pumpkins were harvested on October 14th. Pumpkins were categorized as fully orange and mature green. At this site harvest occurred when all fruit was classified in either of these categories (no fruit was turning orange). Quality of the handles (stems) was rated at this site using a 1-5 scale with 5 indicating the highest quality.

At the southwestern site a raised bed system without plastic mulch was used. When beds were pulled, 600 lb/acre of 13-13-13 was applied through the bedmaker. Direct seeding occurred on June 25, 2016. A single line of drip was installed over each bed to use only in the event the crop needed to be saved as there wasn't a pond at this site. As it turned out irrigation was used to get the crop started. Pre-emergent herbicide was applied.

Pumpkins were harvested on October 8th and were categorized as fully orange, turning orange, mature green and unmarketable. Quality of the handles was also determined at this site.

Data were analyzed using the mixed procedure and means were separated at the 5% level using pdiff.

Results

Yield and Stem Ratings

Central Site

At the central site pumpkins were categorized as fully orange, turning orange, mature green, and unmarketable. According to seed industry descriptions, cultivars evaluated had maturity dates between 90 and 115 days (Table 1). Harvest occurred over a 2 day period. Had harvest occurred as each cultivar reached maturity, pumpkins in the turning orange and mature green category likely would have had time to reach the fully orange stage. The three separate categories are intended to serve as a measure of relative maturity.

'Honky Tonk' and 'Magic Lantern' produced a larger mean number of fully orange pumpkins than 'Gladiator' (Table 2). The number of fully orange pumpkins produced by the other cultivars was not different than 'Gladiator'. 'Early King', 'Camaro', and 'Challenger' produced heavier pumpkins than 'Gladiator' which was not different than any other cultivar.

When combining the fully orange and turning orange pumpkins, none of the cultivars produced a mean number that was different than 'Gladiator'. 'Challenger' and 'Early King' mean pumpkin weight was higher than 'Gladiator' for the combined category. All other cultivars were not different than 'Gladiator'.

'Magic Lantern' produced a higher mean number and weight of mature green pumpkins than 'Gladiator'. All other cultivars were not different than 'Gladiator'.

Mean number and weight of unmarketable pumpkins for all cultivars was not different from 'Gladiator'.

Southeastern Site

Mean number of fully orange pumpkins produced by all cultivars was not different from 'Gladiator' (Table 3). Mean weight of pumpkins produced by 'Challenger' and 'Bellatrix' was heavier than 'Gladiator'. All other cultivars were not different than 'Gladiator'.

The mean number of mature green pumpkins from all cultivars was not different than from 'Gladiator'.

The mean number and weight of unmarketable pumpkins from all cultivars was not different than from 'Gladiator'.

'Ares' and 'Rhea' produced handles with a mean rating that was higher than 'Gladiator', while 'Early King', 'Camaro', 'Spartan', and 'Challenger' handles had lower mean ratings. Ratings for all other cultivars were not different than 'Gladiator'.

Southwestern Site

Yields were lower at this site because of stress early in the growing season. Planting was delayed due to very dry conditions, then dry weather post emergence through the 3rd week of July resulted in slow and uneven germination and growth.

Mean number of fully orange pumpkins produced by 'Mrs. Wrinkles', 'Orange Rave', and 'Eagle City Gold' was larger than 'Gladiator' (Table 4). All other cultivars were not different than 'Gladiator'. Mean weight of pumpkins produced by 'Mrs. Wrinkles' was heavier than 'Gladiator'. All other cultivars were not different than 'Gladiator'.

Mean number of fully orange and turning orange pumpkins produced by 'Mrs. Wrinkles', 'Orange Rave', and 'Eagle City Gold' was higher than 'Gladiator' (Table 4). All other cultivars were not different than 'Gladiator'.

The mean number of mature green pumpkins from all cultivars was not different than from 'Gladiator'.

The mean number and weight of unmarketable pumpkins from all cultivars was not different than from 'Gladiator'.

Mean handle ratings for all pumpkins was not different than 'Gladiator'.

Rind Color

Rind color varied slightly within a site and also between sites for most cultivars (Table 5). However, 'Kratos' was consistently rated as dark orange and 'Solid Gold' as orange within and between sites.

Yearly environmental conditions can affect results and recommendations; therefore, we have proposed to evaluate the same pumpkin cultivars again in 2017.

Table 2. Mean number and weight per plot (6 plants) of 24 pumpkin cultivars categorized as fully orange, fully orange and turning orange, mature green, and unmarketable grown in Pennsylvania Furnace, Pennsylvania in 2016.

Cultivar	Mean fully orange fruit no.	Mean fully orange fruit weight (lb)	Mean fully orange and turning fruit no.	Mean fully orange and turning fruit weight (lb)	Mean mature green no.	Mean mature green weight (lb)	Mean unmarketable No.	Mean unmarketable weight (lb)
Ares	11.5 a-e	204.6 a-d	16.3 a-e	293.7 a-d	2.5 b	37.6 bc	0.0	0.0
Bayhorse Gold	9.3 de	165.8 d	13.3 b-e	223.0 c-f	1.8 b	18.7 bc	0.5	7.5
Bellatrix	11.8 a-e	215.8 a-d	14.8 a-e	261.3 a-f	3.0 b	35.2 bc	0.3	2.1
Camero	10.3 b-e	262.1 ab	13.3 b-e	309.6 abc	4.8 ab	61.2 ab	0.0	0.0
Cargo	9.3 de	187.9 a-d	11.8 cde	236.1 b-f	2.0 b	24.9 bc	0.0	0.0
Challenger	11.3 a-e	255.4 abc	17.0 a-d	354.5 a	2.3 b	33.0 bc	0.0	0.0
Eagle City Gold	10.0 b-e	157.3 d	13.5 b-e	206.7 def	3.0 b	39.1 abc	0.0	0.0
Earlipak	10.3 b-e	184.6 a-d	13.3 b-e	233.7 b-f	2.5 b	30.3 bc	0.0	0.0
Early King	12.3 a-e	272.7 a	15.0 a-e	323.5 ab	3.3 b	42.6 abc	0.3	1.5
El Capitan	8.3 e	129.7 d	10.8 e	179.3 ef	1.8 b	20.0 bc	0.0	0.0
El Toro	11.0 a-e	207.0 a-d	12.8 b-e	239.9 b-f	2.8 b	44.7 abc	0.0	0.0
Gladiator	9.8 cde	134.2 d	15.0 a-e	200.5 def	1.0 b	15.2 bc	0.5	6.4
Gold Challenger	9.3 de	168.1 cd	11.5 de	209.9 def	1.8 b	21.9 bc	0.5	4.3
Hannibal	11.5 a-e	188.8 a-d	13.0 b-e	215.7 c-f	.8 b	12.7 bc	0.0	0.0
Honky Tonk	15.5 a	191.1 a-d	20.0 a	248.2 b-f	2.5 b	27.8 bc	0.0	0.0
Kratos	12.5 a-e	200.3 a-d	17.0 a-d	277.5 a-e	2.3 b	29.8 bc	0.0	0.0
Magic Lantern	15.0 ab	181.1 bcd	18.0 ab	223.7 c-f	8.0 a	89.0 a	0.3	3.4
Magic Wand	14.3 a-d	179.9 bcd	18.0 ab	231.8 b-f	2.0 b	15.7 bc	0.0	0.0
Mrs. Wrinkles	9.3 de	142.8 d	12.5 b-e	183.1 ef	3.5 b	41.1 abc	1.0	20.8
Orange Rave	14.3 a-d	214.9 a-d	17.5 ab	255.1 b-f	2.0 b	20.0 bc	0.3	3.7
Rhea	14.5 abc	203.4 a-d	17.3 abc	249.7 b-f	2.8 b	30.9 bc	0.5	4.8
Solid Gold	9.8 cde	191.1 a-d	13.0 b-e	254.3 b-f	1.3 b	10.3 c	0.3	5.3
Spartan	12.3 a-e	180.9 bcd	14.8 a-e	225.2 c-f	1.8 b	19.0 bc	0.0	0.0
Zeus	10.3 b-e	129.8 d	13.0 b-e	164.8 f	4.8 ab	42.3 abc	0.3	2.4

^aValues are the mean of 4 replications; data were analyzed using the mixed procedure and means were separated using pdiff; values followed by different letters within a column are significantly different at the 5% level; ‘Gladiator’ was considered the standard and values are bolded; values in orange are statistically higher than ‘Gladiator’.

Table 3. Mean number and weight per plot (6 plants) of 24 pumpkin cultivars categorized as fully orange, mature green, and unmarketable. Mean pumpkin handle (stem) rating. Pumpkins were grown in Manheim, Pennsylvania in 2016.

Cultivar	Mean fully orange fruit no.	Mean marketable fruit weight (lb)	Mean mature green fruit no.	Mean unmarketable fruit no.	Mean unmarketable fruit weight (lb)	Mean handle rating (1-5; 5 = great)
Ares	12.0 ² ab	192.0 a-d	0.8	0.8	7.4	5.0 a
Bayhorse Gold	12.5 ab	164.4 cd	0.5	2.0	16.5	3.3 c-f
Bellatrix	17.0 a	262.7 ab	1.0	1.3	15.0	3.5 bcd
Camero	10.8 b	152.2 cd	1.5	3.3	39.4	2.4 fg
Cargo	11.0 ab	195.8 a-d	0.0	0.8	13.7	3.3 c-f
Challenger	15.5 ab	286.2 a	0.3	2.5	38.6	2.3 g
Eagle City Gold	10.5 b	130.5 d	1.5	1.3	10.9	3.0 c-g
Earlipak	10.3 b	174.1 bcd	0.0	1.0	14.3	3.0 c-g
Early King	14.8 ab	247.0 abc	1.3	1.0	15.9	2.5 efg
El Capitan	9.8 b	145.5 d	1.3	1.0	14.1	2.8 d-g
El Toro	10.5 b	173.9 bcd	0.8	0.5	5.7	3.5 bcd
Gladiator	11.8 ab	152.4 cd	0.5	1.0	13.9	3.5 bcd
Gold Challenger	10.0 b	162.6 cd	0.3	1.8	22.1	3.8 bc
Hannibal	10.3 b	164.6 cd	0.5	2.8	29.7	3.5 bcd
Honky Tonk	13.8 ab	169.3 bcd	0.3	0.5	3.3	3.0 c-g
Kratos	12.8 ab	196.0 a-d	1.3	0.3	4.4	3.8 cde
Magic Lantern	15.3 ab	166.9 bcd	2.0	0.8	5.3	3.0 c-g
Magic Wand	13.0 ab	168.8 bcd	0.8	1.0	11.9	3.3 c-f
Mrs. Wrinkles	14.5 ab	186.7 bcd	1.0	1.3	12.9	3.3 c-f
Orange Rave	12.0 ab	172.7 bcd	1.0	2.0	18.7	2.9 c-g
Rhea	10.0 b	144.9 d	0.3	1.0	12.5	5.0 a
Solid Gold	10.8 b	193.4 a-d	0.0	1.3	21.2	4.4 ab
Spartan	15.0 ab	219.3 a-d	0.0	0.8	9.6	2.3 g
Zeus	14.8 ab	170.6 bcd	0.3	1.5	17.2	3.0 c-g

²Values are the mean of 4 replications; data were analyzed using the mixed procedure and means were separated using pdiff; values followed by different letters within a column are significantly different at the 5% level; 'Gladiator' was considered the standard and values are bolded; values in orange are statistically higher and blue lower than 'Gladiator'.

Table 4. Mean number and weight per plot (6 plants) of 24 pumpkin cultivars categorized as fully orange, fully orange and turning orange, mature green, and unmarketable grown in Indiana, Pennsylvania in 2016.

Cultivar	Mean fully orange fruit no.	Mean fully orange fruit weight (lb)	Mean fully orange and turning fruit no.	Mean mature green no.	Mean unmarketable No.	Mean handle rating (1-5; 5 = great)
Ares	1.5 cde ^z	34.2 bcd	2.0 cd	0.5 a	0.0 a	3.3 a
Bayhorse Gold	2.8 bcd	58.3 abc	4.5 abcd	0.8 a	0.0 a	3.5 a
Bellatrix	2.8 bcd	64.7 abc	4.0 abcd	0.5 a	0.3 a	3.3 a
Camero	1.8 bcde	41.1 abcd	4.3 abcd	1.5 a	0.3 a	3.3 a
Cargo	1.8 bcde	31.1 bcd	2.8 bcd	2.0 a	0.0 a	3.5 a
Challenger	1.5 cde	54.1 abc	4.3 abcd	1.8 a	0.0 a	2.5 a
Eagle City Gold	3.5 abc	68.3abc	5.5 abc	2.0 a	0.0 a	3.0 a
Earlipak	1.0 de	22.6 cd	2.3 bcd	1.5 a	0.0 a	3.6 a
Early King	1.8 bcde	48.7 abc	4.3 abcd	0.8 a	0.3 a	3.0 a
El Capitan	0.0 e	0.0 d	1.5 d	0.5 a	0.3 a	- ^y
El Toro	1.0 de	29.6 bcd	3.3 abcd	1.8 a	0.0 a	4.0 a
Gladiator	1.0 de	27.5 bcd	1.5 d	1.0 a	0.0 a	3.0 a
Gold Challenger	1.5 cde	33.1 bcd	1.8 d	0.8 a	0.0 a	2.8 a
Hannibal	2.0 bcde	51.1 abc	3.5 abcd	0.8 a	0.0 a	4.0 a
Honky Tonk	2.3 bcd	42.7 abcd	4.3 abcd	1.5 a	0.0 a	3.0 a
Kratos	1.8 bcde	57.6 abc	3.8 abcd	2.0 a	0.3 a	3.0 a
Magic Lantern	2.5 bcd	59.3 abc	4.3 abcd	0.5 a	0.0 a	3.0 a
Magic Wand	2.5 bcd	61.5 abc	3.8 abcd	1.5 a	0.0 a	3.5 a
Mrs. Wrinkles	5.3 a	83.1 a	6.8 a	0.5 a	0.3 a	2.5 a
Orange Rave	3.8 ab	70.6 ab	5.8 ab	1.0 a	0.0 a	3.0 a
Rhea	2.0 bcde	61.6 abc	4.3 abcd	1.5 a	0.3 a	3.5 a
Solid Gold	2.3 bcd	55.7 abc	3.3 abcd	1.5 a	0.3 a	4.5 a
Spartan	1.5 cde	33.4 bcd	2.8 bcd	1.0 a	0.0 a	2.8 a
Zeus	1.0 de	25.9 bcd	2.3 bcd	2.0 a	0.0 a	3.6 a

^zValues are the mean of 4 replications; data were analyzed using the mixed procedure and means were separated using pdiff; values followed by different letters within a column are significantly different at the 5% level; ‘Gladiator’ was considered the standard and values are bolded; values in orange are statistically higher than ‘Gladiator’.

^yHandle ratings were not taken for ‘El Capitan’ because no orange or turning fruit were harvested.

Table 5. Level of orange rind color of 24 cultivars of pumpkins grown in Pennsylvania Furnace, Manheim, and Indiana, Pennsylvania in 2016.

Cultivar	Central rating	Southeastern rating	Southwestern
Ares	Orange – dark orange	Orange – dark orange	Orange – dark orange
Bayhorse Gold	Orange – dark orange	Orange – dark orange	Orange – dark orange
Bellatrix	Orange – dark orange	Orange	Orange – dark orange
Camero	Light orange – orange	Light orange	Light orange – orange
Cargo	Dark orange	Light orange – orange	Dark orange
Challenger	Orange	Light orange – orange	Orange
Eagle City Gold	Orange – dark orange	Light orange – orange	Orange – dark orange
Earlipak	Dark orange	Orange – dark orange	Dark orange
Early King	Orange – dark orange	Orange – dark orange	Orange – dark orange
El Capitan	Dark orange	Dark orange	-
El Toro	Orange – dark orange	Orange – dark orange	Orange – dark orange
Gladiator	Dark orange	Orange – dark orange	Dark orange
Gold Challenger	Orange – dark orange	Orange – dark orange	Orange – dark orange
Hannibal	Orange – dark orange	Orange – dark orange	Orange – dark orange
Honky Tonk	Orange – dark orange	Orange – dark orange	Orange – dark orange
Kratos	Dark orange	Dark orange	Dark orange
Magic Lantern	Orange – dark orange	Dark orange	Orange – dark orange
Magic Wand	Orange – dark orange	Orange – dark orange	Orange – dark orange
Mrs. Wrinkles	Dark orange	Orange – dark orange	Dark orange
Orange Rave	Orange – dark orange	Orange – dark orange	Orange – dark orange
Rhea	Orange – dark orange	Light orange – orange	Orange – dark orange
Solid Gold	Orange	Orange	Orange
Spartan	Orange – dark orange	Dark orange	Orange – dark orange
Zeus	Orange – dark orange	Orange – dark orange	Orange – dark orange