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# Kentucky Bell Pepper Variety Trial — 2014

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Bell pepper (*Capsicum annum* L.) is the eighth largest fresh market vegetable with respect to area of production in Kentucky. Bell peppers were grown on 162 acres accounting for 2.3% of the total fresh market vegetable acreage in 2013 (USDA, 2013). Bell peppers are grown in various areas across the state both in open fields and high tunnels. Most of the producers are smaller, however, there is one large wholesale operator in Pulaski County and one new wholesale operator in Scott County. In the 1980s there was a fairly significant amount of processing pepper production in the state, but due to consecutive losses over a few years due to bacterial leaf spot, the processors closed facilities and left the state. Given the increased demand for local food and the quality of pepper that can be produced in the state, there is likely an opportunity for continued growth in bell pepper acreage. Variety selection continues to be one of the primary decisions producers make each season to meet their needs with respect to high yield, resistance to abiotic disorders (e.g., blossom end rot), and good fruit uniformity. Harvest maturity for timing of market windows is also generally a consideration for producers. Aristotle has been and remains one of the primary bell pepper varieties grown east of the Mississippi River, accounting for approximately 60% of the market. The objective of the experiment was to evaluate 15 bell pepper varieties grown under Midwestern United States growing conditions at the University of Kentucky Horticulture Research Farm in Lexington, Ky.

## Materials and Methods

The experiment was established when seeds of 15 bell pepper varieties were sown in 50-cell black seedling flats (Landmark Plastic, Akron, OH) on April 11, 2014, using Jiffy-Mix #17 (Jiffy Products of America, Lorain, Ohio) as the transplant production media. All varieties were transplanted in the field in their designated plot based on the randomized complete block design on May 21, 2014. Experimental plots were 30 feet in length. Beds were spaced on 6-foot centers with double rows. In a given bed there was a 12-inch in-row spacing and 15 inches between rows. There were three replicates of each variety and 30 plants in each plot. Plants were trellised around the perimeter of each double row with 30-inch wood stakes and string.

Preplant fertilization consisted of 109 lbs of urea (46-0-0) and 120 lbs of sulfate of potash (0-0-50) per acre based on soil nutrient analysis and fertility recommendations of the ID-36 *Vegetable Production Guide for Commercial Growers* (Bessin, et al., 2014). Raised beds were formed and covered in black plastic mulch (4 ft x 1 mil, Filmtech Plastics of the Sigma Plastics Group, Lyndhurst, NJ), while drip tape (8-inch emitter spacing, 30 gph/100 ft, Aqua Traxx, The Toro Company, Bloomington, MN) was installed under the plastic to allow for irrigation during the season as needed. Fertigation applications at 10 lbs N per acre were made weekly alternating calcium nitrate and potassium nitrate from June 4 to August 29. Weeds on the shoulders of the beds were weeded by hand and with the use of a scuffle hoe. Row middles were cultivated for weed management.

A preventative fungicide program was utilized as found in the ID-36 *Vegetable Production Guide for Commercial Growers* (Bessin, et al., 2014). Fungicides/bactericides utilized included: Nordox, Manzate Prostick, Chlorothalonil, and Cabrio. Scouting was conducted on a weekly basis for arthropod pests. Insecticide and/or miticide applications were made based on the scouting

report. Insecticides used included: Mustang Max, Baythroid XL, Brigade 2, Montana, Javelin, Assail, Oberon, and Dipel.

Fruit were harvested once per week for a total of nine harvests from July 16 to September 12. Fruit were graded using USDA guidelines (USDA, 2005). Thirty fancy fruit from each variety (10 from each replication over the entire harvest) were evaluated for diameter, length, wall thickness, and average number of lobes. Yield data were analyzed by general linear model and means were separated with Fisher's least significant difference test using SAS statistical programs (SAS Institute, Cary, NC.). Conversion to acres was done assuming a plant population of 14,500 plants per acre.

## Results and Discussion

Yields in 2014 ranged from 132-166 pounds per plot or approximately 64,000-81,000 pounds per acre (Tables 1 and 2). Karisma had greater total fruit weight per plot (166.7 lbs) over nine harvests as compared to the standard (Aristotle) and all other varieties with the exception of Currier and Bastille (Table 1). For the total weight and fruit number, fancy grade fruit accounted for 38% of the total number and 48% of the total weight for Karisma (Table 1). Currier and Bastille also had similar distributions of fancy fruit relative to the total.

During the early harvest period, Currier had greater total fancy fruit weight as compared to eight of the varieties in the trial (Table 3). Varieties that had comparable fancy fruit weight in this period include: Aristotle (standard), ACX251Y, Excursion II, Karisma, Bastille, and Vanguard. During the middle three harvests, there were no significant differences in yield amongst any of the varieties. However, Vanguard and Aristotle had middle harvest of fancy fruit weight per plot at 12.8 and 4.8 pounds, respectively (Table 4). For the last three harvests, Karisma and Excursion II had greater fancy fruit weight per plot compared to six of the 15 varieties (Table 5). Other varieties that did not statistically differ from those two for fancy fruit weight include: E3, Islamorada, Currier, Aristotle (standard), ACX297, Bastille, and Vanguard (Table 5).

Fancy grade fruit characteristics differed significantly among all varieties for diameter, height, number of lobes, but not for wall thickness. Rampart had significantly greater average fruit diameter (4.09 inches) than all varieties with the exception of Enforcer, Vanguard, Bastille, and Islamorada (Table 6). All varieties were similar to Aristotle (standard) with respect to fruit diameter except Rampart and Excursion II, which were 4.09 and 3.67 inches respectively (Table 6). Aristotle had greater average fruit height as compared to the other varieties with the exception of Currier, Bayonet, ACX251Y, ACX297, Islamorada, Bastille, and Vanguard (Table 6).

From a practical perspective, there are varieties that are comparable to the industry standard, Aristotle, in commercial production systems worth trying. Based on a single year of evaluation, varieties that could be comparable or better in yield and fancy fruit characteristics include: Karisma, Currier, and Bastille. However, at minimum an additional season's worth of data to confirm the results would be best. The results do show promise of new options for bell pepper producers.

## Acknowledgements

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**Table 1.** Pepper harvest per plot<sup>1</sup>, 2014 — (July 16-September 12), 9 harvests.

Variety	Seed Company	Total Marketable Fruit		Fancy Fruit		Number 1 Fruit		Number 2 Fruit		Cull Fruit	
		Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)
Karisma	Harris Moran	390.0	166.7 a <sup>2</sup>	147.7 a	80.3 a	207.7 bcd	79.4 bcd	34.7 bcde	7.1 c	24.3 cd	9.4
E3	Enza Zaden	382.0	149.9 bc	118.3 abcd	58.6 bcde	225.0 b	82.7 bc	38.7 bcde	8.7 bc	21.3 cd	7.9
Enforcer	Abbott & Cobb	373.3	145.7 bcd	41.0 g	22.4 g	271.0 a	107.2 a	61.3 a	16.2 a	30.3 abc	13.0
8620-ACX251Y	Abbott & Cobb	363.3	146.6 bcd	107.5 cdef	54.2 cdef	204.2 bcd	79.9 bcd	51.5 ab	12.5 ab	24.6 cd	9.2
Garfield	Abbott & Cobb	362.3	136.1 cd	82.3 ef	41.0 f	232.0 ab	85.3 bc	48.0 abc	9.8 bc	40.0 a	16.7
Currier	Harris Moran	358.3	152.6 abc	137.3 abc	72.6 ab	189.0 bcd	71.9 bcde	32.0 bcde	8.1 bc	25.0 bcd	9.4
Bayonet	Syngenta	351.0	140.4 bcd	94.0 def	48.5 ef	224.3 bc	84.7 bc	32.7 bcde	7.2 c	14.3 d	5.3
Excursion II	Abbott & Cobb	348.7	143.5 bcd	141.7 ab	71.7 ab	179.0 bcd	64.5 de	28.0 de	7.4 bc	26.0 abcd	10.4
ACX297	Abbott & Cobb	348.7	146.1 bcd	104.3 def	53.5 def	223.0 bc	87.1 b	21.3 e	5.6 c	15.7 d	7.0
Aristotle	Seedway	347.0	140.1 bcd	143.7 ab	69.7 abc	174.3 d	63.1 e	29.0 cde	7.3 bc	19.3 cd	8.2
Dashen	Enza Zaden	342.0	132.2 d	100.0 def	50.2 ef	196.3 bcd	71.4 bcde	45.7 abcd	10.6 bc	20.7 cd	8.1
Islamorada	Seedway	333.3	133.2 d	102.7 def	53.3 def	194.7 bcd	69.5 cde	36.0 bcde	10.4 bc	39.0 ab	14.7
Bastille	Syngenta	325.3	155.3 ab	109.3 cde	70.0 abc	196.0 bcd	79.8 bcd	20.0 e	5.5 c	20.7 cd	9.0
Vanguard	Harris Moran	312.7	145.0 bcd	114.3 bcd	67.6 abcd	165.7 d	69.0 cde	32.7 bcde	8.4 bc	21.3 cd	9.7
Rampart	Syngenta	312.7	148.6 bcd	77.7 f	55.0 cdef	206.3 bcd	86.6 b	28.7 cde	7.0 c	24.3 cd	10.0

<sup>1</sup>Plot size: 180 ft<sup>2</sup>.<sup>2</sup>Means within columns separated by Fisher's least significant test ( $P \leq 0.05$ ), means with same letter are not significantly different. Means within columns without letters are not significantly different from one another.

**Table 2.** Pepper harvest per acre, 2014 — (July 16-September 12), 9 harvests.

Variety	Seed Company	Total Marketable Fruit		Fancy Fruit		Number 1 Fruit		Number 2 Fruit		Cull Fruit	
		Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)
Karisma	Harris Moran	188,760	80,683 a <sup>1</sup>	71,487 a	38,865 a	100,527 bcd	38,430 bcd	16,795 bcde	3,437 c	11,761 cd	4,550
E3	Enza Zaden	184,188	72,552 bc	57,257 abcd	28,362 bcde	108,900 b	40,027 bc	18,731 bcde	4,211 bc	10,309 cd	3,824
Enforcer	Abbott & Cobb	180,677	70,519 bcd	19,844 g	10,842 g	131,164 a	51,885 a	29,669 a	7,841 a	14,665 abc	6,292
8620-ACX251Y	Abbott & Cobb	175,837	70,954 bcd	52,030 cdef	26,233 cdef	98,833 bcd	38,672 bcd	24,926 ab	6,050 ab	11,906 cd	4,453
Garfield	Abbott & Cobb	175,353	65,872 cd	39,833 ef	19,844 f	112,288 ab	41,285 bc	23,232 abc	4,743 bc	19,360 a	8,083
Currier	Harris Moran	173,417	73,858 abc	66,453 abc	35,138 ab	91,476 bcd	34,800 bcde	15,488 bcde	3,920 bc	12,100 bcd	4,550
Bayonet	Syngenta	169,884	67,954 bcd	45,496 def	23,474 ef	108,561 bc	40,995 bc	15,827 bcde	3,485 c	6,921 d	2,565
Excursion II	Abbott & Cobb	168,771	69,454 bcd	68,583 ab	34,703 ab	86,636 bcd	31,218 de	13,552 de	3,582 bc	12,584 abcd	5,034
ACX297	Abbott & Cobb	168,771	70,712 bcd	50,481 def	25,894 def	107,932 bc	42,156 b	10,309 e	2,710 c	7,599 d	3,388
Aristotle	Seedway	167,948	67,808 bcd	69,551 ab	33,735 abc	84,361 d	30,540 e	14,036 cde	3,533 bc	9,341 cd	3,969
Dashen	Enza Zaden	165,528	63,985 d	48,400 def	24,297 ef	95,009 bcd	34,558 bcde	22,119 abcd	5,130 bc	10,019 cd	3,920
Islamorada	Seedway	161,317	64,469 d	49,707 def	25,797 def	94,235 bcd	33,638 cde	17,424 bcde	5,034 bc	18,876 ab	7,115
Bastille	Syngenta	157,445	75,165 ab	52,901 cde	33,880 abc	94,864 bcd	38,623 bcd	9,680 e	2,662 c	10,019 cd	4,356
Vanguard	Harris Moran	151,347	70,180 bcd	55,321 bcd	32,718 abcd	80,199 d	33,396 cde	15,827 bcde	4,066 bc	10,309 cd	4,695
Rampart	Syngenta	151,347	71,922 bcd	37,607 f	26,620 cdef	99,849 bcd	41,914 b	13,891 cde	3,388 c	11,761 cd	4,840

<sup>1</sup>Means in columns separated by Fisher's least significant test ( $P \leq 0.05$ ), means with same letter are not significantly different. Means within columns without letters are not significantly different from one another.

**Table 3.** Early pepper harvest per plot<sup>1</sup>, 2014 — early (July 16-July 29), 3 harvests.

Variety	Seed Company	Total Marketable Fruit		Fancy Fruit		Number 1 Fruit		Number 2 Fruit		Cull Fruit	
		Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)
8620-ACX251Y	Abbott & Cobb	157.5	74.9	75.0 abc <sup>2</sup>	38.7 abcd	75.3	32.7	9.3	3.5	8.4	3.2 cd
Excursion II	Abbott & Cobb	143.7	66.7	71.3 abcd	36.6 abcde	66.7	27.6	5.7	2.4	15.3	6.6 abc
Aristotle	Seedway	141.0	66.9	87.0 a	43.3 ab	50.3	22.0	3.7	1.5	13.0	5.3 abcd
Karisma	Harris Moran	133.3	68.4	70.0 abcd	40.2 abc	62.3	28.1	1.0	0.2	9.7	2.8 d
Garfield	Abbott & Cobb	132.7	59.8	45.7 ef	23.2 fgh	85.0	36.0	2.0	0.5	18.7	8.6 a
Currier	Harriss Moran	126.0	64.5	84.7 ab	45.6 a	37.3	17.3	4.0	1.7	7.7	3.1 cd
E3	Enza Zaden	125.0	58.4	58.7 cde	31.1 cdefg	65.3	26.9	1.0	0.4	7.0	2.8 d
Dashen	Enza Zaden	120.3	56.6	62.7 bcde	31.6 bcdefg	55.7	24.1	2.0	0.8	7.3	3.7 bcd
ACX297	Abbott & Cobb	118.3	57.6	36.0 gf	20.1 gh	80.7	36.8	1.7	0.6	5.3	2.6 d
Bastille	Syngenta	113.3	66.6	56.0 cdef	40.6 abc	54.3	24.8	3.0	1.1	9.7	4.5 bcd
Bayonet	Syngenta	110.7	53.0	52.0 def	26.8 efg	56.7	25.5	2.0	0.7	8.3	2.9 d
Vanguard	Harris Moran	109.3	58.1	57.0 cdef	34.4 abcdef	48.0	22.0	4.3	1.8	9.0	3.9 bcd
Rampart	Syngenta	104.0	64.2	35.3 fg	30.3 cdefg	66.7	33.2	2.0	0.8	9.0	3.7 bcd
Enforcer	Abbott & Cobb	104.0	46.8	21.3 g	11.8 h	78.3	33.4	4.3	1.6	11.7	5.3 abcd
Islamorada	Seedway	103.0	49.0	50.7 def	27.2 defg	45.3	18.5	7.0	3.2	20.0	7.3 ab

<sup>1</sup>Plot size: 180 ft<sup>2</sup>.<sup>2</sup>Means in columns separated by Fisher's least significant test ( $P \leq 0.05$ ), means with same letter are not significantly different. Means within columns without letters are not significantly different from one another.

**Table 4.** Middle pepper harvest per plot<sup>1</sup>, 2014 — mid (August 5-August 19), 3 harvests.

Variety	Seed Company	Total Marketable Fruit		Fancy Fruit		Number 1 Fruit		Number 2 Fruit		Cull Fruit	
		Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)
Karisma	Harris Moran	65.3	30.8	21.3	12.5	38.7	17.0	5.3	1.2	3.0	1.7
ACX297	Abbott & Cobb	63.3	28.4	18.0	9.8	41.0	17.0	4.3	1.5	4.3	2.1
Vanguard	Harris Moran	56.3	29.5	19.3	12.8	33.7	15.9	3.3	0.8	4.0	2.2
Bastille	Syngenta	54.3	23.5	9.0	5.6	38.7	16.1	6.7	1.8	2.7	1.2
Rampart	Syngenta	53.7	26.0	15.0	10.0	35.3	15.1	3.3	0.8	5.3	2.9
Currier	Harris Moran	52.0	22.3	12.7	7.3	37.0	14.3	2.3	0.7	3.0	1.4
Enforcer	Abbott & Cobb	50.3	21.5	6.3	3.5	40.7	17.2	3.3	0.8	3.3	1.4
Islamorada	Seedway	49.0	22.6	11.7	7.0	30.7	13.4	6.7	2.2	6.3	3.1
Dashen	Enza Zaden	49.0	21.1	11.3	6.7	34.3	13.5	3.3	0.9	5.0	2.1
Excursion II	Abbott & Cobb	47.7	19.4	15.0	8.5	27.7	9.8	5.0	1.1	3.7	1.4
Bayonet	Syngenta	47.3	20.0	8.7	5.2	34.0	13.7	4.7	1.1	0.7	0.3
E3	Enza Zaden	46.7	23.0	12.0	6.9	32.7	15.7	2.0	0.5	4.3	1.8
Aristotle	Seedway	38.7	16.9	8.3	4.8	28.0	11.4	2.3	0.7	2.3	1.2
Garfield	Abbott & Cobb	38.3	16.2	6.0	3.3	28.0	11.7	4.3	1.3	10.7	5.0
8620-ACX251Y	Abbott & Cobb	38.2	18.7	8.4	4.9	27.7	13.2	2.0	0.6	7.1	3.4

<sup>1</sup>Plot size: 180 ft<sup>2</sup>.

**Table 5.** Late pepper harvest per plot<sup>1</sup>, 2014 — late (August 25-September 12), 3 harvests.

Variety	Seed Company	Total Marketable Fruit		Fancy Fruit		Number 1 Fruit		Number 2 Fruit		Cull Fruit	
		Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)	Number	Weight (lb)
Enforcer	Abbott & Cobb	219.0	77.4	13.3 f <sup>2</sup>	7.1 f	152.0	56.6 a	53.7 a	13.7 a	15.3	6.3
E3	Enza Zaden	210.3	68.6	47.7 abc	20.6 abc	127.0	40.1 bc	35.7 abc	7.8 bcd	10.0	3.2
Bayonet	Syngenta	193.0	67.4	33.3 cde	16.5 bcde	133.7	45.5 ab	26.0 bcd	5.4 bcde	5.3	2.2
Karisma	Harris Moran	191.3	67.6	56.3 a	27.5 a	106.7	34.4 bcd	28.3 bcd	5.6 bcde	11.7	4.8
Garfield	Abbott & Cobb	191.3	60.1	30.7 de	14.5 cdef	119.0	37.6 bcd	41.7 ab	8.0 bcd	10.7	3.1
Islamorada	Seedway	181.3	61.6	40.3 abcde	19.1 abcde	118.7	37.6 bcd	22.3 bcd	5.0 bcde	12.7	4.3
Currier	Harris Moran	180.3	65.8	40.0 abcde	19.7 abcd	114.7	40.4 bc	25.7 bcd	5.7 bcde	14.3	4.9
Dashen	Enza Zaden	172.7	54.5	26.0 ef	11.9 def	106.3	33.7 bcd	40.3 ab	8.9 ab	8.3	2.3
8620-ACX251Y	Abbott & Cobb	167.6	53.1	24.2 ef	10.6 ef	103.2	34.0 bcd	40.2 ab	8.4 bc	9.1	2.7
Aristotle	Seedway	167.3	56.4	48.3 abc	21.6 abc	96.0	29.6 cd	23.0 bcd	5.1 bcde	4.0	1.7
ACX297	Abbott & Cobb	167.0	60.2	50.3 ab	23.5 ab	101.3	33.2 cd	15.3 cd	3.4 de	6.0	2.3
Bastille	Syngenta	157.7	65.2	44.3 abcd	23.8 ab	103.0	38.9 bcd	10.3 d	2.5 e	8.3	3.3
Excursion II	Abbott & Cobb	157.3	57.5	55.3 a	26.6 a	84.7	27.1 d	17.3 cd	3.8 cde	7.0	2.5
Rampart	Syngenta	155.0	58.4	27.3 ef	14.7 cdef	104.3	38.3 bcd	23.3 bcd	5.4 bcde	10.0	3.3
Vanguard	Harris Moran	147.0	57.4	38.0 bcde	20.4 abcd	84.0	31.1 cd	25.0 bcd	5.9 bcde	8.3	3.6

<sup>1</sup>Plot size: 180 ft<sup>2</sup>.<sup>2</sup>Means in columns separated by Fisher's least significant test ( $P \leq 0.05$ ), means with same letter are not significantly different. Means within columns without letters are not significantly different from one another.



**Table 6.** Fancy fruit characteristics of pepper varieties, 2014.

Variety	Seed Company	Diameter (in)	Height (in)	Wall Thickness (in)	Number of Lobes
Rampart	Syngenta	4.09 a <sup>1</sup>	3.72 cdef	0.298	3.40 abcde
Enforcer	Abbott & Cobb	3.99 ab	3.71 def	0.510	3.57 abc
Vanguard	Harris Moran	3.98 ab	3.89 abc	0.275	3.37 abcde
Bastille	Syngenta	3.94 abc	3.86 abcd	0.288	3.43 abcde
Islamorada	Seedway	3.94 abc	3.89 abc	0.288	3.63 ab
ACX297	Abbott & Cobb	3.89 bcd	3.85 abcdef	0.256	3.43 abcde
E3	Enza Zaden	3.84 bcde	3.81 bcdef	0.277	3.43 abcde
Aristotle	Seedway	3.84 bcde	4.01 a	0.290	3.30 cde
Currier	Harris Moran	3.81 cdef	3.96 ab	0.272	3.33 bcde
Karisma	Harris Moran	3.78 def	3.69 ef	0.290	3.67 a
Garfield	Abbott & Cobb	3.77 def	3.73 cdef	0.280	3.40 abcde
Bayonet	Syngenta	3.76 def	3.96 ab	0.291	3.23 def
8620-ACX251Y	Abbott & Cobb	3.74 def	3.94 ab	0.268	2.97 f
Dashen	Enza Zaden	3.71 ef	3.67 f	0.258	3.53 abcd
Excursion II	Abbott & Cobb	3.67 f	3.87 abcd	0.286	3.17 ef

<sup>1</sup>Means in columns separated by Fisher's least significant test ( $P \leq 0.05$ ), means with same letter are not significantly different. Means within columns without letters are not significantly different from one another.

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