

## Bell Pepper Evaluations for Yield and Quality in Eastern Kentucky

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### Introduction

As a result of several multi-year studies evaluating bell pepper cultivars for resistance to bacterial leaf spot (*Xanthomonas campestris* pv. *vesicatoria* or Xcv) and fruit quality, nearly 100% of Kentucky's pepper acreage is planted with resistant bell pepper cultivars with high fruit quality, like Aristotle. As new pepper cultivars are released we try to test them for leaf spot resistance, as well as for fruit yield and quality under Kentucky conditions. Because Kentucky farmers are planting more vegetable crop acreage, new disease problems like Phytophthora Blight (*Phytophthora capsici*) and tomato spotted wilt virus (TSWV) are becoming more prevalent. Past studies have shown that pepper cultivars with leaf spot resistance to at least three races of Xcv (races 1, 2 and 3) perform better under high disease pressure. Several of the cultivars in this study also contain resistance or tolerance to TSWV or Phytophthora Blight in addition to bacterial spot resistance.

The bell pepper cultivars were tested in replicated trials at two Kentucky locations in 2005 (central and eastern). See the report for central Kentucky elsewhere in this publication.

### Materials and Methods

Eleven new bell pepper cultivars with the Bs2 gene for bacterial spot resistance were compared with a main season and early season control varieties, Aristotle and King Arthur, respectively (Table 2). Mature green fruit were harvested two times from late June to mid August. Fruit were graded and weighed according to class size (U.S. No. 1 extra large, large, medium, chopper and cull). Yields in each class size were multiplied by their respective wholesale market prices to determine gross returns (income) for each cultivar. Wholesale prices from 2005 were used to calculate incomes for the different varieties. The income variable has been a good indicator of a cultivar's overall performance, taking into account time of harvest as well as yields of the different size classes and their price differentials.

The thirteen bell peppers were seeded in 72-cell trays in the greenhouse at the Robinson Station on 18 March and were transplanted to the field on May 12<sup>th</sup>. Fifty pounds of actual nitrogen along with sixty pounds of P<sub>2</sub>O<sub>5</sub> and sixty pounds of K<sub>2</sub>O/A were applied the day before planting. Ninety additional pounds of nitrogen/A were applied to the peppers during the growing season for a total of 140 lb actual N/A.

Each plot contained 14 plants in a double row with 7 plants/row. The in-row spacing was 14 in. with 20 in. between rows. One empty space/row was left between plots. Plots were replicated four times in a randomized complete block design. Dual II Magnum 1.3 pt/A was applied to the bare ground between plastic strips to control weeds.

**Fruit appearance ratings.** All pepper cultivars harvested on (7/18) were laid out on the ground and evaluated for fruit appearance. Overall appearance ratings were the result of several factors listed in order of decreasing importance: overall attractiveness, shape, smoothness, degree of flattening, color and uniformity of shape.

## Results and Discussion

Total marketable yields, gross incomes and fruit quality characteristics are shown in Table 2. Total marketable yields based on 2 harvests ranged from 12.8 to 21.2 tons/acre. The growing season was very dry and temperatures were warm-hot with clear skies. Incomes were lower than in previous years and ranged from around \$3175 to \$5178 per acre. Heritage had the highest marketable yield and the highest number of pounds of extra large fruit. The total marketable yield of nine other pepper cultivars was not significantly different from Heritage (Table 2.).

Heritage produced significantly more pounds of extra large peppers than nine of the other cultivars (Aristotle, Socrates, Revolution, Alliance, Patriot, Excursion II, Mahi, E41.8338, and King Arthur). Only three other pepper cultivars had similar yields of extra large fruit (PS9915776, Double-up, and Telstar (Table 2.).

Fruit quality ratings showed that Aristotle, PS9915776, Patriot and Heritage and Excursion II fruit had the best overall appearance ratings at Quicksand. Socrates and King Arthur had the lowest overall fruit quality ratings. Nine cultivars (Aristotle, PS9915776, Heritage, Alliance, Patriot, Excursion II, Mahi, E41.8338, and Telstar) had commercially acceptable fruit at both Lexington and Quicksand (Table 3).

Growers should also see results from a similar trial in 2005 from central Kentucky found elsewhere in this publication. Results of previous Kentucky research on pepper cultivars can be viewed on the web at: <http://www.uky.edu/Ag/Horticulture/comveggie.html>

Cultivar	Source	Days to Maturity	Comments
Aristotle (X3R)	RU	72	Very large green to red, BLS 1,2,3 and PVY, TMV
Socrates	SW	64	Very early, blocky, green to red, sturdy-medium size plants BLS 1, 2, 3
PS 9915776	SM		5 race BLS resistance, Phytophthora tolerant
Revolution (HMX 1660)	HM	72	Large to exlg blocky fruit, tall plants. BLS 1,2,3,5, CMV & Phytophthora tolerant. Cool tolerant
Heritage	HM	75	Green to red fruit, tall plant, TSWV resistant, BLS 1, 2, 3, 5
Alliance (HMX2643)	HM	73	Blocky, green to red fruit; BLS 1,2,3,5, "intermediate resistance" to phytophthora, PVY, PepMoV, CMV.
Patriot	HM	70	Early red, blocky concentrated fruit, BLS 1, 2, 3, 5, and PVY
Double-up	SW	69-80	Early to midseason. Resistant to BLS 1, 2, 3 and Tobamo virus
Excursion II	AC	75?	Large blocky fruit; BLS 1, 2, 3, TSWV, PVY, and TMV
Mahi	EZ		large, high-yielding green to red blocky pepper
E41.8338	EZ		
Telestar	HZ	Early	Resistant to PVY, TMV, BLS
King Arthur	SM	65-70	BLS susceptible

Table 2. Yields, gross returns and appearance ratings of bell pepper cultivars in Quicksand, Kentucky

Cultivar	Seed Source <sup>1</sup>	Tot. mkt. yield <sup>2</sup> (tons/A)	Pounds XL fruit/A <sup>2</sup>	% XL <sup>4</sup>	Income (\$/acre <sup>5</sup>	Overall appearance <sup>6</sup>	No lobes <sup>7</sup>	Fruit color	Comments
Aristotle	RU	18.8 AB	14,040 BC	64 BCD	\$4,564 ab	6	4-3	Dk green	Good yield.
Socrates	SW	15.9 ABC	11,982 C	52 E	\$4,131 abc	4.5	4-3	Pale med. green	Some misshapen fruit distorted lobes.
PS9915776	SM	19.2 AB	16,725 ABC	71 AB	\$4,571 ab	6	4-3	Dk green	Good shape little distortion.
Revolution	HM	14.2 BC	13,525 BC	68 ABC	\$3,486 bc	5	4-3	Md green	A lot of pumpkin shaped fruit.
Heritage	HM	21.2 A	21,250 A	73 A	\$5,178 a	6	3-4	Variable green	Slightly irregular shape.
Alliance	HM	12.8 C	11,468 C	65 ABCD	\$3,176 c	6	3-4	Variable pale-med green	About 1/3 flattened misshapen fruit.
Patriot	HM	17.5 ABC	13,239 BC	56 DE	\$4,130 abc	7	4-3	Mostly dk green	About ¼-1/3 flattened fruit.
Double-up	HM	17.5 ABC	18,288 AB	67 ABC	\$4,318 abc	4.5	3-4-5	Dk green	About ¼-1/3 flattened fruit. Ugly blossom end.
Excursion II	AC	16.2 ABC	13,297 BC	64 ABCD	\$3,738 bc	7	4-3	Dk green	A lot of pumpkin shaped fruit.
Mahi	EZ	14.0 BC	12,203 C	63 ABCD	\$3,281 bc	5	4-3	Med-green	About ¼ fruit pumpkin shaped.
E41.8338	EZ	16.8 ABC	14,763 BC	62 BCD	\$3,955 abc	5	4-3		A lot of fruit pumpkin shaped.
Telestar	HZ	17.8 ABC	15,802 ABC	60 CDE	\$4,192 abc	5	4-3		
King Arthur	SM	17.1 ABC	14,059 BC	62 BCD	\$4,206 abc	4	4-3		
<i>Waller-Duncan LSD (P&lt;0.05)</i>		<i>5.64</i>	<i>5,513</i>	<i>9.1</i>	<i>1,311</i>				

<sup>1</sup> Seed source identification and address information are listed elsewhere in this publication.

<sup>2</sup> Pounds of extra large peppers (>3.5 in. diameter)

<sup>3</sup> Total marketable yield includes the yields of U.S. Fancy and No. 1 fruits of medium (>2.5 in. diameter) size and larger misshapen, but sound fruit which could be sold as choppers to foodservice buyers.

<sup>4</sup> Percentage of total yield that was extra large (> 3.5 in. diameter).

<sup>5</sup> Income + gross returns per acre: average 2005 season local wholesale prices were multiplied by yields from the different size/grade categories: \$0.17-0.19/lb for extra large; \$0.09-0.14/lb for large and mediums, and \$0.05-0.11/lb for 'choppers' i.e. misshapen fruits.

<sup>6</sup> Visual rating: 1-9 scale where 1= worst, 9=best, taking into account overall attractiveness, shape, smoothness, degree of flattening, color, and shape uniformity; all fruit from two separate replications were observed on 7/18. A rating of 5 was considered commercially acceptable.

Table 3. Appearance Ratings of Fresh Market Bell Peppers, Quicksand and Lexington 2005

Cultivar	Overall Appearance			Number of Lobes (Quick)	No. Lobes (LEX)	Fruit Color (Quick)	Color (LEX)	Comments (Quick)	Comments (LEX)
	(Quick)	Lex	Avg						
Aristotle	6	6.5	6.25	4/3	Mostly 4	Dark green on shaded side, light green	Med-dk	High yielder	
Socrates	4.5	4.5	4.5	4/3	Mostly 4	Light green	Lt.-med.	Deep distorted lobes	50% flattened; pumpkin-shaped
PS 9915776	6	6	6.0	4/3	3-4	Dark green, light green on side	Med.	Good shape	Very few flattened; some misshapen
Revolution	5	4.5	4.75	4/3	Mostly 4	Light/dark green	Med-dk.	Pumpkin shape, large ones	50% flattened; otherwise ok
Heritage	6	5.75	5.88	3/4	Mostly 4	Variable green	Med.	Changes color just a little bit	No flattening; shapes somewhat irreg.
Alliance	6	5.5	5.75	3/4	Mostly 4	Variable green	Med-dk.	Shaded side a lighter green	1/3 flattened, otherwise nice
Patriot	7	5	6	4/3	Mostly 4	Mostly dark green	Med-dk.		¼ to 1/3 flattened.
Double-up	4.5	5	4.75	3/4/5	3-4	Dark green	Med.	Ugly blossom end	¼ to 1/3 flattened, many 3-lobed
Excursion II	7	5	6.0	4/3	3-4	Dark green, some light	Med.-dk.	A lot of pumpkins	1/3 flattened; some 3-lobed, nice color
Mahi	6.0	5.5	5.75	4/3	Mostly 4	Dark green, some light	Med.-dk.		¼ flattened, otherwise nice
E41.8338	5	5.5	5.25	4/3	Mostly 4	Uniform green	Lt-med. Med-dk.	A lot of pumpkins	< 25% flattened
Telestar	5	6	5.5	4/3	3-4	Good green	Med.	A lot of misshapen lobes, deep lobes	Many 3-lobed; some flat & long.
King Arthur	4	na	4.0	4/3	na	Medium green	na	A lot of culls, choppers, pumpkins shapes	Not grown in LEX

1 Visual Rating: 1-9 scale where 1=worst, 9=best, taking into account overall attractiveness, shape, smoothness, degree of flattening, color, and shape uniformity; a rating of 5 is considered commercially acceptable.