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Kimberly L. Oxley
Kansas State University

Cary L. Rivard
Kansas State University

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2014 Evaluation of Hybrid Bell Pepper Varieties for High Tunnel Production in Kansas

Kimberly L. Oxley and Cary L. Rivard
Kansas State University

Dept. of Horticulture, Forestry, and Recreation Resources, Manhattan, KS

High tunnel (hoop house) production of vegetables has become quite common in Kansas as they protect the crop from wind and storm damage in addition to providing season extension. We conducted a variety trial of bell peppers grown in a high tunnel to determine which cultivar is best suited for hoop house cultivation in the Great Plains. Ten commercially available varieties were tested and yields ranged from 10.3 to 11.7 lbs of total fruit per plant. The three varieties with the highest marketable fruit number were 'Chesapeake,' 'Red Knight,' and 'Declaration.' However, 'Chesapeake' had the smallest average marketable fruit size and was statistically significant compared to all of the other varieties ($P < 0.05$). 'Red Knight' and 'Declaration' had the highest average marketable fruit weight.

Introduction

Fresh-market bell peppers are a valuable crop for vegetable growers in Kansas, and can be grown successfully in high tunnels. Bell peppers are a valuable commodity that are sold through farmers' markets and CSA's as well as wholesale markets and restaurant sales. Due to the crop requirements (planting dates, soil temperature, crop height), three-season high tunnels provide an excellent system for bell pepper production. The goal of our study was to investigate the performance of ten hybrid bell pepper (green to red) varieties for fresh-market production in high tunnels.

Materials and Methods

The trial was conducted at the Olathe Horticulture Research and Extension Center located approximately 30 miles southwest of Kansas City. Transplants were grown in soilless potting media using 50-cell propagation trays. Seeds were sown on March 17, 2014 and transplanted to 50-cell trays on March 31. Transplants were set on May 9 in one bay of a multi-bay high tunnel (96 x 200 foot Haygrove Multibay High Tunnel) in the outer two (of four) rows. A randomized complete block design was utilized with four replications (two reps per 200 feet of row). The high tunnel trial had five plants per plot and in-row spacing was 18 inches, typical of commercial pepper production. Preplant crop nutrients were provided by calcium nitrate and potassium nitrate using equal portions of nitrogen at 75 lbs nitrogen/acre total. Plastic mulch and drip irrigation were employed and the stake-and-weave method was utilized to trellis the plants vertically. Fertigation was carried out at a rate of 10 lbs nitrogen/acre per application on July 15 and 23, and August 7. Calcium nitrate was used for the first and third fertigation events and potassium nitrate was used for the second fertigation. Harvesting was carried out from July 9 until October 2. During the last harvest, all fruit larger than 5 cm were picked. Fruit were graded for marketability, and fruit number and weight were recorded. Average fruit size and percent marketability were determined and are presented below. All data were analyzed using ANOVA (PlotIt, Scientific Programming Enterprises, Haslett, MI), and a mean separation test was carried out by using an F-protected least significant difference (LSD) test. A separate analysis was

carried out for each individual observation and the results of the LSD test are shown where statistically significant treatment effects occurred.

Results and Discussion

Table 1. Marketable and total per plant fruit yield of green pepper varieties grown in a three-season high tunnel in Olathe, Kansas.

Variety	Marketable		Total	
	Number	Weight (lbs)	Number	Weight (lbs)
Chesapeake	42.0 e	9.55	48.7 c	10.44
Red Knight	37.3 cd	10.10	44.0 bc	11.31
Declaration	36.2 bc	10.25	43.6 bc	11.69
Intruder	33.5 abc	9.47	36.8 a	10.30
Currier F1	33.3 abc	9.60	39.6 ab	10.93
Archimedes	32.6 ab	9.16	42.7 b	11.52
Karisma	32.1 ab	9.75	38.8 ab	11.25
Vanguard	31.2 a	9.09	41.1 ab	11.31
Blitz	30.1 a	8.90	43.2 b	11.23
Olympus	29.6 a	8.89	41.9 ab	11.24
LSD _(0.05)	4.7	NS	5.5	NS

Table 2. Mean pepper fruit size (lbs) and marketability of green pepper varieties grown in a three-season high tunnel in Olathe, Kansas.

Variety	Average Fruit Size (lbs)		Percent Marketability	
	Marketable	Total	Number	Weight
Chesapeake	0.23 a	0.21 a	85.6 cd	90.8 b
Red Knight	0.27 b	0.26 b	85.3 cd	89.6 b
Declaration	0.28 bc	0.27 bc	83.5 c	86.6 b
Intruder	0.28 bc	0.28 bc	90.9 d	91.7 b
Currier F1	0.29 bc	0.28 bc	84.0 cd	87.8 b
Archimedes	0.28 bc	0.27 bc	76.1 ab	78.7 a
Karisma	0.30 c	0.29 c	82.7 bc	86.4 b
Vanguard	0.29 bc	0.28 bc	76.0 ab	80.0 a
Blitz	0.30 bc	0.26 b	69.9 a	79.2 a
Olympus	0.30 bc	0.27 bc	70.6 a	78.3 a
LSD _(0.05)	0.03	0.03	7.3	5.9

In our trial, there were no statistically significant differences between any of the varieties in regards to marketable and total yield as measured by fruit weight. However, there were some differences observed in fruit number ($P < 0.05$). ‘Chesapeake’ had the highest marketable and total fruit number per plant. Marketable fruit number of ‘Chesapeake’ was statistically similar to

'Red Knight' and 'Declaration,' but was higher than the other varieties that were tested ($P < 0.05$). 'Karisma' had the highest average marketable fruit size, but was statistically similar to 'Olympus,' 'Blitz,' 'Vanguard,' and 'Currier F1.' 'Chesapeake' had a particularly low average marketable fruit size and was statistically lower than all the other varieties. In 2013, 'Karisma,' 'Vanguard,' and 'Olympus' had the highest average fruit size in a similar trial. Depending on how important average fruit size is to the market, this data can be interpreted differently. If smaller fruit are accepted/preferred for market, 'Chesapeake' may be an ideal variety as peppers are typically sold per piece at retail markets. However, if larger fruit are preferred, 'Declaration' or 'Currier F1' may be more valuable as they maintain good fruit size and have higher yield (weight) than many of the other varieties tested. Similar to 2013, 'Intruder' had the highest percent marketability although 'Chesapeake' and 'Red Knight' were statistically similar. A large portion (>80%) of the fruit quality problems seen in this trial was the result of blossom end rot (BER). Although the cull fruit were not graded specifically for this issue, the results seen in this study were most likely the result of a lower incidence of BER.

Total weekly fruit yield was plotted in order to summarize early vs. mid- and late-season production (data not shown). In contrast to the 2013 trial, several varieties showed excellent production early and mid-season, whereas in 2013 the majority of the yield came in September. Three varieties showed high potential for early-season production, which can be advantageous for marketing high-value fruit. In particular, 'Karisma,' 'Blitz,' and 'Declaration' showed the highest yields during July (data not shown). At the peak of the season, 'Currier F1,' 'Intruder,' 'Vanguard,' and 'Archimedes' had the highest production and were dramatically higher than the other varieties tested. During the peak harvest, and throughout the month of August, 'Blitz' had very poor production. 'Red Knight,' 'Chesapeake,' and 'Archimedes' had the highest yields late in the season (data not shown).

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