2015 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 10.8 to 13.9 lbs of total fruit per plant. The three varieties with the highest marketable fruit number per plant were 'Chesapeake', 'Currier', and 'Karisma'. However, 'Chesapeake' had the smallest average marketable fruit size and was not statistically significant compared to all of the other varieties ($P<0.05$). 'Currier' and 'Karisma' 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 3 March 2015 and transplanted to 50-cell trays on 16 March. Transplants were set on 1 May in one bay of a multi-bay high tunnel (96' x 200' 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' row). The high tunnel trial had five plants per plot and in-row spacing was 18", which is 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 19 May, 26 June and 18 July. Potassium nitrate was used for the first and third fertigation events and calcium nitrate was used for the second fertigation. Magnesium was also applied through fertigation at 10 lb magnesium/acre on the second application. Harvesting was carried out from 22 June until 22 September. During the last harvest, all fruit larger than 5 cm were picked and seconds were counted and weighed separately. 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		Wt (lbs)		Number		Wt (lbs)	
Chesapeake	32.7	d	9.49	ab	41.1	b	10.84	a
Currier	31.9	cd	12.22	d	37.2	ab	13.93	d
Karisma	30.2	bcd	11.71	cd	36.7	ab	13.32	cd
Archimedes	28.2	abcd	10.72	abcd	34.5	a	12.18	abc
Declaration	27.9	abcd	11.15	bcd	35.2	ab	12.85	bcd
Red Knight	27.1	abcd	9.61	ab	35.9	ab	11.59	abc
Intruder	26.7	abc	10.44	abc	32.5	a	11.64	abc
Vanguard	25.2	ab	10.67	abcd	34.0	a	13.10	bcd
Olympus	23.5	a	9.22	ab	36.9	ab	12.51	abcd
Blitz	22.6	a	8.79	a	35.4	ab	11.45	ab
LSD $_{(0.05)}$	6		1.9		6		1.7	

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	
Vanguard	0.42	d	0.39	e	74.9%	ab	81.8%	abc
Declaration	0.40	cd	0.37	cde	79.8%	b	86.7%	c
Karisma	0.40	c	0.37	cde	81.7%	b	87.9%	c
Intruder	0.39	c	0.36	cde	82.4%	b	89.8%	c
Olympus	0.39	c	0.34	bc	63.4%	a	72.7%	a
Blitz	0.39	c	0.32	b	63.9%	a	76.3%	ab
Currier	0.39	c	0.38	de	85.9%	b	87.7%	c
Archimedes	0.38	bc	0.35	bcd	81.9%	b	88.0%	c
Red Knight	0.36	b	0.32	b	75.2%	ab	82.6%	bc
Chesapeake	0.29	a	0.26	a	79.6%	b	87.6%	c
LSD $_{(0.05)}$	.02		.03		.12		.09	

In our trial ‘Currier’ had the highest marketable yield per plant at 12.22 lb and was statistically similar to ‘Karisma’, ‘Declaration’, ‘Archimedes’, ‘Vanguard’. As for marketable number, ‘Chesapeake’ came in highest at 33 per plant and was statistically similar to ‘Currier’, ‘Karisma’, ‘Archimedes’, ‘Declaration’, ’Red Knight’. ‘Chesapeake’ performed similarly in our 2014 and 2015 trials. In 2015, ‘Chesapeake’ had the highest marketable number per plant at 33 but the lowest average fruit size at 0.29 lb/fruit. In 2014, the ranking results were the same at 42 and .23lb respectively. The highest fruit number per plant went to ‘Chesapeake’ at 32 and was not statistically similar to other varieties both years (P<0.05). ‘Vanguard’ had the highest average fruit size

(0.42 lbs/fruit) and was only statistically similar to ‘Declaration’. We have had ‘Vanguard’ and ‘Declaration’ in our trials every year since 2013 and these two varieties have consistently performed well in regards to mean fruit size and number, and have been statistically similar to each other.

The market preference in your area may determine what characteristics are sought after by growers. If smaller fruit is accepted or preferred in your market, then ‘Chesapeake’ may be ideal for you. However, if you sell in a market where larger fruit is desirable, then ‘Vanguard’, ‘Currier’ or ‘Declaration’ may the variety to choose since they have consistently maintained a higher fruit yield weight and average fruit size than others tested. Blossom end rot (BER) was the most significant issue related to marketability and a large portion (>80% of culls) were the result of 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.

Additional analysis was conducted using the marketable fruit yield by plant by harvest date to find harvest peaks within the varieties (data not shown). Early vs mid/late season peaks were analyzed. Several varieties consistently showed increased production in July. These included ‘Currier’, ‘Declaration’ and ‘Archimedes’. In 2013 and 2014, ‘Declaration’ showed a strong early season as well. As for mid/late season strong producers throughout the month of August, ‘Karisma’, ‘Currier’ and ‘Archimedes’ were top producers and for another year, ‘Blitz’ had a very poor late season production.

Acknowledgements

We would like to sincerely thank the Kansas Vegetable Growers Association for support of this project. Seeds were donated by Harris Moran, Seedway, and Johnny’s Selected Seeds. Technical support provided by Stephanie Gruetze, Kelly Gude, David Loewen, Tracy Oelschlaeger and Cameron Smith. We also thank the Olathe Horticulture Research and Extension Center for assistance with this project.

2015 KVGA High Tunnel Hybrid Bell Pepper Findings:

- Top 3 Highest Marketable Yield by Number: Chesapeake (32.7), Currier (31.9), Karisma (30.2)
- Top 3 Highest Marketable Yield by Weight: Currier (12.72lb), Karisma (11.71lb), Declaration (11.15lb)
    - 2014 – No statistical difference 1: Declaration (10.25lb), Red Knight (10.10lb), Karisma (9.75lb)
- Highest Marketable Number per Plant: Chesapeake (32.7)
    - Was not statistically similar to other varieties in 2015 or 2014
- Highest Marketable Fruit Weight per Plant: Currier at 12.72lb
    - Statistically similar to Archimedes, Declaration, Karisma, Vanguard
    - 2014: No statistical difference
    - 2013: Karisma was highest (11.2lb), statistically similar to Intruder, Declaration, Archimedes, Olympus, Red Knight
- Highest Marketable Avg. Fruit Size: Vanguard .42lb
    - Statistically similar to Declaration and Currier
    - 2014: Karisma was highest at .30 and statistically similar to Declaration, Intruder, Currier, Archimedes, Vanguard, Blitz, Olympus
    - 2013: Karisma and Intruder were highest at .30lb and statistically similar to Declaration, Archimedes, Olympus, Vanguard, Karma
- Highest % Marketability: Currier at 86%
    - % Marketability Number Range: 63% to 86%
    - % Marketability Weight Range: 72% to 91%
    - 2014: Highest # - Chesapeake at 85.6%
    - 2014: Highest Weight – 91.7%
    - 2013: Highest: Intruder - # 88% & Weight: 91%
- Our marketability issues was contributed to BER. Over 75%