

Evaluation of Hybrid Determinate Tomato Varieties for Commercial High Tunnel Production in Kansas

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Summary

High tunnel (hoop house) production of vegetables has become very common in Kansas as they protect the crop from wind and storm damage and extend the growing season. We conducted a variety trial of determinate hybrid tomatoes grown in a high tunnel to determine what cultivar is best suited for hoop house cultivation in the Great Plains.

Ten commercially available varieties were tested and yields ranged from 15.8 to 18.4 lbs of total fruit per plant. The three varieties with the highest marketable yield were 'Red Deuce,' 'BHN 1021,' and 'BHN 589.' 'Red Deuce' had the largest marketable fruit size and the highest percent marketability (by weight).

Introduction

Fresh-market tomatoes are a valuable crop for vegetable growers in Kansas, and are often grown in high tunnels. They provide a valuable commodity that can be sold through farmers markets and CSAs, as well as for wholesale markets and restaurants. In four-season high tunnels, indeterminates are often used in addition to determinate varieties and heirlooms.

However, in three-season high tunnels, a vertical trellis system typically cannot be supported by the tunnel frame and planting dates are only slightly earlier than traditional field plantings. This offers a unique situation where determinates and/or semi-determinates grown in raised-bed plasticulture under stake-and-weave management are more practical than indeterminates and/or heirloom varieties. The goal of our study was to investigate the performance of 10 determinate hybrid 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. Transplants were set on April 16 in the high tunnel (24 feet x 200 feet Haygrove Solo Tunnel) in the inner two (of four) rows. A randomized complete block design was utilized with four replications (two reps per 200-foot row). The high tunnel trials had five plants per plot and in-row spacing was 18 inches, typical of commercial determinate production. Crop nutrients were provided by calcium nitrate and potassium nitrate using equal portions of nitrogen at 75 lbs/acre nitrogen total. Plastic mulch and drip irrigation were employed and the stake-and-weave method was utilized to trellis the plants vertically.

Harvesting was carried out from June 27 until September 13. 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. Mean marketable and total per plant fruit yield of tomato varieties grown in a three-season high tunnel in Olathe, Kansas.

Variety	Marketable		Total	
	Number	Wt (lbs)	Number	Wt (lbs)
Red Deuce	32.3 ab	15.2 b	40.8 a	18.4
BHN 1021	40.5 bc	14.7 b	50.7 bc	17.7
BHN 589	39.2 abc	14.5 ab	51.2 bc	17.9
Mountain Fresh	41.5 c	14.3 ab	51.8 c	17.3
Florida 91	36.4 abc	13.4 ab	47.8 abc	16.7
Scarlet Red	39.2 abc	13.4 ab	53.0 c	17.2
Biltmore	37.5 abc	13.1 ab	53.6 c	18.0
Volante	31.6 a	13.1 ab	40.4 a	16.1
Red Bounty	35.2 a	12.7 ab	51.1 bc	17.5
Rocky Top	30.4 a	11.5 a	43.7 ab	15.8
LSD _(0.05)	8.8	3.1	7.65	NS

Table 2. Mean tomato fruit size (lbs) and marketability of tomato varieties grown in a three-season tunnel in Olathe, KS.

Variety	Average Fruit Size (lbs)		Percent Marketability	
	Marketable	Total	Number	Weight
Red Deuce	0.47 d	0.45 d	79.4 bc	83.0 d
BHN 1021	0.37 a	0.35 ab	80.1 c	83.7 d
BHN 589	0.37 a	0.35 ab	76.5 abc	80.8 bcd
Mountain Fresh	0.34 a	0.33 ab	79.8 bc	82.2 d
Florida 91	0.37 a	0.35 ab	76.5 abc	80.3 abcd
Scarlet Red	0.34 a	0.32 a	74.0 abc	78.3 abcd
Biltmore	0.35 a	0.34 ab	69.8 ab	72.5 ab
Volante	0.42 bc	0.40 c	78.3 abc	81.3 cd
Red Bounty	0.36 a	0.34 ab	68.5 a	72.2 a
Rocky Top	0.38 ab	0.36 b	70.0 abc	73.0 abc
LSD _(0.05)	0.04	0.03	10.3	8.3

‘Red Deuce’ had the highest per plant total and marketable yield, but marketable yield was statistically similar to all other cultivars other than ‘Rocky Top’ ($P < 0.05$). No significant treatment effects were seen for total fruit yield. ‘BHN 1021’ also performed very well in addition

to 'BHN 589' and 'Mountain Fresh.' In particular, 'Red Deuce' had very large fruit and average total and marketable fruit weight (lbs/fruit) were significantly higher than all the other cultivars tested ($P<0.05$). 'BHN 1021' and 'Red Deuce' also had the highest percent marketability although they were statistically similar to many of the other cultivars.

A large portion (>75%) of the fruit quality problems seen in this trial were 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.

Several varieties showed high potential for early-season production, which can be advantageous for marketing high-value fruit. In particular, 'Red Deuce,' 'Scarlet Red,' 'Volante,' and 'Rocky Top' showed the highest yields during the early weeks of July (data not shown). Similarly, 'Biltmore,' 'BHN 1021,' and 'Mountain Fresh' had strong production in the later part of the season and may be useful for growers looking to utilize several cultivars in order to provide a consistent supply of fruit throughout the season (data not shown).

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