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High Tunnel Bell Pepper Spacing Trial

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The objective of this trial is to determine an optimum spacing for bell peppers grown in a high tunnel production system.

Material and Methods

Bell pepper transplants of the variety 'PS09941819' were grown at the Dixon Springs Agricultural Center (DSAC) and transplanted into permanent raised beds within a 30' x 96' high tunnel on April 10, 2020. This variety was selected because it was the top performer in the 2019 bell pepper variety trial at this location. A pre-plant fertilizer of 12-12-12 was applied at a rate of 70 lb of product per acre (2.3 lb of product per row). Potassium nitrate (13.7-0-46) and calcium nitrate (15.5-0-0) were applied weekly through fertigation and supplied a total of 100 lb per acre of nitrogen during the growing season. Two drip irrigation lines with 4 inch emitter spacing were utilized in the raised beds to supply water and additional fertilizer throughout the growing season. Six spacing treatments were replicated three times within this trial utilizing a single planted row in a bed or twin rows with plants staggered in a bed:

Treatment	Treatment Description	Number of Plants	Plot Length in Feet
12-2	Twin Rows at 12 inches	12	6
12-1	Single Row at 12 inches	6	6
18-2	Twin Rows at 18 inches	12	9
18-1	Single Row at 18 inches	6	9
24-2	Twin Rows at 24 inches	12	12
24-1	Single Row at 24 inches	6	12

In order to make the plots fit within the length of the permanent raised beds in the high tunnel, the twin row treatments were established in one bed and the single row treatments were established in another bed (Figure 1). Treatments were randomized within each bed. This also allowed for more uniform staking down each row.

Plots were harvested 12 times from June 6 to September 1, 2020. Harvest data included U.S. No. 1 weight and number, U.S. No. 2 weight and number, cull number, and blossom end rot (BER) number.

Figure 1. Photo of 2020 bell pepper spacing trial plots. Photo credit: B. Aly Illinois Extension 2020.

Results

In comparing U.S. No. 1 fruit size per plant and percent marketable fruit per plant, no significant differences were found between treatments, indicating that plant spacing had no effect on the size or marketability of the fruit. One general production observation made from the treatments was better standability and support from plants in twin rows with trellis support. Plants in the single rows were also trellised but still tended to fall or lean, creating less efficient harvests.

From the data in Table 1, the 24-1 spacing treatment showed a significantly higher number of marketable fruit per plant than the other spacing treatments. Total marketable yield per plant increased with a single row compared with twin rows at a given plant spacing. Table 2 data shows treatments 12-2, 18-2 and 12-1 yielded a significantly higher number of marketable fruit and marketable fruit weight per 100 feet of linear row than the 18-1, 24-1 and 24-2 treatments. Results from this study suggest that a tighter plant spacing increased yield per unit area (100 feet of linear row) but decreased the yield per plant.

Table 1. Yield data results provided per plant from different plant spacings from the 2020 bell pepper spacing trial at DSAC.

Treatment	No. 1 Fruit/Plant	No. 2 Fruit/Plant	Marketable Fruit/Plant	Marketable Weight/Plant
(alpha .05)	*(number)*	*(number)*	*(number)*	*(lb)*
24-1*	4.57 *a*	12.07 *a*	16.60 *a*	6.00 *a*
18-1	4.40 *ab*	9.10 *b*	13.53 *b*	5.00 *ab*
12-1	3.60 *abc*	8.67 *b*	12.27 *bc*	4.57 *bc*
24-2	2.97 *bcd*	8.33 *b*	11.30 *bc*	4.10 *bc*
18-2	2.10 *cd*	7.40 *bc*	9.40 *cd*	3.40 *cd*
12-2	1.97 *d*	5.40 *bc*	7.37 *d*	2.70 *d*
LSD	*1.57*	*2.55*	*2.98*	*1.21*

**Treatments are listed in descending order by marketable fruit number and weight.*

Table 2. Yield data results provided per 100 feet of linear row from different plant spacings from the 2020 bell pepper spacing trial at DSAC.

Treatment	No. 1 Fruit/100 ft	No. 2 Fruit/100 ft	Marketable Fruit/100 ft	Marketable Weight/100 ft
(alpha .05)	*(number)*	*(number)*	*(number)*	*(lb)*
12-2*	394 *a*	1083 *a*	1478 *a*	544 *a*
18-2	274 *ab*	981 *ab*	1256 *ab*	453 *ab*
12-1	361 *ab*	867 *ab*	1228 *ab*	455 *ab*
24-2	297 *ab*	833 *bc*	1131 *bc*	412 *bc*
18-1	296 *ab*	607 *c*	904 *cd*	333 *cd*
24-1	228 *b*	603 *c*	831 *d*	299 *d*
LSD	*141*	*239*	*255*	*101*

**Treatments are listed in descending order by marketable fruit number and weight.*

With many commercial high tunnels being 96 feet in length, providing an income projection based on 100 feet of row, provides a quick comparison of potential profits per row for the different bell pepper spacings included in this trial (Table 3). The most profitable row spacing was twin rows at 12 inches.

Table 3. Projection of income and profit per 100 feet of linear row from different plant spacings based on yield data from the 2020 bell pepper spacing trial at DSAC.

Treatment	Plants/ 100 ft row	Marketable Fruit/ 100 ft row	Cost of Production/ 100 ft row*	Income/ 100 ft row*	Profit/ 100 ft row
	(number)	*(number)*	*(transplants, stakes, +$145.00 est. fixed input costs)*	*($0.75/fruit)*	*($)*
12-2	200	1478	$243.00	$1108.50	$865.50
18-2	133	1256	$222.20	$942.00	$719.80
12-1	100	1228	$203.00	$921.00	$718.00
24-2	100	1131	$203.00	$848.25	$645.25
18-1	66	904	$195.40	$678.00	$482.60
24-1	50	831	$183.00	$623.25	$440.25

**Cost of production inputs and fruit price were based on 2020 figures for comparison and can be adjusted to reflect current amounts.*

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