

GREATER PLANT POPULATIONS MAY INCREASE BROCCOLI YIELD

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Introduction

Georgia has had very little commercial broccoli production in the past. Despite the fact, that good quality broccoli could be produced in Georgia, the cost of production was too high to compete with western producers. However, with the increase in shipping costs, the dynamics of broccoli production have changed and Georgia growers are beginning to find they can be competitive in growing this crop. Plant spacing recommendations for broccoli in Georgia have never been researched and the current recommendations are out of line with the plant spacings that are used in most broccoli production systems. Therefore, this project was undertaken to determine optimum planting densities and arrangements for broccoli in Georgia.

Methods

Two different between-row plant spacings and three within-row plant spacings for broccoli were evaluated at the Tifton Vegetable Park at the Coastal Plain Experiment Station (elev. 382 feet) in Tifton, Georgia. Containerized broccoli transplants were produced in greenhouses on the research station. Experiments were conducted for both spring and fall crops with the same treatments. Broccoli was transplanted to the field on March 3, 2006 and September 8, 2006 into a Tifton sandy loam soil (fine, loamy, siliceous, thermic Plinthic Kandiudult). The crop was planted with bare ground culture and the field was deep turned and 1000 pounds/A 10-10-10 was incorporated prior to planting for each crop. Trifluralin (0.5 lb. ai/A) was applied pre-plant and

incorporated for weed control. Plots were each 10 feet long and were planted on beds that were six feet apart from center to center. ‘Gypsy’ variety broccoli (Sakata Seed Co.) was transplanted into the plots according to the appropriate planting arrangement. Six arrangements were used. Three arrangements were planted with two rows per bed spaced 36 inches apart with plants spaced six, nine and 12 inches apart within the row. Three other arrangement included three rows per bed spaced 18 inches apart again with plants spaced six, nine and 12 inches apart within the row. The corresponding plant populations are shown in Table 1. The planting was arranged in a Randomized Complete Block Design with four replications.

Otherwise normal cultural practices were used for bare ground broccoli culture in Georgia. An additional 75 pounds/A N were applied through drip irrigation as 7-0-7 and one granular side dress with 250 pounds/A 34-0-0 was applied for a total of 260 pounds N, 100 pounds P and 175 pounds K. Fungicide and insecticide applications were made according to current University of Georgia recommendations. Drip irrigation was applied as needed.

Broccoli was harvested at maturity on May 4, May 8, May 11, May 16, May 19, May 23, May 26, June 1 and June 8, 2006 in the spring. In the fall harvests occurred on December 4, December 11, December 15, December 18, December 21, December 28, 2006 and January 2, 2007. Data were collected on yield by grade, marketability, average head weight and average head and stem diameter. Results are summarized in Tables 1 and 2.

Results

There were dramatic yield differences in

the spring test with the highest population producing significantly more yield than any other treatment. The 18 X 9 arrangement produced significantly more yield than any other treatment but the highest population even though it was the same population as the 36 X 6 treatment. The 36 X 12 arrangement produced significantly lower yields than the other treatments. This is the current UGA recommended plant spacing.

The number of heads per acre paralleled the plant populations as would be expected and were significantly different from one another with the exception of the two identical populations. There was no difference in percent marketability of harvested heads among the treatments.

Average head weight was basically in inverse proportion to population as smaller heads were produced with the higher populations. The three highest populations all produced head weights that were not significantly different from one another. The size of the heads was within what is expected for commercial broccoli, however.

Average stem diameter was more affected by the in-row spacing than the between-row spacing. The stem diameters were smallest for the 36 X 6 arrangement, however, the 18 X 6 arrangement produced significantly smaller stems than either of the 12-inch spacings and was similar to both 9-inch spacings.

Average head diameter was greatest with the 18 X 36 arrangement, but only significantly greater than the 36-inch row spacings. All other arrangements produced similar head diameter.

Results in the fall test were not nearly as dramatic. There were no significant differences among treatments for yield although numerically the 18-inch row arrangements produced the highest yields. The number of heads followed paralleled the planting density once again as expected and there was no difference among treatments for the percentage of harvested heads that were marketable.

The 36 X 12 arrangement produced significantly heavier heads than any other spacing. With the exception of the 36 X 6 arrangement, stem diameter seemed to follow along the same lines as the spring test where in-row spacing had more effect than between-row spacing. The 18 X 6 arrangement produced the smallest stems and along with the 18 X 9 arrangement were both significantly smaller than the 36 X 12 spacing. There was no difference among treatments for head diameter in the fall test.

Based on these results it appears that an arrangement with 18 inch rows and either a six or nine-inch in-row spacing would be better than the current UGA recommendation of 36 inch rows with 12 inches between plants.

Table 1. Total marketable yield, marketability, number of heads per acre, and head characteristics of broccoli grown at six different plant spacings at Tifton, GA in spring 2006.

Between-Row Spacing (in)	Within-Row Spacing (in)	Population	Yield ¹ (24-pound Boxes/Acre)	Number Heads/Acre	% Marketable	Avg. Head Wt. (grams)	Avg. Stem Diameter (cm)	Average Head Diameter (cm)
36	6	29,040	445.9 cd	23,051 c	92.8 a	210.9 ed	2.88 d	11.94 b
36	9	19,360	402.7 d	17,061 d	95.9 a	257.4 b	2.97 bcd	11.91 b
36	12	14,520	336.9 e	13,250 e	91.0 a	276.7 a	3.11 ab	11.78 b
18	6	43,560	631.9 a	33,759 a	90.1 a	203.0 e	2.93 cd	12.76 a
18	9	29,040	542.6 b	26,499 b	94.8 a	222.3 d	3.04 abc	12.39 ab
18	12	21,780	484.4 c	21,599 c	97.5 a	243.8 c	3.18 a	12.45 ab
Mean of Test			474.1	22,536	93.7	235.68	3.02	12.20
L.S.D. (0.05)			55.9	2596	9.16	12.52	0.16	0.78
C.V. (%)			7.82	7.64	6.49	3.52	3.44	4.34

Numbers followed by the same letter within a column are not significant at p=0.05.

Table 2. Total marketable yield, marketability, number of heads per acre, and head characteristics of broccoli grown at six different plant spacings at Tifton, GA in fall 2006.

Between-Row Spacing (in)	Within-Row Spacing (in)	Population	Yield ¹ (24-pound Boxes/Acre)	Number Heads/Acre	% Marketable	Avg. Head Wt. (grams)	Avg. Stem Diameter (cm)	Average Head Diameter (cm)
36	6	29,040	552.4 a	25,955 bc	96.8 a	231.3 b	3.24 ab	10.72 a
36	9	19,360	509.0 a	19,058 d	97.3 a	284.6 b	3.21 ab	11.00 a
36	12	14,520	548.7 a	15,972 d	96.9 a	377.6 a	3.39 a	11.18 a
18	6	43,560	652.3 a	33,396 a	95.2 a	214.3 b	2.95 c	11.00 a
18	9	29,040	659.1 a	28,314 b	96.3 a	254.0 b	3.07 bc	11.19 a
18	12	21,780	568.7 a	22,688 c	98.5 a	273.3 b	3.28 ab	10.80 a
Mean of Test			581.7	24,230	96.8	272.2	3.19	10.98
L.S.D. (0.05)			160.3	3368.1	5.57	71.35	0.23	0.78
C.V. (%)			18.3	9.22	3.82	17.4	4.83	4.73

Numbers followed by the same letter within a column are not significant at p=0.05.