EVALUATION OF TWIN-ROW COTTON IN SOUTH CAROLINA

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Abstract

Due to increasing production costs and frequently reduced prices, cotton producers must now ensure optimal returns on their cotton crops in order to make a profit. One way producers are trying to increase their profitability in crops such as corn and soybeans across the US is by planting their crops using twin row systems. The objectives of this study were: to evaluate the effectiveness of using twin row cotton in South Carolina; to compare the growth, yield, fiber quality, and maturity differences between cotton plants grown in traditional single wide rows and cotton plants produced in twin rows; and to determine the impact of twin-row systems on weed populations, especially glyphosate-resistant palmer amaranth.

Introduction

Due to increasing production costs and frequently reduced prices, cotton producers must now ensure optimal returns on their cotton crops in order to make a profit. One way producers are trying to increase their profitability in crops such as corn and soybeans across the US is by planting their crops using twin row systems. The most popular twin-row system is planting two 7.5 inch rows on a 38- or 40-inch bed with 30 or 32 inch centers. Main advantages of twin row corn and soybeans has been increased yields due to greater sunlight utilization and more uniform plant spacing, and increased weed control due to shading from earlier canopy closure. In cotton production in South Carolina, increased weed control due to earlier canopy closure may become an extremely important weed management practice due to the significant increase in glyphosate-, DNA-, and ALS-resistant pigweed populations over the past few years. Moreover, the use of crop rotations has increased dramatically across the US mainly due to extremely volatile commodity prices. To be profitable, producers need to cut costs associated with equipment overhead and finding a planting system that is effective in many crops would be beneficial. The use of new seeding patterns that are effective in cotton, corn, and soybeans may help improve stand consistency, lower seed costs due to lower seeding rates, and save time and money associated with equipment.

Unfortunately, very little research has been conducted across the Cotton Belt on the effectiveness of using twin-row cotton. A recent three year study was conducted in Arkansas from 2007 to 2009 on a silt loam soils comparing single 38-inch rows to twin 7.5 inch rows and twin 15 inch rows. Results from this study indicated very little yield advantage of twin row 7.5 inch or 15 inch cotton compared to conventional 38-in single row cotton. However, these researchers did report significant increases in maturity as measured by NAWF counts and boll development patterns. NAWF was significantly lower throughout the growing season and at cutout in twin rows compared to single 38 inch rows, signifying earlier cutout and plant maturity. They also reported a significant reduction in the number of bolls found in the first position and a significant increase in bolls found on outer positions of the plant (beyond second position) of the 38in cotton compared to the twin rows.

The objectives of this study were: to evaluate the effectiveness of using twin row cotton in South Carolina; to compare the growth, yield, fiber quality, and maturity differences between cotton plants grown in traditional single wide rows and cotton plants produced in twin rows; and to determine the impact of twin-row systems on weed populations, especially glyphosate-resistant palmer amaranth.

Materials and Methods

A replicated field trial was established at PDREC located in Florence in 2010. The plots were planted on May 18 and consisted of 4 rows, spaced 38 inches apart and 40 feet long for the single, 38-inch row pattern. Twin, 7.5-inch row plots consisted of 8 rows, with two 7.5-inch rows planted on a 38 inch bed. This planting pattern resulted in two 7.5-inch rows and a 30 inch row spacing between the next two 7.5-inch rows. DPL 0949B2RF was planted with a cone-planter at six different seeding rates. This resulted in plots with varying plant populations. Target plant populations consisted of 10,000, 20,000, 30,000, 40,000, 50,000, and 60,000 plants/acre. Plots were arranged in a randomized complete block design with four replications. Data collected included plant height and number of nodes at several times during the season, and a final plant map at the end of season (plant height, number of nodes, total fruiting sites, boll location on main stem nodes and sympodia). At mid-bloom, a measurement of PAR was made with a LI-COR Model LI-191B line quantum sensor placed perpendicular to a center bordered row. Weed control ratings and populations were determined throughout the season (Data not reported in this paper). Maturity differences were measured by taking NAWF counts at several times during the bloom season until cutout. At season's end, the middle two rows of each four row plots was machine-harvested with a Case 1822 2-row picker. Seedcotton was ginned on a 10-saw gin and gin turnout calculated, and fiber quality determined by HVI analysis at Star Lab (Knoxville, TN). Data were evaluated by analysis of variance (SAS Institute Inc., Cary, NC).

Results

Table 1. Lint yield, seedcotton, gin turnout and fiber quality of cotton grown in two different row patterns (ROW) and six plant populations (POP) at Florence, SC, in 2010.

Parameter	Lint Yield (lb/a)	Seed Cotton (lb/a)	Gin Turnout (%)	Mic	Fiber Length (in.)	Fiber Strength (g/tex)	Fiber Uniformity (%)
Row Pattern							
Single, 38 inch	1280	2967	43.1	5.0	1.17	32.5	83.1
Twin, 7.5 inch	1226	2864	42.8	5.0	1.18	32.6	83.5
LSD (0.05)	NS	NS	NS	NS	NS	NS	NS
Plant Population							
10,000 plants/A	981	2326	42.2	4.8	1.17	32.8	83.0
20,000 plants/A	1218	2848	42.7	4.9	1.18	32.3	83.4
30,000 plants/A	1274	2953	43.1	5.0	1.18	32.4	83.2
40,000 plants/A	1357	3138	43.3	5.0	1.17	32.9	83.4
50,000 plants/A	1345	3134	42.9	5.0	1.18	32.6	83.3
60,000 plants/A	1342	3093	43.4	5.0	1.19	32.4	83.7
LSD (0.05)	168	379	NS	NS	NS	NS	NS
ROW x POP	NS	NS	NS	NS	NS	NS	NS

Table 2. Total bolls, number of fruiting sites, fruit retention, location of bolls on sympodia and vegetative branches, and location of bolls by main stem node as determined from plant mapping cotton on October 1, 2010 in response to two row patterns (ROW) and six plant populations (POP at Florence, SC.

						Sympodia Position			Mainstem node			
Parameter	Actual Pop. plants/A	Total bolls bolls/A	Fruit Retention %	1st Fruiting Branch node/plt	No. of Veg. bolls bolls/A	1st pos. bolls/A	2nd pos. bolls/A	≥3rd pos. bolls/A	1 to 5 bolls/A	6 to 10 bolls/A	11 to 15 bolls/A	16 to 20 bolls/A
Row Pattern												
Single, 38 in	39,259	351,479	52.0	7.5	66,218	195,982	73,240	14,730	2,617	154,410	118,209	12,272
Twin, 7.5 in	42,997	384,060	48.6	7.3	86,490	204,471	74,718	18,323	1,337	163,681	118,191	15,744
LSD (0.05)	2,958	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Population Plants/A												
10,000	11,597	296,769	55.3	7.2	114,624	85,857	58,090	30,227	254	83,857	74,175	22,419
20,000	23,610	367,498	55.3	7.8	119,992	137,552	73,084	28,653	297	110,902	120,754	20,849
30,000	33,797	339,724	48.2	7.3	73,523	184,057	75,753	11,853	1717	134,233	120,140	10,562
40,000	46,094	368,725	48.3	7.3	55,522	225,583	80,075	5,704	4,506	169,552	128,645	9,267
50,000	61,230	442,172	51.4	7.3	64,374	279,330	93,721	13,798	4,194	232,649	140,643	8,723
60,000	70,437	391,729	43.1	7.5	30,090	288,982	63,150	8,926	894	223,079	124,844	12,228
LSD (0.05)	5,124	NS	NS	NS	60,334	45,277	NS	17,012	NS	43,356	NS	NS
ROW x POP	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS

Table 3. Percentage of photosynthetically active radiation intercepted (PAR), nodes above white flower (NAWF), plant height, number of nodes, and number of vegetative branches on cotton in response to two rows patterns (ROW) and six plant populations (POP) at Florence, SC, in 2010

Parameter	7/20/2010 PAR Interception %	7/20/2010 NAWF cm/plt	8/1/2010 NAWF no/plt	Plant height cm/plt	10/1/2010 No. of Nodes no/plt	No. of Veg. Branches no/plt
Row Pattern						
Single, 38 in	85	5.4	2.4	83	16	2.3
Twin, 7.5 in	83	5.3	2.7	81	16	2.5
LSD (0.05)	NS	NS	NS	NS	NS	NS
Population (plants/A)						
10,000	76	5.8	3.5	85	19	3.5
20,000	79	5.6	2.6	81	17	3.0
30,000	88	5.5	2.5	84	16	2.6
40,000	85	5.2	2.4	82	16	2.0
50,000	87	5.1	2.4	80	15	1.8
60,000	88	4.9	2.1	80	15	1.6
LSD (0.05)	NS	0.4	0.6	NS	1.3	0.9
ROW x POP	NS	NS	NS	NS	NS	NS

Summary

1) No row pattern (ROW) x plant population (POP) interactions were found for any of the parameters measured in this study.
2) No differences in lint yield, gin turnout, or fiber quality were found between single, 38-inch rows and twin, 7.5-inch rows (Table 1.) Moreover, no differences in boll development patterns (Table 2), PAR interception (Table 3.), plant development (Table 3), or maturity as measured by NAWF (Table 3) were found between single, 38-inch rows and twin, 7.5-inch rows.
3) Reducing plant populations to 10,000 plants/A resulted in reduced yields compared to the other five plant populations evaluated (Table 1.). Lower plant populations also resulted in a shift in boll development patterns, with more bolls produced on vegetative branches and sympodial positions further up the mainstem and at more distal positions on sympodial branches (Table 2.). Lower plant populations also resulted in reduced PAR interception at mid-bloom (Table 3.), delayed maturity as measured by NAWF counts (Table 3.), and an increase in total node and vegetative branch development (Table 3).
4) No problems were encountered harvesting twin, 7.5-inch row cotton with a normal 2-row Case 1822 spindle-picker.