

Twin Line Cotton Production in a Conservation Tillage System

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Abstract

Two experiments were conducted in 2004 evaluating twin line cotton production using a conservation tillage system approach. DPL 451 BR Upland cotton was planted into oat hay stubble on April 30 and May 5, 2004 at commercial cooperator sites at Tonopah and Tolleson AZ, respectively. The two primary experimental objectives were to determine whether cotton planted into previous crop residue initiated fruiting on the mainstem once the cotton seedling grew above the crop stubble and whether there were differences in lint yield between the single and twin line system. Previous twin line cotton production research had been conducted by authors at 30 locations from 2001-2003. In almost all cases, the harvest of low set bolls presented problems with the twin line system. In 2004, the initiation of the first fruiting branch was independent of the stubble height at both locations. In addition, there were no differences in lint yield in either a single or twin line cotton production system when planting into previous crop residue using conservation tillage.

Introduction

Extensive twin line (two lines per bed) cotton research was conducted (Husman et al.) by University of Arizona Cooperative Extension faculty from 2001-2003. 30 experiments were conducted both on commercial cooperator sites and University of Arizona experiment stations. The experiments were simple in nature and compared conventional single line per bed with twin line systems comparing yield and fiber quality.

Fiber micronaire was significantly reduced in 8 of the 30 experiments. Lint yield was significantly increased in 6 of the 30 experiments and decreased in 11 of the experiments. There was no yield difference in the remaining 13 experiments.

A common problem that was consistently encountered was the inability to effectively pick the bolls low on the lower fruiting branches in the twin line system. In general, it was noted that the stalk was not picked clean using a spindle harvester below the point where the plants crossed when entering the head. This was not surprising since the spindle picker is designed to pick a single row of cotton fed through the center of the bars. The issue was increasingly problematic as the fruiting branch number with effective retention decreased. In addition, hand harvest comparisons of the twin and single line system at a limited number of locations (3) suggested that the twin line system may actually produce 6-8% more lint but could not be effectively harvested.

Conservation tillage system research and commercial evaluation was being conducted simultaneously with the twin line research. Observation by one commercial producer that was planting cotton directly into grain stubble noted that it appeared that the cotton tends to initiate fruiting once the cotton has grown above the grain stubble resulting in higher mainstem fruiting. In essence, the 2004 twin line in a conservation tillage research was initiated based on the possibility of higher yields in a conservation tillage system due to higher fruiting branch initiation and increased harvester effectiveness opportunity.

Materials and Methods

Two experiments were conducted on commercial farms in central Arizona in 2004 which were designed to compare first fruiting branch number and lint yield in twin and single line cotton production systems using conservation tillage. The experimental locations were Tonopah and Tolleson, Az. The cotton (DPL451BR) was planted dry and irrigated up on April 30 and May 5, 2004 in Tonopah and Tolleson respectively. Both experiments were planted following a cutting of oat hay with the cotton being planted directly into the oat stubble. The oat hay was cut leaving a stubble height of approximately 4 inches. The experiments were planted on flat ground in borders which were 80 feet wide running the entire field length of approximately 1250 feet.

The experiments compared conventional single line versus a twin line system using 38 inch row spacing. The twin line system had 7.5 inches between seed lines and both the single and twin line used the same seed drop rate per acre. The experiments were planted using a 6 row twin line Monosem (12 planter units) vacuum planter equipped with 12 wave cutting coulters mounted in front of the seed disk openers. The single line system was planted by disabling one planter unit in each row and changing the driver and driven sprockets on the planter to match the seed drop of the twin line system. Both experiments consisted of 8 borders with the twin and single line system alternating resulting in a 4 replicate experiment arranged in a block design.

After planting, the experiments were managed using the cooperators' standard production practices relative to irrigation, fertilization, and pest control. Following planting, there were no other equipment trips through the field prior to harvest. Data collected during the season includes stand counts, first fruiting position, plant height, nodes above top white flower at cutout, and lint yield.

The experiments were harvested on December 14 and December 15, 2004 at Tonopah and Tolleson respectively. The Tonopah experiment was harvested using a John Deere 7455 stripper equipped with a 14 feet wide finger stripper header effectively harvesting 5 rows per pass. The Tolleson site was harvested using a 4 row spindle picker. At Tonopah, a pass (5 rows) was made in the center area of each border with the stripper harvester while at Tolleson, a round (8 rows) was made with the spindle harvester for yield measurement purposes. The seed cotton was weighed using a boll buggy equipped with load cells and lint yields calculated based on reported commercial turnouts and harvested area.

Results and Discussion

The two primary objectives were to measure differences in first fruiting branch initiation and lint yield in single and twin line cotton production systems while planting the cotton into a previous oat hay stubble. There were no differences at either experimental location with respect to first fruiting branch initiation or final yield (Table 1, 2). These results are very consistent with the 30 twin line experiments previously conducted using conventional tillage. As described earlier, these experiments were conducted to determine whether the twin line cotton production system may prove advantageous in a conservation tillage situation. That was not the case when controlled replicated experiments were completed. Twin line cotton production research will not be continued in Arizona.

Table 1.					
Plant Population, First Fruiting Branch,, Plant Height, NAWF**, and Lint Yield, Tonopah, AZ 2004.					
	Plant Population	First Fruiting Branch	Plant Height (in.)	NAWF	Lint Yield
	(ppa)	(June 17, 2004)	(July 28, 2004)	(Sept 14, 2004)	(lbs/A)
Single Line	69,250 a*	7.00 a	27.25	5.70 a	1136 a
Twin Line	58,812 b	7.00 a	30.30	4.55 b	1122 b
*Means followed by the same letter are not significantly different according to the Duncan Multiple Range Test					
**Nodes above top white flower					

Table 2.					
Plant Population, First Fruiting Branch,, Plant Height, NAWF**, and Lint Yield, Tolleson, AZ 2004.					
	Plant Population	First Fruiting Branch	Plant Height (in.)	NAWF	Lint Yield
	(ppa)	(July 1, 2004)	(July 29, 2004)	(Sept 14, 2004)	(lbs/A)
Single Line	58,326	7.70 a*	30.10 a	7.05 a	1414 a
Twin Line	66,295	7.95a	28.55 b	5.60 b	1321 a
*Means followed by the same letter are not significantly different according to the Duncan Multiple Range Test					
**Nodes above top white flower					