Evaluation of a Twin-Line Cotton Production System in Graham County

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Abstract

A single field study was established in 2001 at the Safford Agricultural Center to evaluate a twin-line cotton production system. This location was part of a larger, statewide program conducted in 2001. This location consisted of two separate planting dates (PD) in which two separate planting systems were used. Results from this location indicated trends in yield increases with the twin-line production system when compared to the single or conventional production system. Lint yield increases of approximately 200 lbs. lint/acre were observed on the second PD. Lower yields were observed in the twin-line planting with the first PD which was in part due to poor seed placement with the equipment used to plant the twin-line on the first PD. Results indicate the potential for increased yield with the twin-line production system with the caveat that the proper equipment be used to plant the twin-line system to ensure precise and consistent seed placement and spacing.

Introduction

Agricultural producers have seen the cotton industry suffer through extremely difficult times of late. With rising costs of production and a continued depressed market for cotton it has been very difficult for growers to remain profitable. The current sentiment among agricultural economists and marketers is that there will be minimal change in prices over the next two years. Along with the depressed price many Arizona growers have had discounts applied to their crop due to fiber quality problems mainly as a result of high fiber micronaire. In light of these circumstances growers are interested in techniques that will allow them to decrease their costs of production and help improve their margin of profitability.

There has been a considerable amount of research in other parts of the cotton belt investigating different configurations of plant population and stand geometry. Research conducted in California has indicated increased profitability in a twin-line cotton production system. Cotton is planted in a twin-line configuration on top of the bed with a seven-inch spacing. Results have shown modest yield increase of 5 to 8% and a decrease in production costs from $40 to $60 per acre. Results from other research conducted in Arizona during 2001, also published in this report, indicate trends in decreased micronaire values in the twin-line production systems when compared to the traditional single line production. Previous research done at this site showed that planting two seed lines on a bed can produce yields in excess of those produced with a single seed line, where columnar-type plants are grown (Clark and Carpenter, 2000)

The potential advantages of the twin-line production systems include quicker canopy closure, which will aid in weed control and efficient sunlight interception. The seven-inch twin-line row spacing also allows for harvesting with a traditional spindle harvester. Other ultra narrow row (UNR) production systems that have been attempted in Arizona required the use of stripper harvesters. The statewide effort in 2001 was designed to evaluate this production technique as a means of reducing production costs, and culturally managing fiber micronaire.

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Materials and Methods

A study was conducted in 2001 at the University of Arizona Safford Agricultural Center in an effort to evaluate the profitability of a relatively new production system involving twin-line cotton planting. Two separate PDs (Planting Dates) were established, each planted with a different planter. The first PD was planted with a John Deere flex planter with four planters off-set three inches. A second pass with the planter was made down the same four rows in order to obtain the twin-line configuration. The second PD was planted with two International 900 plate planters which had been combined into a double tool bar system with 8 offset planter units using a 4 row configuration for the twin-line system. Lint yield results were analyzed statistically in accordance to procedures outlined by Gomez and Gomez (1984) and the SAS Institute (SAS, 1998).

Results and Discussion

The first PD which was planted with the offset planter resulted in a high degree of variation in the distance between the twin line. The optimum spacing would be 6 inches. With this type of planting, this distance between rows ranges any where from 3-4 inches to over 10 inches. This resulted in plots that were difficult to harvest with a conventional spindle harvester. A significant amount of cotton remained on the ground unable to be harvested in the twin-line treatments. Plant population, plant height, and height to node ratio for each of the plots are presented in Table 1. Yield results are presented in both Table 2 and Figure 1. Target plant populations for the twin line production system are approximately 80,000 – 100,000 plants per acre. This population was not obtained (Table 1). Higher populations were obtained when compared to the single line production system. Differences in final plant height were also observed with the single line production system producing more vegetatively vigorous plants. This is demonstrated in both the plant height data and height to node ratio data (Table 1). Lint yield results produced opposite results between the two PDs. Lint yield produced by the single line production system was greater in PD1 (Table 2). The opposite was observed in PD2. The twin line production system produced a statistically greater yield of 206 lbs. lint/acre than the single line production system in the same planting date. Figure 1 graphically demonstrates the differences observed in lint yield for all treatments.

Summary

One of the major benefits to the twin-line productions system being realized by growers around the state is the decrease in fiber micronaire observed in the twin-line system when compared to traditional single-line systems. This is not a significant factor for growers in the upper Gila River valley since elevated micronaire has not been a problem. However, this technology may benefit growers in this region from the standpoint of stand geometry. The target plant population is near 100,000 plants per acre. In many cases growers in this valley will have population that high and higher in a single-line configuration. Higher seeding rates are typically used to ensure a proper stand due to cooler conditions that typically are present at planting in this valley. A twin-line production setting may provide the ability to take the already high population and “spread it out” to allow for less in-row competition. This will obviously be variety dependent. One would expect to see greater benefits in a variety that has a more compact “bush-type” growing pattern as opposed to a more columnar-type variety. The University of Arizona has purchased a new Monosem precision planter designed specifically for planting in a twin-line production system. This planter will allow for very precise seed placement and spacing, which is critical to the success of this type of production practice. This work will continue in 2002 as part of a statewide project to evaluate twin-line cotton production.

Table 1. Agronomic characteristics for each of the treatments, SAC, 2001.

PD	Treatment	Plant Population Plants/acre	Plant Height Inches	Height to Node Ratio
1	Single	55584	34	1.53
	Twin	69424	30	1.42
2	Single	13159	38	1.69
	Twin	24956	39	1.62

Table 2. Lint yield results along with statistical analysis for each of the treatments, SAC, 2001.

	PD 1	PD 2
	Lbs. Lint/Acre	
Single	1206 a*	991 b
Twin	1016 a	1197 a
LSD**	NS	179
OSL§	0.1908	0.0357
C.V.(%)¶	14.35	7.30

* Means followed by the same letter are not significantly different according to a Fisher's LSD means comparison test.
** LSD – Least Significant Difference
§ OSL – Observed Significance Level
¶ C.V. – Coefficient of Variation

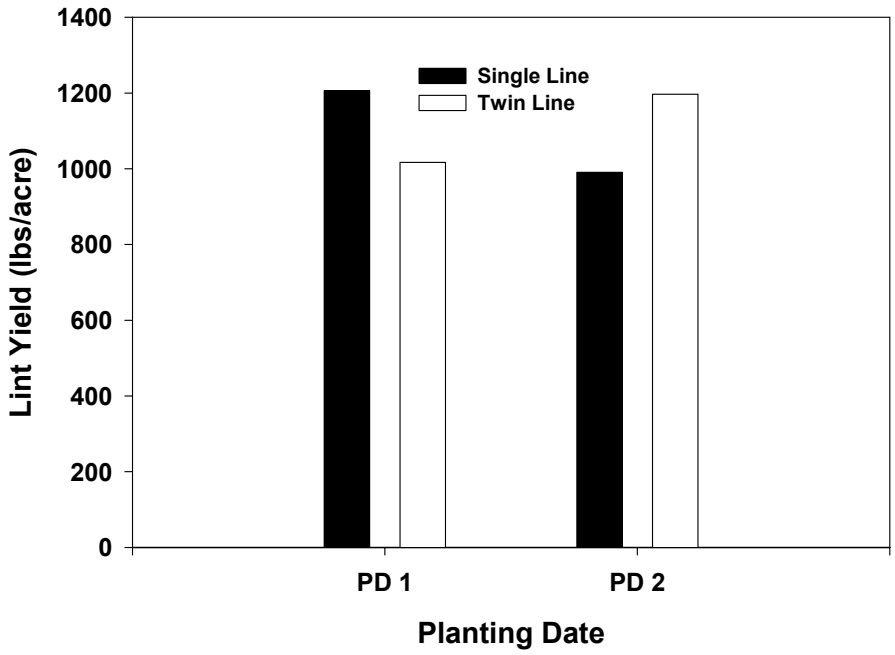

Figure 1. Lint yield results for each treatment and PD at SAC, 2001.