Continuing Investigations in Ultra-narrow Row Cotton, Safford Agricultural Center, 2000

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Abstract

The continuing investigation in ultra-narrow row cotton production has not produced a definitive answer to whether this practice would be economically feasible in this area. Results of this season showed that planting two seed rows on a bed can produce yields in excess of those yields produced with a single seed row, where the plant populations are comparable. This configuration can be harvested with a conventional spindle picker. Plant mapping data and HVI data are shown for all treatments in this study.

Introduction

The preliminary study on ultra narrow row cotton on the Safford Agricultural Center in 1999 had as objectives single, double and quadruple rows per bed with plant populations targeted at 100,000 plants per acre to be compared with a traditional single row planting of 50,000 plants per acre. The plant populations fell short of the 100,000 plants per acre goal but achieved nearly 80,000 plants per acre in a single row. The highest yield in the trial came from the traditional single row planting with 53,000 plants per acre. It was felt that the study should be performed again to try to achieve the higher plant populations in a multi-row configuration and to look at varieties of varying maturities.

Materials and Methods

This trial was designed as a replicated small plot trial with four replications and three varieties. DP 655BR, DP 451BR and DP 422BR were used to see the response to UNR techniques by cotton of different maturity classes. The objectives were the same as the previous year's study (1) to have one row per bed with populations around 50,000 and 100,000 plants per acre, two rows per bed and four rows per bed with populations around 100,000 plants per acre. The plots were planted with a cone-type planter which distributes a given weight of seed uniformly over the length of the plot for the single rowed plots and with a John Deere-Van Brunt grain drill for the multiple row plots. The plots had been pre-irrigated, but water was flushed through the plots to make sure adequate moisture was available for uniform germination. The following crop history provides the information on how the crop was managed:

Crop History:

Previous crop: Cotton
Soil type: Pima clay loam variant/Grabe clay loam complex
Planting date: 20 April 2000 Varieties: DP 655BR, DP 451BR and DP 422BR
Herbicide: 1.5 pt/ac Treflan pre-plant
Fertilizer: Side dressing of 100 lbs/ac of urea on 5/24 + approximately 75 lbs N in irrigation water
Insecticide: 2 applications to control pinkie, aphids and whitefly
Pix/Prep: None
Defoliation: Ginstar
Irrigation: Furrow, watered up + 8 irrigations (ca. 37.4 inches + 3.3 inches of rain)
Harvest dates: 1st pick: 30 November 2nd pick: not taken
Heat units (HU 86/55EF) from planting to defoliation: 3446

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Prior to harvest plants were counted and measured to determine plant population, plant height, total nodes, and first fruiting branch. Boll samples were also taken to determine boll weights. These samples were ginned to determine percent lint turnout and these lint samples were sent to the classing office to determine lint qualities.
The plots were picked using a modified 2-row cotton picker. The production from each plot was caught in a sack and weighed on an electronic platform scale to determine seed cotton yields.

Results and Discussions

Table 1 shows all the data tabulated from the plots planted to DP 422BR in the study. From the first part of the table one can see that plant populations were far below expectations and the multi-row planting ended up with plant populations below the low planting rate of the one row treatment. Yields were highly correlated with plant population and the yields were considered to be very good. There was no significant correlation between lint yield of any of the plant variables that were measured. The untimely rains in October precluded the option to pick these early maturing plots before the longer maturing varieties. The first fruiting branch was lower than with the other two varieties and was lowest in the plots with low plant populations. Boll weights were higher on the two-row plots, perhaps because the plants were more evenly spaced and had more root space per plant. The bottom part of the table has the HVI data from the lint. The one-row treatments had the best grades and the one-row treatment with low population had the highest micronaire, the longest, weakest and least uniform fiber. The four-row treatment had the lowest micronaire value, the strongest and most uniform fiber. The RD color value varied from one-row treatment to multi-rowed treatments.

Table 2 contains the data from plots planted to the mid/early season variety, DP 451BR. As noted previously the plant populations were below our expectations and the yields were not as good as with DP 422BR. Yields were highly correlated with plant population and the highest yielding treatment was the one-row treatment with the high planting rate. Again, none of the measured plant variables was significantly correlated with lint yield. As was observed with the previous variety, the plants started fruiting at lower nodes with the multi-row treatments than with the conventional single row per bed. The HNR tended to be lower for these multi-rowed plots, too. At the bottom of the table is the HVI values for the lint samples. Similar to the previous table, grades of the one-rowed treatments was superior to that of the multi-rowed treatments. The one-row, high density treatment produced lint with the shortest but strongest fiber. The +b factor in fiber color was lower with the multi-row treatments than in the single row treatment.

Table 3 has the data from plots planted to the latest maturing entry in the study, DP 655BR. Plant populations were lower than expected, but the two-row per bed treatment had a value close to that of the high density, one-row treatment. This brought an interesting result, the two-row treatment yielded higher than the one-row treatment with a similar plant population. Positive correlations were found between lint yield and the measured variables, plant population, plant height and first fruiting branch. Plant heights of the two treatments with high plant populations were higher, node numbers lower and the HNR values were also higher. HVI values shown at the bottom of the table indicate that DP 655BR has a longer, stronger fiber than the other two varieties and with color components between the two. Few other trends could be picked out from the fiber data.

The experiment was not definitive in answering the question of whether a higher density stand of cotton in narrower row configuration would be economically feasible in this valley. The planting system used for the multi-row configuration has failed on two successive studies, so we must change systems if we hope to answer the question. Information from the plots planted to DP 655BR at least indicate that yields don't decrease with the two-row planting configuration if the plant population can be maintained.

References

1. Clark, L.J. and E.W. Carpenter. 2000. Preliminary investigations in ultra-narrow row cotton, Safford Agricultural Center, 1999. Cotton, A College of Agriculture Report, The University of Arizona, Tucson, AZ. Series P-121, pp. 352-356.

Table 1. Yield, plant mapping and fiber quality variables for DP 422BR in the UNR study on the Safford Agricultural Center, 2000.

Variety	Lint Yield	% Lint Turnout	Boll Weight	Plants per Acre
One Row Low	1315.2 a	36.7 ab	5.8 b	39930 b
One Row High	1317.5 a	36.5 ab	5.7 b	64206 a
Two Rows	1263.0 a	37.4 a	7.1 a	33351 b
Four Rows	946.6 b	36.2 b	6.1 b	21099 c
Average	1210.6	36.7	6.2	39646
LSD(05)	176.3	1.05	1.16	8119
CV(%)	9.1	1.79	11.7	12.8

Variety	Plant Height	1st Fruiting Branch	Total Nodes	HNR
One Row Low	29.8 a	5.4 ab	22.4 a	1.3 a
One Row High	29.3 a	6.1 a	22.3 a	1.3 a
Two Rows	30.5 a	5.1 b	21.9 a	1.4 a
Four Rows	30.9 a	4.6 b	22.1 a	1.4 a
Average	30.1	5.3	22.2	1.4
LSD(05)	2.12	0.85	2.83	0.15
CV(%)	4.4	10	7.8	6.67

Variety	Grade	Mike	Length	Strength	Uniformity	Leaf Grade	RD	+b
One Row Low	11	5.4	1.11	25.0	82	2	82	86
One Row High	11	5.3	1.07	26.4	83	3	83	80
Two Rows	21	5.3	1.09	27.3	83	2	81	80
Four Rows	21	5.1	1.09	26.8	84	2	81	83
Average	16	5.3	1.09	26.4	83.0	2.3	81.8	82.3

Table 2. Yield, plant mapping and fiber quality variables for DP 451BR in the UNR study on the Safford Agricultural Center, 2000.

Variety	Lint Yield	% Lint Turnout	Boll Weight	Plants per Acre
One Row Low	835.1 a	36.7 ab	5.5 a	41291 b
One Row High	997.0 a	36.5 ab	6.2 a	60349 a
Two Rows	755.9 a	37.4 a	6.3 a	37761 b
Four Rows	538.0 a	36.2 b	6.0 a	26771 c
Average	781.4	36.7	6	41518
LSD(05)	644.3	1.05	1.7	8429.7
CV(%)	51.5	1.79	18.2	12.69

Variety	Plant Height	1st Fruiting Branch	Total Nodes	HNR
One Row Low	30.8 a	6.1 a	21.3 a	1.4 a
One Row High	29.6 a	6.0 a	22.1 a	1.4 a
Two Rows	30.8 a	5.5 a	23.5 a	1.3 a
Four Rows	29.3 a	4.8 a	22.6 a	1.3 a
Average	30.1	5.6	22.4	1.4
LSD(05)	3.12	1.35	3.82	0.18
CV(%)	6.47	15.1	10.7	8.15

Variety	Grade	Mike	Length	Strength	Uniformity	Leaf Grade	RD	+b
One Row Low	21	5.3	1.10	26.9	82	2	81	80
One Row High	21	5.5	1.06	27.4	83	2	80	81
Two Rows	31	5.4	1.10	25.2	83	3	80	77
Four Rows	41	5.3	1.11	26.4	84	2	75	74
Average	28.5	5.4	1.09	26.5	83.0	2.3	79.0	78

Table 3. Yield, plant mapping and fiber quality variables for DP 655BR in the UNR study on the Safford Agricultural Center, 2000.

Variety	Lint Yield	% Lint Turnout	Boll Weight	Plants per Acre
One Row Low	848.7 b	36.8 a	6.5 a	36981 b
One Row High	1161.3 ab	36.9 a	5.4 a	76457 a
Two Rows	1222.6 a	37.5 a	6.5 a	70558 a
Four Rows	840.9 b	37.4 a	5.4 a	39023 b
Average	1018.4	37.2	5.9	55755
LSD(05)	321.7	0.87	1.74	23524
CV(%)	19.8	1.47	18.3	26.38

Variety	Plant Height	1st Fruiting Branch	Total Nodes	HNR
One Row Low	31.8 a	6.0 ab	22.0 a	1.4 a
One Row High	33.8 a	6.6 ab	21.3 a	1.6 a
Two Rows	32.1 a	7.3 a	20.6 a	1.6 a
Four Rows	31.6 a	5.0 b	22.1 a	1.4 a
Average	32.3	6.2	21.5	1.5
LSD(05)	4.5	1.83	2.98	0.26
CV(%)	8.7	18.4	8.67	10.7

Variety	Grade	Mike	Length	Strength	Uniformity	Leaf Grade	RD	+b
One Row Low	31	5.1	1.10	32.0	81	4	80	76
One Row High	21	5.2	1.10	32.9	82	2	81	80
Two Rows	21	5.3	1.11	31.6	83	3	80	82
Four Rows	21	5.0	1.11	33.1	84	2	80	85
Average	23.5	5.2	1.11	32.4	82.5	2.8	80.3	80.8