THE EFFECT OF PLANT SPACING ON YIELD AND QUALITY USING 2-SEED HILL-DROP METHOD ON COTTON IN BERRIEN COUNTY, GEORGIA

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Introduction

The most commonly grown cotton variety in Georgia is DP 555 BG/RR. Growers plant this variety due to its proven high yield capacity. With the ever-increasing costs of technology associated with this and other transgenic varieties, growers seek to minimize their input costs per pound of lint to create an opportunity for profit. Previous field trials in 2004 looked at varying plant populations and their effect on yield. No significant differences were found in yield due to 1, 2 or 3 plants per foot of row in the trials conducted in 2004. Since there was limited data relating to plant spacing affect on yield and quality characteristics, the objective of this experiment was to determine any yield and quality differences due to plant spacing. Economic analysis was also conducted to determine differences in net return due to yield, fiber quality, and seed cost (plant spacing).

Methods and Materials

In 2005 a field trial was conducted at a Berrien County location to compare DP 555 BG/RR planted on Irvington loamy sand soil type in 36" rows at 10" and 14" plant spacing using the hill drop method at 2 seed per hill. Experimental design was a randomized complete block design with 3 replications per treatment. Each plot was 16 rows wide (48') and between 780 and 805 feet long. Planting date was May 16, 2005. Final plant stand was 1.5 plants per foot for the 10" plant spacing and 1.2 plants per foot for the 14" plant spacing. Harvest date was October 24, 2005. Seed-cotton weights were taken in the field using a boll buggy with scale. Random samples of seed-cotton from each plot were sent to the UGA Micro Gin at Tifton, GA. Before and after ginning weights were taken to determine lint turn-out (percentage) and lint yield per acre.

From the ginned cotton of each replication (plot), 3 random samples were taken and these lint samples sent to the International Textile Center at Texas Tech University for HVI classing. Fiber quality from the 3 samples for each plot was then averaged to arrive at an average fiber quality for each plot or yield replication.

Lint value (income) was based on the base loan rate for Berrien County (52.7 cents per pound) adjusted for fiber quality. Seed cost was the only relevant cost to consider in the analysis. All other inputs and costs were the same regardless of seed spacing. The value (lint income), seed cost, and net return were calculated for each plot (replication) and then averaged for each test (seed spacing).

Seed cost was calculated based on the seed spacing and 36-inch rows (2 seed every 10 inches = 2.4 seed per foot of row and 34,848 seeds/acre, 2 seed every 14 inches = 1.7 seed per foot of row and 24,891 seed per acre). Seed was priced at $396 per bag including technology fee.

The basis for comparing 10-inch vs. 14-inch seed spacing was the net return above seed cost. All other inputs and costs were the same in both tests and thus irrelevant to the analysis.

Results and Discussion

There was no significant difference in lint yield when comparing the 10" plant spacing to the 14" plant spacing. Gin turn-out, loan value, income and net return also expressed no significant difference between plant spacing.

Fiber quality and Loan Value are presented in Table 1. There was no difference in Color/Leaf Grade. There were, however, differences in Staple, Strength, and Micronaire. The plots planted in 14-inch seed spacing were shorter in Staple, lower in Strength, and higher in Micronaire. There was no difference in fiber length Uniformity.

Although 3 of the 5 quality parameters were impacted by seed spacing (population), there was no statistical difference in Loan Value. This is likely because although quality factors can differ numerically (even statistically), it may result in little or no change in Value per pound of lint because premiums and discounts for some quality factors are the same for a range of quality. For example, the 2005 loan premium was 25 points (0.25 cents per pound) for strength 29.5 to 30.4 and zero for strength 25.5 to 29.4.

Although the Loan Value per pound was not “statistically different” between the 10-inch and 14-inch tests, it is worth noting that the Loan Value for each plot of the 14-inch test was below the lowest Value of any plot in the 10-inch test.

Table 2 presents a comparison of Yield, Income, and Net Return. There was no statistical difference in lint turn-out (Gin T/O), Lint Yield, Income per acre, or Net Return. Yield was essentially the same at both 10-inch and 14-inch spacing. Because of the difference in Loan Value, Income was lower for the 14-inch spacing but not statistically different. At 14-inch seed spacing, Seed Cost (including technology fee) was lowered by $15.77 per acre but there was no difference in Net Return. The savings in Seed Cost was offset by lower Loan Value per pound of lint.

In summary, reducing the seed rate resulted in cost savings but no difference in Net Return. Yield was not different but fiber quality was less. There was no difference in Net Return thus no income advantage or disadvantage to reduced seeding rate. But fiber quality was better at the higher seeding rate.

Although no difference in Net Return, because fiber quality was higher quality with the 10" plant spacing versus the 14" plant spacing, this experiment would support the plant

spacing of 10" versus the 14" due to the contribution of higher quality cotton from Georgia producers with no economic loss due to increased seed costs.

Table 1. Comparison of Fiber Quality Characteristics and Loan Value, By Seed Spacing

Seed Spacing	Color/Leaf	Staple	Strength	Mic	Uniformity	Loan Value
Rep 1	31/1	35.8	29.8	4.33	82.43	58.15
Rep 2	31/2	36.2	29.8	4.17	81.70	58.40
Rep 3	31/1	36.2	30.7	4.20	82.17	58.60
10-Inch Avg	31/1 a	36.1 a	30.1 a	4.23 a	82.10 a	58.38 a
Rep 1	31/1	35.6	29.2	4.47	81.37	57.90
Rep 2	41/1	35.7	28.5	4.33	80.93	55.40
Rep 3	31/3	35.1	28.7	4.33	82.53	57.25
14-Inch Avg	31/2 a	35.5 b	28.8 b	4.36 b	81.61 a	56.85 a

Means (Averages) within the same column followed by the same letter are not statistically different. Means (Averages) within the same column followed by a different letter are statistically different at the 90% level or better. Loan value in cents per pound of lint, adjusted for quality from the Berrien County base warehouse loan rate of 52.7 cents per lb.

Table 2. Comparison of Yield and Per Acre Net Return, By Seed Spacing

Seed Spacing	Gin T/O	Lint Yield	Loan Value	Income	Seed Cost	Net Return
Rep 1	38.2%	1,305	58.15	$758.86	$55.18	$703.68
Rep 2	37.7%	1,249	58.40	$729.42	$55.18	$674.24
Rep 3	38.0%	1,239	58.60	$726.05	$55.18	$670.87
10-Inch Avg	38.0% a	1,264 a	58.38 a	$738.18 a	$55.18	$683.00 a
Rep 1	37.6%	1,264	57.90	$731.86	39.41	$692.45
Rep 2	38.1%	1,292	55.40	$715.77	39.41	$676.36
Rep 3	38.6%	1,261	57.25	$721.92	39.41	$682.51
14-Inch Avg	38.1% a	1,272 a	56.85 a	$723.18 a	$39.41	$683.77 a

Means (Averages) within the same column followed by the same letter are not statistically different. Means (Averages) within the same column followed by a different letter are statistically different at the 90% level or better. Yield, Income, Seed Cost and Net Return are per acre. Loan Value is cents per pound of lint.