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FIBER QUALITY AND GROSS RETURNS AS INFLUENCED BY BLENDING TWO COTTON VARIETIES

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Abstract

A study was conducted at Stoneville and Verona, Mississippi to evaluate the effect high yield cotton varieties with widely different fiber quality (high and low micronaire values) planted as a blend, had on gin turnout and lint yield in 2003 and 2004; and fiber quality and gross returns in 2003. Both years and locations, PM 1218BR had greater gin turnout than DP 451BR. Compared to DP 451BR, PM 1218BR in a 50% PM 1218BR + 50% DP 451BR seed blend, 75% PM 1218BR + 25% DP 451BR seed blend and DP 451BR/PM 1218BR alternate row pattern increased gin turnout. However, at both locations and years there were no yield differences among all treatments. The 2003 HVI analysis indicated fiber properties (uniformity, strength, elongation, Rd, +b and color grade) had minor differences between treatments and locations, but were in the acceptable range (no price discounts). Micronaire only showed differences at Verona, but none were in the cotton classification base price discount range. In 2003 DP 451BR had greater fiber length than PM 1218BR at both locations and showed increased fiber length where DP 451BR was at least 50% of the blended mixture. Results indicated blending these varieties may improve gin turnout and fiber length but showed no improvement in yield or gross returns.

Introduction

With the introduction of high yielding transgenic varieties, high micronaire problems have increased significantly. Highly productive BT/RR varieties, which either had high or low micronaire showed severe lint price discounts (Caldwell et al., 2002; Creech et al., 2002). Research by Craig and Gwathmey (2003, 2004) indicated lint yields of most variety blends were similar or better than the pure variety. Blending type (alternate row or 50:50 seed blend) had no effect on lint yield or fiber quality. Lint yield and gin turnout were intermediate to the variety and it's blend. However, the micronaire of some blends with PM 1218BR avoided a low micronaire discount. The objective of this study was to determine the effect of a high yield variety with high micronaire and a high yield variety with low miconaire planted alone and in different blend ratios had on lint yield, gin turnout, fiber quality and gross returns.

Materials And Methods

Two productive varieties (PM 1218BR, with high micronaire variety, and DP 451BR, with low micronaire) in an alternate row configuration, and seed blend ratios by weight of 1:1 (50% PM 1218BR + 50% DP 451BR) and 3:1 (75% PM 1218BR + 25% DP 451BR and 75% DP 451BR + 25% PM 1218BR) were evaluated for fiber quality, plant population, percent gin turnout and yield in 2003 and 2004; and for fiber quality, net loan price and gross returns in 2003. These were compared to each variety grown alone. The experimental design was a randomized complete block with 4 replications. Plot size was 8 rows by 120 ft with a seeding rate of 4 seed/ft of row. To achieve the desired seed blend ratios, the seed for each blend ratio was weighed and mixed by hand in a container.

The cotton at Verona was planted on a fall prepared seedbed on 5/28/03 and 5/04/04. The cotton at Stoneville was planted on a conventional prepared seedbed on 4/30/03 and 4/29/04. Current recommended production practices were used to achieve high yield. The centered 2 rows of each plot were harvested with a spindle picker. Seed cotton from all individual plots was ginned with a small scale gin (equivalent to a commercial gin) to determine gin turnout. The lint samples were analyzed for HVI fiber quality in 2003. The 2003 treatment gross returns were based on gin turnout, lint yield, and the 2004 USDA National Commodity Credit Corporation South Delta base loan price of 52¢/lb, with premium and discount adjustments for each plot's HVI (high volume instrumentation) fiber

quality (staple, length, grade, micronaire, fiber color, strength and uniformity). Treatment means were separated using Analysis of Variance and Fisher's protected LSD calculated at 5% significance level.

Results And Discussion

Weather from defoliation through harvest at both locations and both years were normal with no extended periods of wet, rainy conditions.

Year 2003

Plant population 4 weeks after planting (WAP) at Verona ranged from 36,678 to 53,680 plants/ac (Table 1). There were population differences among treatments. The 50% PM 1218BR + 50% DP 451BR blend and the PM 1218BR had the lowest populations of 38,971 and 36,678 plants/ac, respectively. These were lower than DP 451BR cotton and 75% PM 1218BR + 25% DP 451BR which had 47,185 and 53,680 plants/ac. However, lint yields indicated no differences between treatments and ranged from 1191 to 1265 lb/ac. These results indicated blending of varieties had no negative or positive effect on yield.

The percent gin turnout ranged from 36.6% for DP 451BR to 39.5% for PM 1218BR. DP 451BR and 75% DP 451BR + 25% PM 1218BR seed blend had the lowest gin turnout, and were lower than PM 1218BR, DP 451BR/PM 1218BR alternate rows, and the 75% PM 1218BR + 25% DP 451BR seed blend. These results indicated PM 1218BR in the 75% PM 1218BR + 25% DP 451BR blend, 50% PM 1218BR + 50% DP 451BR blend and PM 1218BR/DP 451BR in alternate rows increased gin turnout in comparison to DP 451BR. The South Delta net loan price ranged from 54.86¢ to 56.55¢/lb with the 75% DP 451BR + 25% PM 1218BR blend having the highest net loan price. However, there were no differences among treatments. Gross returns were related to loan price and lint yield. There were no gross return differences among varieties planted alone or in blended treatments.

Lint yield, gross returns, net loan price, and plant population at Stoneville in 2003 were not affected by variety blend treatments (Table 2). Plant population 4 weeks after planting at Stoneville ranged from 50,698 for the 75% PM 1218 BR + 25% DP 451BR blend to 53,486 plants/ac for the 75% DP 451BR + 25% PM 1218BR blend with no difference among treatments. The lint yields ranged from 1031 to 1273 lb/ac with no differences among treatments. Gin turnout ranged from 33.6 to 38.1%. DP 451BR had the lowest turnout with 33.6% and was lower than all other treatments. PM 1218BR had the highest turnout of 38.1% and was equal to 75% PM 1218BR + 25% DP 451BR blend. PM 1218BR in the 75% PM 1218BR + 25% DP 451BR blend, DP 451BR/PM 1218BR alternate row pattern and 50% DP 451BR + 50% PM 1218BR showed no differences in gin turnout, but all had greater gin turnout than DP 451BR. Net loan price ranged from 54.63¢ to 55.48¢/lb with no difference among treatments. Gross returns ranged from $573/ac to $703/ac with no difference among treatments.

HVI fiber analysis at both locations indicated strength, elongation, leaf grade, or fiber yellowness (+b) showed no treatment differences (Table 3). At Verona, PM 1218BR and 75% PM 1218BR + 25% DP 451BR had the highest micronaire values of 4.57 to 4.63. These values were higher than DP 451BR, 50% DP 451BR + 50% PM 1218BR and 75% DP 451BR + 25% PM 1218BR seed blend and DP 451BR/PM 1218BR in alternate rows which showed no differences. However, none of the micronaire values were in the price discount range according to the classification of cotton (USDA Handbook, 1995). Rd color reflectance only showed differences at Verona. The 75% PM 1218BR + 25% DP 451BR and PM 1218BR had similar Rd color reflectance. The 75% PM 1218BR + 25% DP 451BR Rd color reflectance was lower than all other treatments, except PM 1218BR.

PM 1218BR had the lowest fiber length which was similar to the 75% PM 1218BR + 25% DP 451BR and lower than all other treatments. DP 451BR and 75% DP 451BR + 25% PM 1218BR seed blend, 50% DP 451BR + 50% PM 1218BR blend and DP 451BR/PM 1218BR in alternate rows had similar length and were greater in length than PM 1218BR, and 75% PM 1218BR + 25% DP 451BR. These results indicated the blends with at least 50% DP 451BR improved fiber length. This was in contrast to Stoneville where fiber length for PM 1218BR was lower than DP 451BR but not different from all other treatments. Uniformity only showed differences at Stoneville. Uniformity for DP 451BR and seed blends of 75% DP 451BR + 25% PM 1218BR, 75% PM 1218BR + 25% DP 451BR, and 50% DP 451BR + 50% PM 1218BR were similar but lower than PM 1218BR which was in the high cotton classification category. The 83% uniformity for PM 1218BR was in the high category while the other treatments range of 81 to 82% was in the intermediate classification category.

Year 2004

Plant population 5 WAP at Verona ranged from 51,011 to 57,316 plants/ac with no population differences among treatments (Table 4). Lint yields ranged from 957 to 1096 lb/ac with no differences among treatments. Percent gin turnout ranged from 36.6% for DP 451BR to 40.2% for PM 1218BR. Gin turnout for PM 1218BR was greater than all other treatments. In comparison to DP 451BR, when the blends contained at least 50% PM 1218BR, gin turnout increased but did not increase yield. DP 451BR and 75% DP 451BR + 25% PM 1218BR had the lowest gin turnout of 36.6 and 37.2%, respectively. The DP 451BR/PM 1218BR alternate rows, 75% PM 1218BR + 25% DP 451BR and 50% DP 451BR + 50% PM 1218BR gin turnout ranged from 38.3 to 39.0% and were not different.

At Stoneville, plant population 5 WAP ranged from 49,928 to 53,579 plants/ac with no differences among treatments (Table 5). Lint yields ranged from 1027 to 1170 lb/ac with no differences among treatments. Gin turnout ranged from 36.3 to 38.5%. As at Verona, DP 451BR had the lowest gin turnout with 36.3% and was lower than all other treatments. PM 1218BR had the highest gin turnout of 38.5% and was equal to 75% PM 1218BR + 25% DP 451BR blend and alternate rows of DP 451BR and PM 1218BR. Compared to DP 451BR, when the blend mixture contained at least 50% PM 1218BR, gin turnout increased but with no yield increase.

Conclusion

Both years and at both locations, PM 1218BR had greater gin turnout than DP 451BR. PM 1218BR in a 50% PM 1218BR + 50% DP 451BR, 75% PM 1218BR + 25% DP 451BR and in a DP 451BR/PM 1218BR alternate row pattern increased gin turnout. However, there were no differences in lint yield among all treatments. In 2003, DP 451BR had greater fiber length than PM 1218BR at both locations and showed improved fiber length at Verona when DP 451BR was at least 50% of the blend mixture. Micronaire only showed differences at Verona but none were in the cotton classification base discount range. At Stoneville, the 83% uniformity for PM 1218BR was greater than all treatments, except DP 451BR/PM 1218BR alternate row pattern. The 83% uniformity was in the high cotton classification category. All other treatments ranged from 81 to 82% uniformity and were in the intermediate classification category. Strength, leaf grade, elongation and +b showed no difference among treatments at both locations. These preliminary results indicated we may be able to improve gin turnout and fiber length by blending these varieties, but with no improvement in yield or gross returns.

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Table 1. Lint yield, gin turnout, gross return, net loan price and plant population response to variety blend treatments in 2003, Verona, MS

Blend treatment	Lint Yield lb/ac	% Gin Turnout	Gross Return $/ac	Loan Price ¢/lb	4 WAP pl/ac
1. DP 451BR	1265	36.6	713	56.35	47,185
2. PM 1218BR	1246	39.5	692	55.55	36,678
3. DP 451BR/PM 1218BR alt row	1195	38.3	668	55.89	43,555
4. 75% 451BR + 25% PM 1218 BR blend	1227	37.3	694	56.55	42,218
5. 75% PM 1218BR + 25% DP 451BR blend	1191	39.0	653	54.86	53,680
6. 50% DP 451BR + 50% PM 1218BR blend	1253	38.0	704	56.15	38,971
Mean	1229	38.1	687	55.89	43,718
LSD (0.05)	NS	0.9	NS	NS	8,127
% CV	5	12.3	6	1.45	12

Table 2. Lint yield, gin turnout, gross return, net loan price, and plant population response to variety blend treatments in 2003, Stoneville, MS

Blend treatment	Lint Yield lb/ac	% Gin Turnout	Gross Return $/ac	Loan Price ¢/lb	4 WAP pl/ac
1. DP 451BR	1031	33.6	573	55.48	51,558
2. PM 1218BR	1227	38.1	672	54.74	51,755
3. DP 451BR/PM 1218BR alt row	1128	36.5	616	54.63	51,047
4. 75% DP 451BR + 25% PM 1218BR blend	1158	35.8	632	54.63	53,486
5. 75% PM 1218BR + 25% DP 451BR blend	1273	37.4	703	55.19	50,698
6. 50% DP 451BR + 50% PM 1218BR blend	1177	36.2	652	55.45	52,408
Mean	1166	36.3	641	55.02	51,825
LSD (0.05)	NS	1.4	NS	NS	NS
% CV	8	8.4	9	1.78	6

Table 3. HVI fiber characteristics as influenced by variety and blend methods for Verona and Stoneville, MS in 2003.

Fiber Characteristics	Treatment #[1] 1	2	3	4	5	6	LSD (0.05)
	Stoneville, Mississippi						
Length (in)	1.10	1.06	1.07	1.08	1.08	1.08	0.02
Uniformity	81	83	82	81	81	81	1
Micronaire	4.45	4.45	4.63	4.55	4.50	4.47	NS
Strength	27.77	27.80	27.67	27.38	27.85	27.57	NS
Elongation	4.97	5.07	5.05	5.13	5.20	5.10	NS
Rd	76.45	76.53	76.20	76.22	76.28	77.05	NS
+b	7.75	7.57	7.70	7.48	7.60	7.83	NS
Color grade	41	41	41	41	41	31	---
Leaf grade	1.00	1.00	1.00	1.00	1.00	2.00	NS
	Verona, Mississippi						
Length (in)	1.15	1.09	1.12	1.14	1.11	1.13	0.02
Uniformity	82	83	82	82	82	82	NS
Micronaire	4.10	4.63	4.40	4.17	4.57	4.32	0.23
Strength	29.50	29.58	28.78	30.55	29.05	29.07	NS

Elongation	5.43	5.35	5.42	5.25	5.67	5.28	NS
Rd	80.17	79.40	80.05	80.27	78.68	80.35	1.15
+b	7.65	7.63	7.55	7.43	7.97	7.70	NS
Color grade	31	31	31	31	31	31	---
Leaf grade	1.00	1.00	1.00	1.00	1.00	1.00	NS

[1]Treatments are: 1) DP 451BR; 2) PM 1218BR; 3) DP 451BR/PM 1218BR alternate row pattern; 4) 75% DP 451BR + 25% PM 1218BR as a seed blend by weight mixture; 5) 75% PM 1218BR + 25% DP 451BR as a seed blend by weight mixture; 6) 50% DP 451BR + 50% PM 1218BR as a seed blend by weight mixture.

Table 4. Lint yield, gin turnout and plant population response to variety blend treatments in 2004, Verona, MS

Blend Treatment	Lint Yield lb/ac	% Gin Turnout	5 WAP pl/ac
1. DP 451BR	960	36.6	53,693
2. PM 1218BR	1096	40.2	51,011
3. DP 451BR/PM 1218BR alt row	957	39.0	53,303
4. 75% DP 451BR + 25% PM 1218 BR blend	1029	37.2	57,316
5. 75% PM 1218BR + 25% DP 451BR blend	1058	39.0	54,267
6. 50% DP 451BR + 50% PM 1218BR blend	995	38.3	53,681
Mean	1016	38.0	53,878
LSD (0.05)	NS	0.7	NS
% CV	7	1.2	6

Table 5. Lint yield, gin turnout and plant population response to variety blend treatments in 2004, Stoneville, MS

Blend Treatment	Lint Yield lb/ac	% Gin Turnout	5 WAP pl/ac
1. DP 451BR	1041	36.3	51,848
2. PM 1218BR	1033	38.5	51,292
3. DP 451BR/PM 1218BR alt row	1090	37.6	53,105
4. 75% DP 451BR + 25% PM 1218BR blend	1027	37.4	49,969
5. 75% PM 1218BR + 25% DP 451BR blend	1170	38.1	49,528
6. 50% DP 451BR + 50% PM 1218BR blend	1048	37.2	53,579
Mean	1068	37.5	51,553
LSD (0.05)	NS	0.9	NS
% CV	8	1.6	7