

Upland Variety Testing Evaluation in Southeastern Arizona

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Abstract

Two separate variety evaluations were conducted in southeastern Arizona during the 2004 cotton growing season. The two locations were on grower-cooperator fields in the Upper Gila River Valley located in Thatcher, AZ (Graham County) and in the Sulfur Springs Valley in Kansas Settlement, AZ (Cochise County). Twelve varieties were selected for the Graham County evaluation and fifteen in the Cochise County evaluation. These varieties included several transgenic varieties and ranged in maturity from early to full-season varieties. Several Acala varieties were also evaluated in both the Graham and Cochise County tests. Both evaluations were conducted using a randomized complete block design with each variety replicated four times. Plant measurements were collected in season on several dates from the Graham County evaluation. End of season plant measurements were collected from the Cochise County evaluation. Lint yield was estimated at each location by harvesting the entire plot and weighing the harvested seed cotton with a weigh wagon equipped with load cells. Sub samples were collected from each plot for fiber quality and percent lint determinations. Total crop value for each variety was calculated by using the fiber quality premium/discount and using a \$0.52 per pound price. The total price is then multiplied by total lint yield to obtain the total value for that particular variety. Results observed in the Graham County evaluation were similar to those in 2003. Lint yield ranged from 1200 to over 1600 lbs. lint/acre. The FiberMax variety FM991BR produced the highest lint yield and also the highest total crop value at over \$950/acre. Results from the Cochise County evaluation demonstrated the potential that high fiber quality can have on total crop value. Lint yields ranged from 600 to over 1200 lbs. lint/acre. The highest yielding variety (ST5242BR) did not produce the highest crop value. Because of the higher fiber quality of the Acala varieties, they produced the highest value at approximately \$630/acre.

Introduction

One of the most important decisions that a cotton producer makes ever year, that has a tremendous effect on the rest of the season, is variety selection. Selection of a properly adapted variety and appropriately timed planting is critical to achieving optimum returns in a cotton production system. The rising cost of seed and technology fees that accompany many of the commonly planted varieties places an ever increasing level of importance on making the right decision for a particular farm. There are many choices available to a grower today which make the task of variety selection that much more difficult.

Several sources may provide information on variety evaluations but it is critical to have regionally based information and, whenever possible, to base a decision on multiple years of evaluation for a particular variety. That is not always possible but should be done to the extent possible. The University of Arizona conducts a thorough evaluation of commercially available cotton varieties in several regions around the state. One of those regions is southeastern Arizona which includes Graham and Cochise counties. The tests provide an unbiased evaluation of available varieties. These tests are almost exclusively conducted in grower-cooperator fields which provide for an added dimension of applicability to the local producers.

Materials and Methods

Two separate studies were conducted in the southeastern region of the state. One was conducted in Thatcher, AZ with Layton Farms and Ranches as the cooperator while the second evaluation took place in Kansas Settlement, AZ with Milton Schmitt as the cooperator.

Thatcher Location

The evaluation conducted at the Thatcher location included 12 varieties with a variety of transgenic traits. Table 1 lists the varieties along with their associated maturity ratings and transgenic traits. These varieties were planted in four, 38" row plots that extended the full length of the irrigation run of approximately 1,260 feet. Each variety was replicated four times in a randomized complete block design. Plant measurements were collected over the course of the growing season to evaluate crop growth and development. These measurements included; plant height, number of mainstem nodes, position of the first fruiting branch, number of retained fruiting structures on the first two positions of each fruiting branch, and number of nodes above the top, first position, fresh bloom.

Kansas Settlement Location

A total of fourteen varieties were included in the Cochise County evaluation (Table 2). Varieties were planted in two, 36" row plots that extended half way around the center pivot irrigation system. Each plot length was different and was accounted for when final lint yield calculations were made. Plots were arranged in a randomized complete block design with four replications. Due to lack of labor and distance, plant measurements were only collected at harvest and included plant height, number of mainstem nodes, and position of first fruiting branch.

At both evaluation locations yield estimates were made by harvesting each entire experimental plot and weighing the resultant seedcotton with a cotton weigh wagon equipped with load cells. Sub samples were collected from each experimental unit that was subsequently cleaned and ginned at the University of Arizona Maricopa Agricultural Center ginning facility. Lint samples were then submitted to the USDA Phoenix Classing Office for HVI analysis to obtain fiber quality estimates. All yield and fiber quality data from both locations were analyzed according to procedures outlined by the SAS Institute (2002) including analysis of variance and means separation using a Fisher's least significant difference test.

The value for each of the varieties was calculated at each location by determining a premium or discount using the USDA CCC loan schedule. This premium/discount is based upon fiber quality characteristics and is added to the base USDA loan rate of \$0.52 per pound. This price is multiplied by the lint yield to calculate a total value for that variety.

Results

Thatcher

The 2004 spring season brought several difficulties in stand establishment. Several of the varieties in this test had to be replanted in certain areas of the field. These varieties included DP555BR, FM991R, and DP444BR. Replanted areas amounted to possibly 20% of the total test area and appeared to 'catch up' with the originally planted cotton.

A summary of plant measurement trends are found in Figures 1, 2, and 3. Height to node ratio trends for each of the twelve varieties are shown in Figure 1. Minor differences were observed among the varieties with DP555BR and SCX-7 exhibiting lower levels of plant vigor towards the latter part of the season. Overall vigor of the test was less than average in part because of the high level of fruit load carried by the crop, particularly early in the season (Figure 2). Fruit retention levels remained above 80% until toward the end of July when levels dropped to an average of 65%. No major differences in fruit load were observed among any of the twelve varieties in this evaluation.

All fiber quality data is presented in Figures 4 and 5. Discounts for low micronaire were applied to three of the twelve varieties in the evaluation (Figure 4B). All varieties received premiums for fiber strength except one (Figure 4C). All varieties were in the premium range for staple length (Figure 5A). The variety evaluation was harvested at a time when many of the varieties still had a significant amount of green leaves remaining on the plant resulting in all but three of the varieties receiving discounts for leaf grade (Figure

5C). Figure 6A shows the premium received for each of the varieties. The FiberMax and Acala varieties received the highest premium of approximately \$0.04/pound. Crop value was calculated using the premium/discount which was added to the base loan rate of \$0.52/pound and multiplied by the total lint yield. Figure 6B shows the total crop value for each of the twelve varieties. Lint yield is presented in Figure 6C. Lint yield average from 1200 to over 1600 lbs. lint/acre. FiberMax variety FM991BR performed extremely well again this year not only having the highest yield but because of the high fiber quality it also had the highest total crop value.

Kansas Settlement

Table 3 lists the end of season plant measurements collected for each of the 15 varieties included in the evaluation. Data collected included plant population, plant height, first fruiting branch, total mainstem nodes, and average seedcotton weight per boll.

Wide variation in fiber quality was observed among the varieties in this evaluation. Several varieties fell into the discount range for low micronaire with a range in micronaire from 3.1 to over 4.0 (Figure 7B). This evaluation had more pronounced differences among the Upland and Acala varieties. Figure 8A shows the increase in staple length for the Acala varieties. The two New Mexico varieties had high fiber uniformity (Figure 8B). All varieties in this evaluation received premiums for fiber quality except one (Figure 9A). Lint yields ranged from 650 to over 1200 lbs lint/acre (Figure 9C) with the Stoneville variety ST5242BR producing the highest lint yield. However due to the lower fiber quality, the high yielding variety did not produce the highest crop value (Figure 9B). The three Acala varieties produced the highest crop values (Sierra, Riata, and C103). This evaluation provides an excellent example of the fact that high fiber quality can make up for some decline in yield.

Table 1. Listing of varieties with corresponding maturity ratings and transgenic traits included in the Graham County variety evaluation in Thatcher, AZ, 2004.

Variety	Company	Maturity Rating	Genetic Traits
ST5242BR	Stoneville	Early-Medium	BG, RR
Sierra	CPCSD	Medium-Full	RR
Riata	CPCSD	Medium-Full	RR
ST5599BR	Stoneville	Medium	BG, RR
ST4646B2R	Stoneville	Early-Medium	BGII, RR
DP555BR	Deltapine	Medium-Full	BG, RR
DP655BR	Deltapine	Medium-Full	BG, RR
DP444BR	Deltapine	Early	BG, RR
DP488BR	Deltapine	Medium	BR, RR
SCX-7	Salcot	Medium-Full	---
FM989BR	FiberMax	Medium	BG, RR
FM991BR	FiberMax	Full	BG, RR

Table 2. Listing of varieties with corresponding maturity ratings and transgenic traits included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2004.

Variety	Company	Maturity Rating	Genetic Traits
ST5242BR	Stoneville	Early-Medium	BG, RR
Sierra	CPCSD	Medium-Full	RR
Riata	CPCSD	Medium-Full	RR
C-103	CPCSD	Medium-Full	---
ST5599BR	Stoneville	Medium	BG, RR
ST4646B2R	Stoneville	Early-Medium	BGII, RR
DP432BR	Deltapine	Early	BG, RR
DP449BR	Deltapine	Medium	BG, RR
DP444BR	Deltapine	Early	BG, RR
SCX-7	Salcot	Medium-Full	---
FM960BR	FiberMax	Early-Medium	BG, RR
FM991BR	FiberMax	Full	BG, RR
1517-99	NMSU	Medium-Full	---
1517-95	NMSU	Medium-Full	---

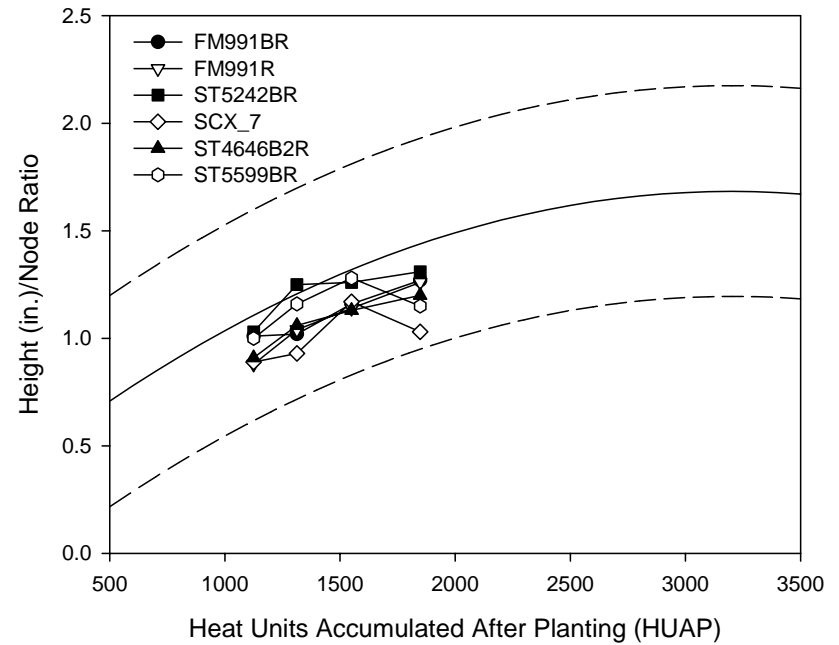
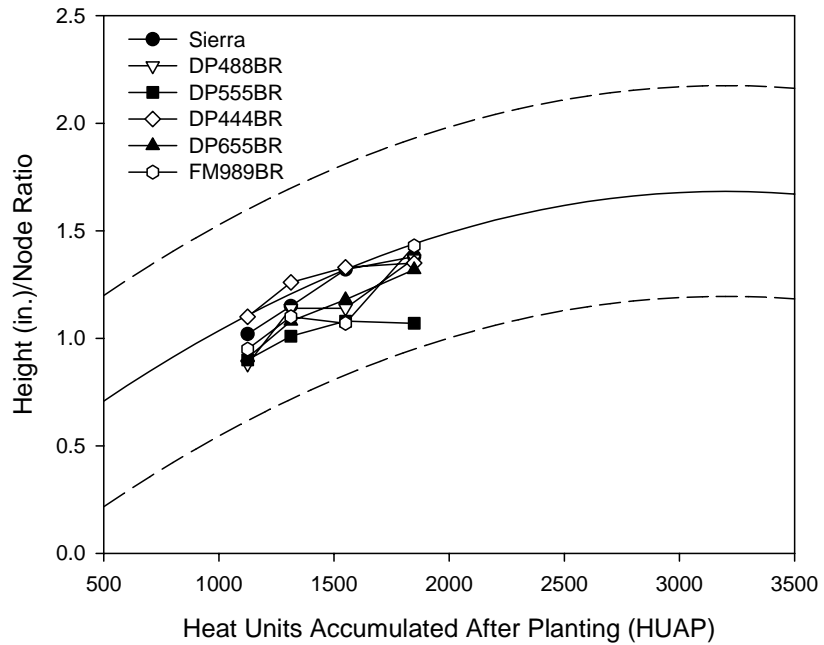


Figure 1. Height (in.) to node ratio trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004.

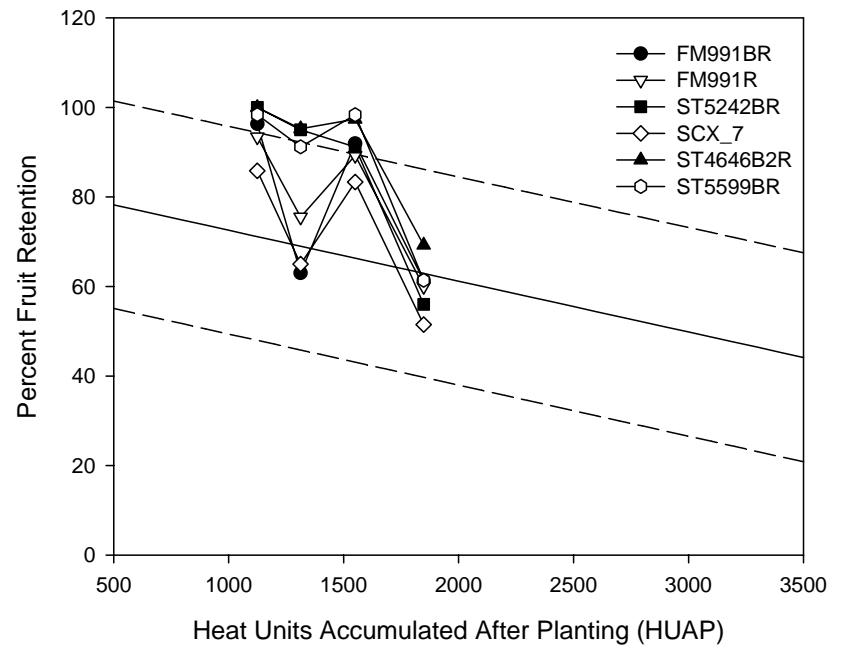
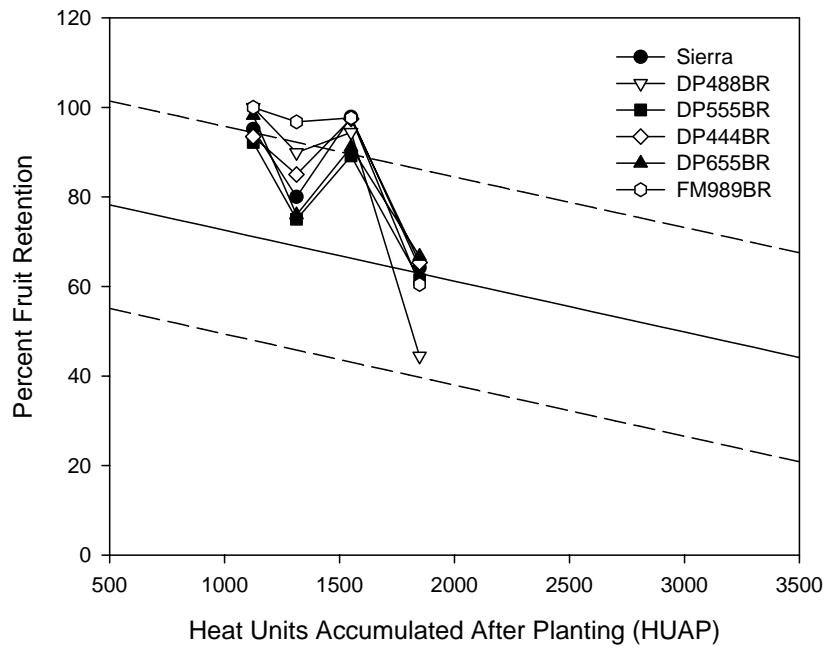


Figure 2. Percent fruit retention trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004.

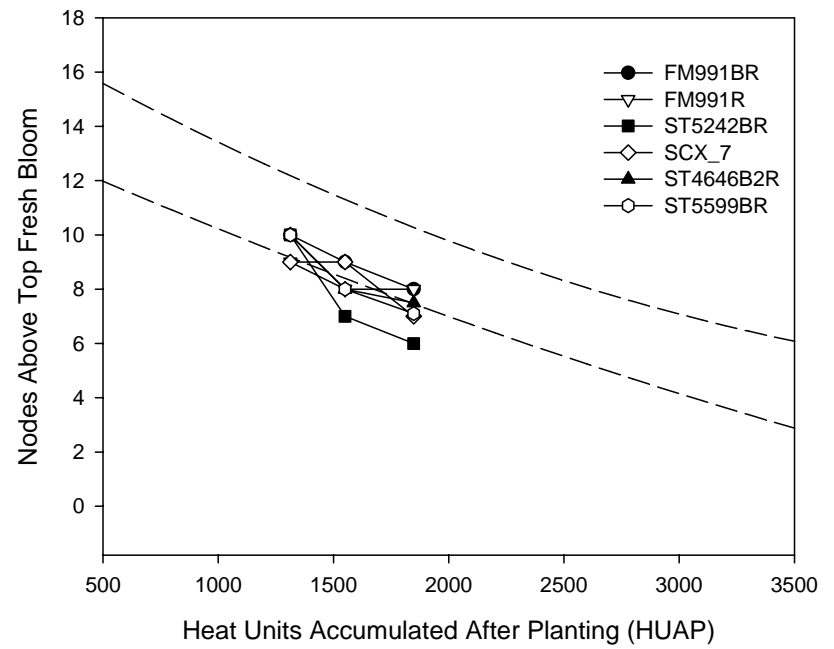
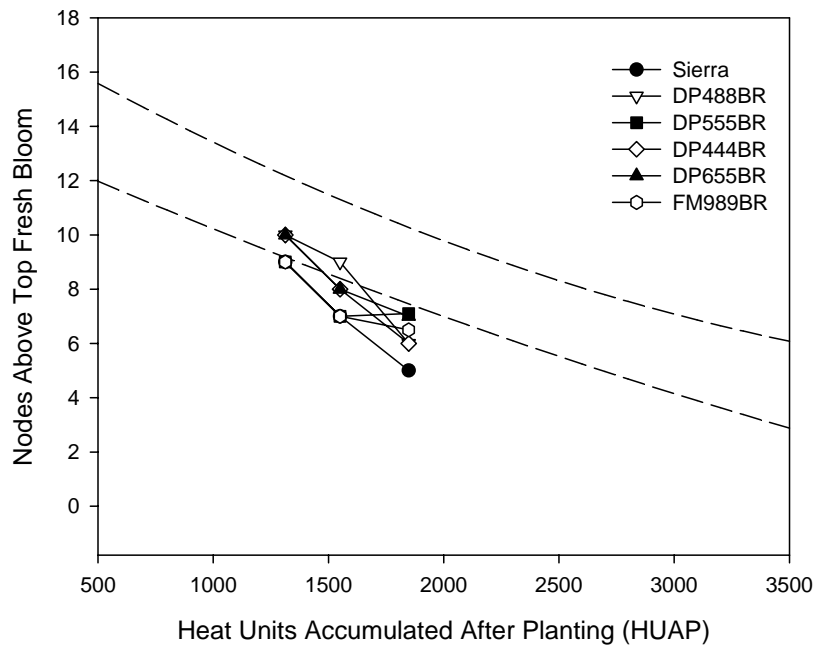


Figure 3. Number of nodes above top fresh bloom trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004.

Table 3. Summary of plant measurement data collected from the Cochise County variety evaluation in Kansas Settlement, AZ, 2004.

Variety	Plant Population	Plant Height	First Fruiting Branch	Mainstem Nodes	Average Boll Weight
1517_95	36363.64	22.25	7.25	18.25	5.44
1517_99	39090.91	28.00	7.75	19.50	5.70
C103	35909.09	29.50	7.25	17.25	5.58,
DP432BR	47727.27	24.00	6.25	15.75	4.80
DP444BR	46363.64	28.00	6.25	17.25	5.16
DP449BR	51818.18	30.25	5.50	19.00	4.90
FM960BR	44363.64	24.80	6.70	17.40	5.90
FM991BR	59090.91	24.25	7.25	17.75	5.22
Riata	41818.18	33.25	6.50	19.25	5.53
S4646B2R	36818.18	29.75	7.50	18.00	5.50
SCX7	46363.64	25.50	5.50	18.75	5.11
Sierra	44090.91	27.75	6.00	15.50	5.69
ST5242BR	30909.09	27.25	6.75	16.50	5.83
ST5599BR	44545.45	27.50	5.50	16.75	5.71

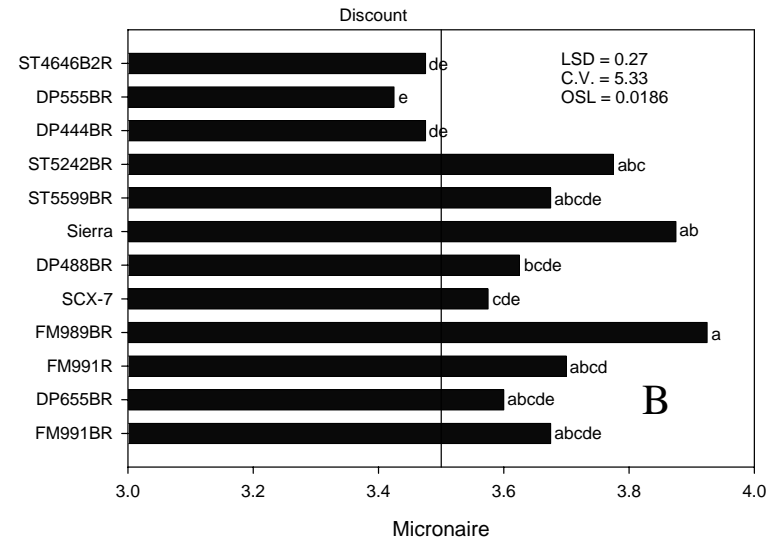
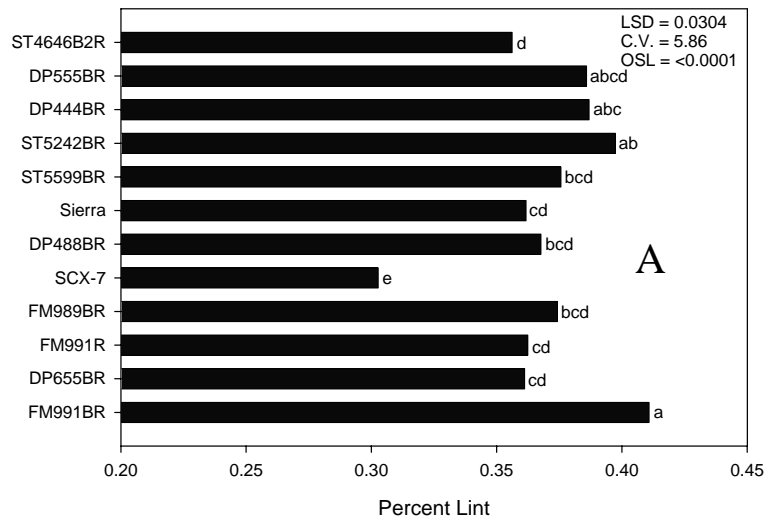
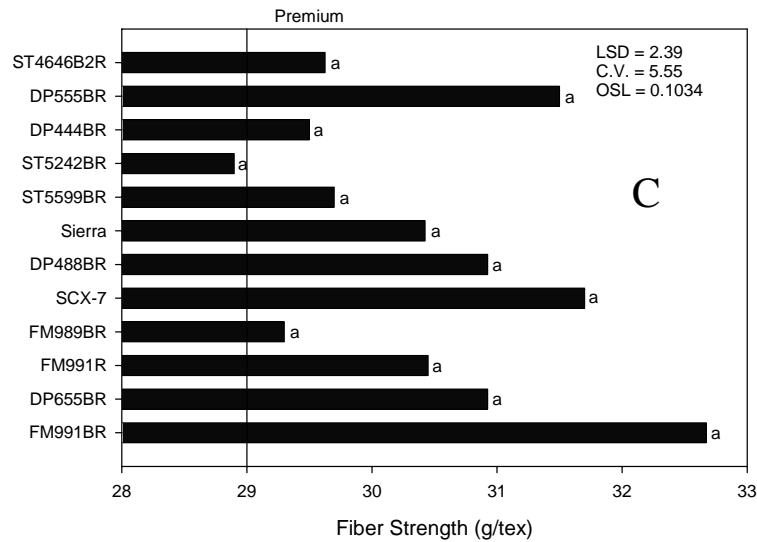


Figure 4. Statistical means separation and analysis of variance results for A) percent lint, B) micronaire, and C) fiber strength for the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.
 LSD = Least Significant Difference
 CV = Coefficient of Variation
 OSL = Observed Significance Level



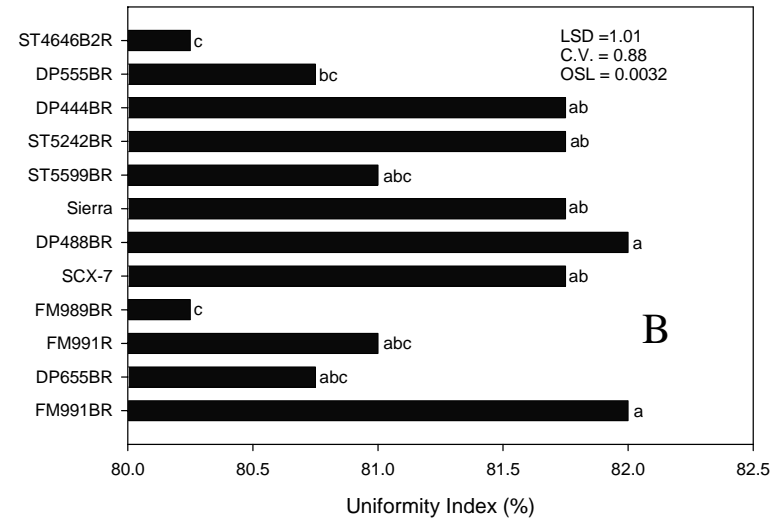
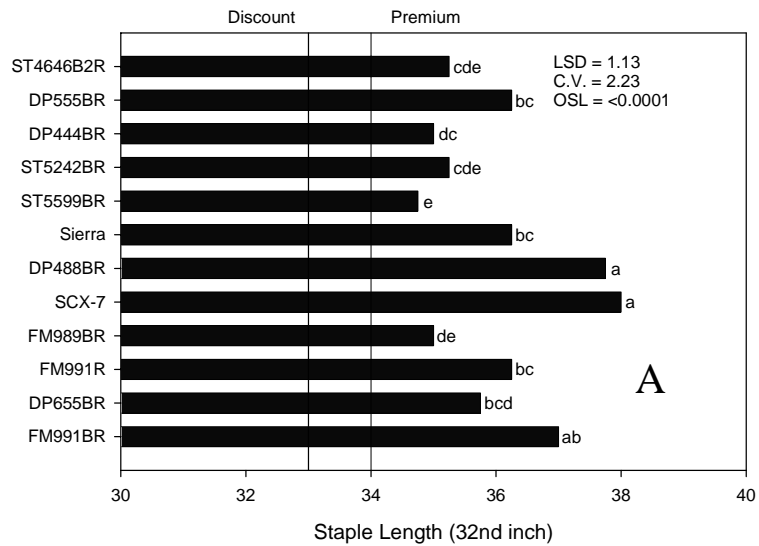
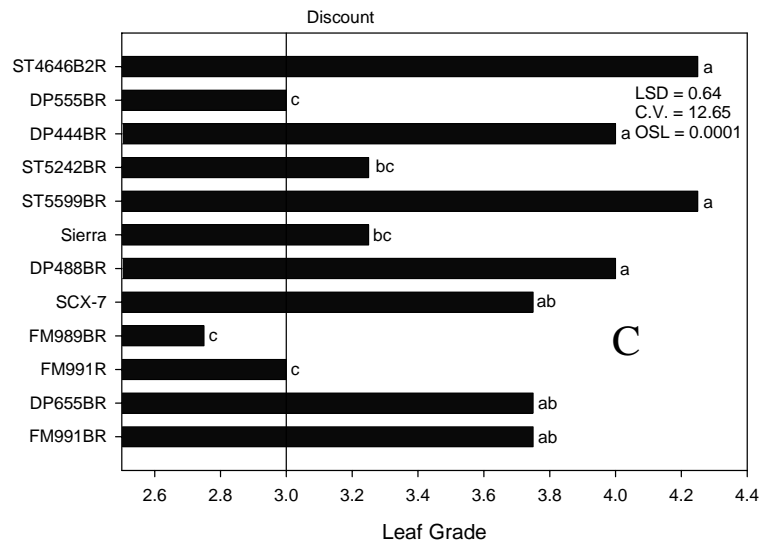


Figure 5. Statistical means separation and analysis of variance results for A) staple length, B) uniformity index, and C) leaf grade for the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.
 LSD = Least Significant Difference
 CV = Coefficient of Variation
 OSL = Observed Significance Level



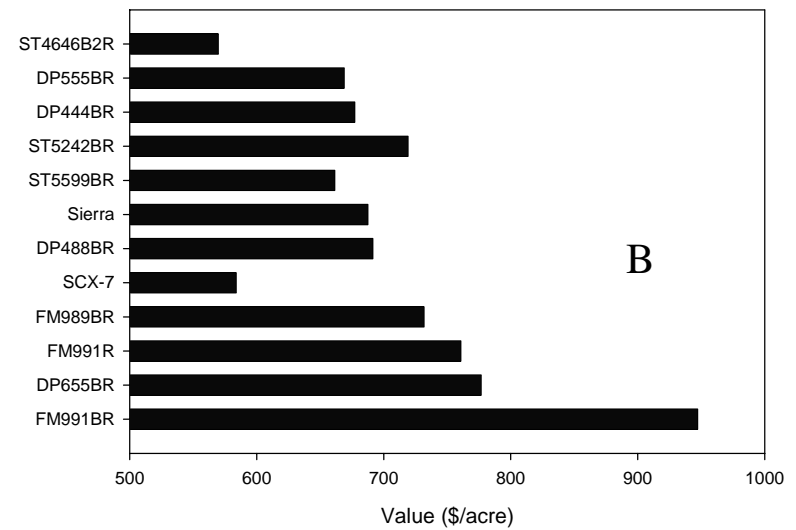
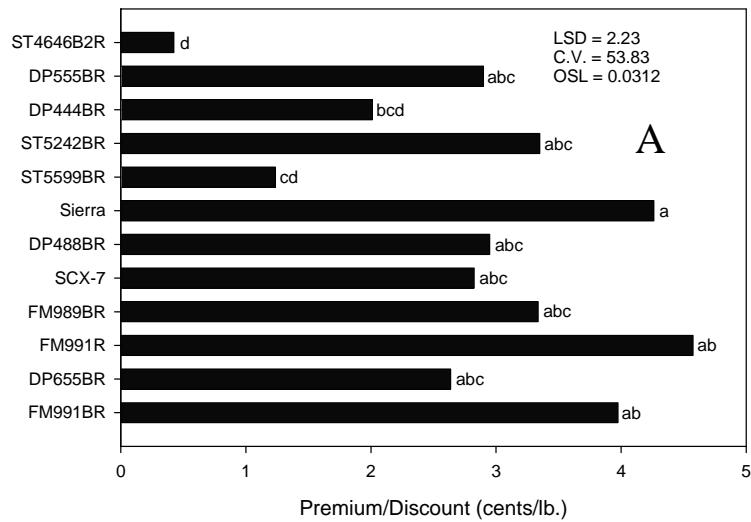
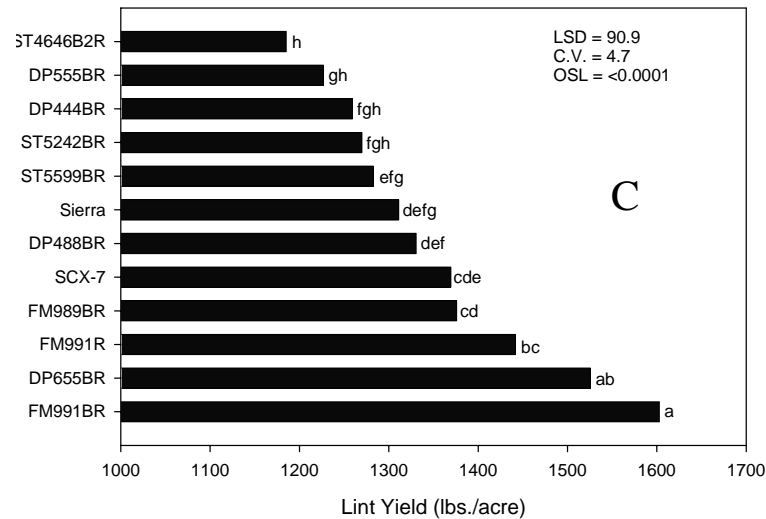


Figure 6. Statistical means separation and analysis of variance results for A) premium/discount, B) total crop value, and C) lint yield for the fourteen varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.
 LSD = Least Significant Difference
 CV = Coefficient of Variation
 OSL = Observed Significance Level



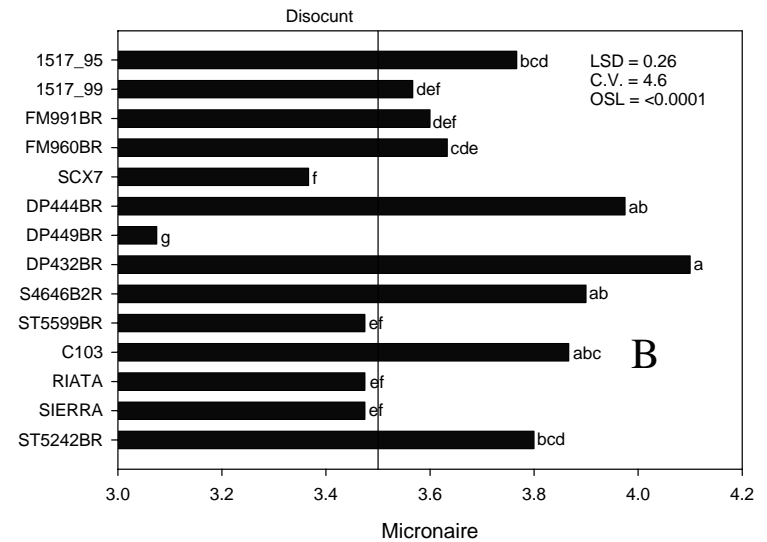
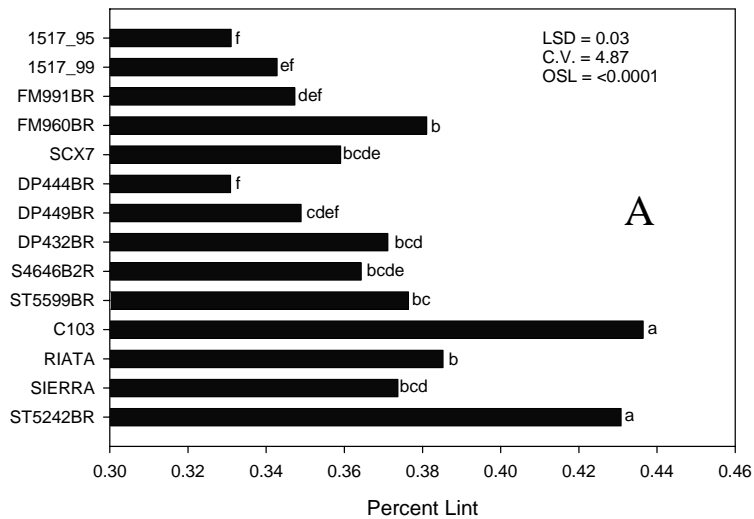
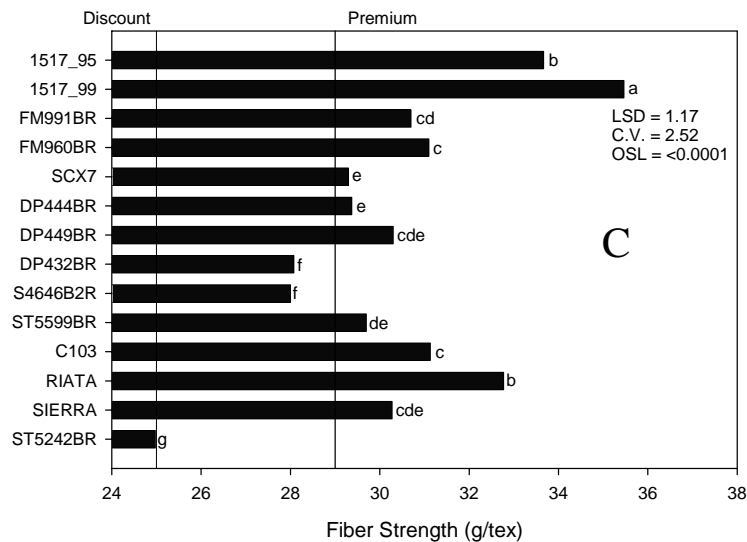


Figure 7. Statistical means separation and analysis of variance results for A) percent lint, B) micronaire, and C) fiber strength for the fourteen varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.
 LSD = Least Significant Difference
 CV = Coefficient of Variation
 OSL = Observed Significance Level



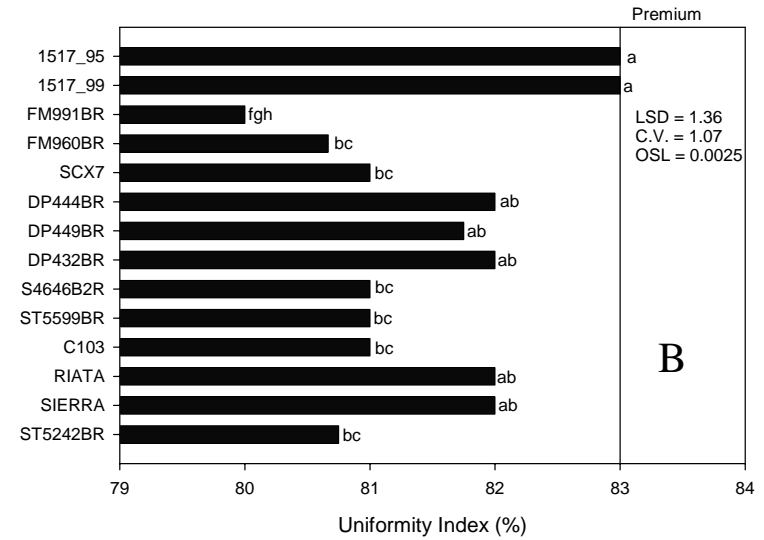
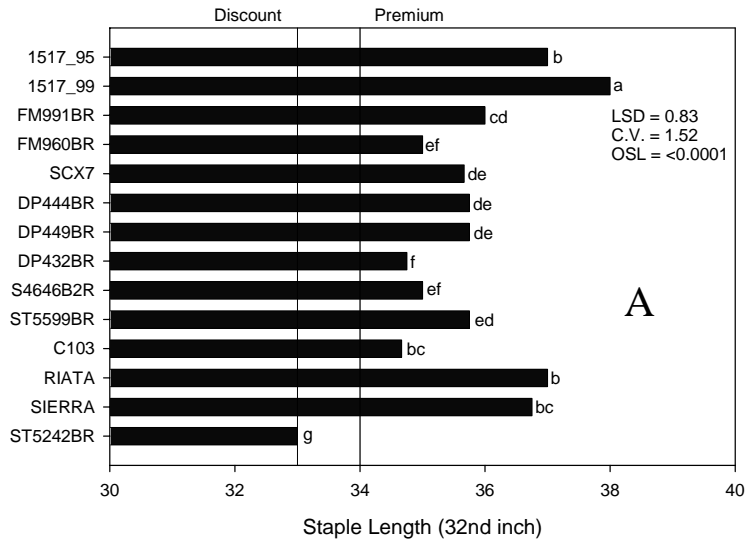
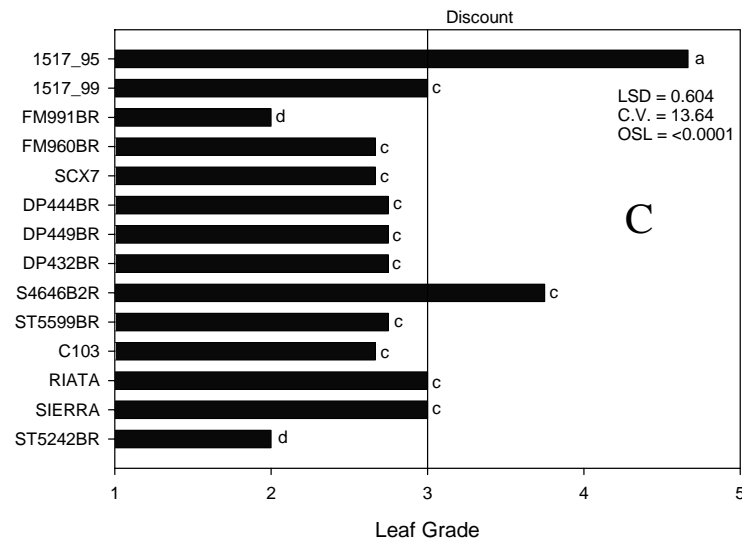


Figure 8. Statistical means separation and analysis of variance results for A) staple length, B) uniformity index, and C) leaf grade for the fourteen varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

LSD = Least Significant Difference
 CV = Coefficient of Variation
 OSL = Observed Significance Level



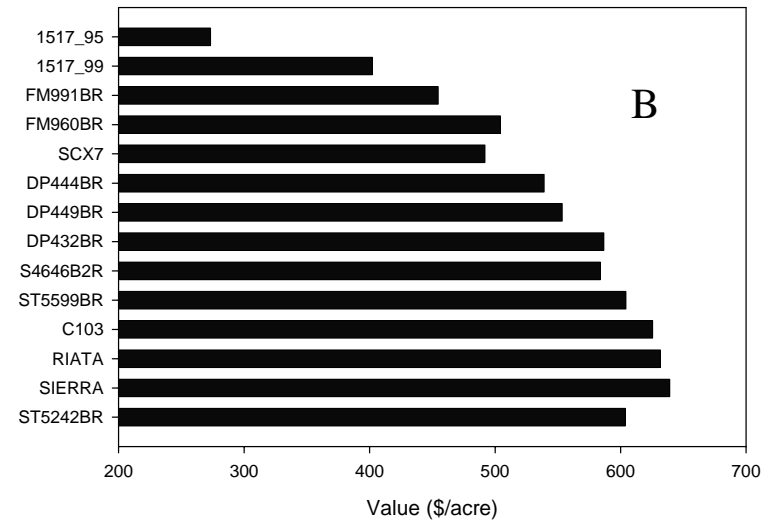
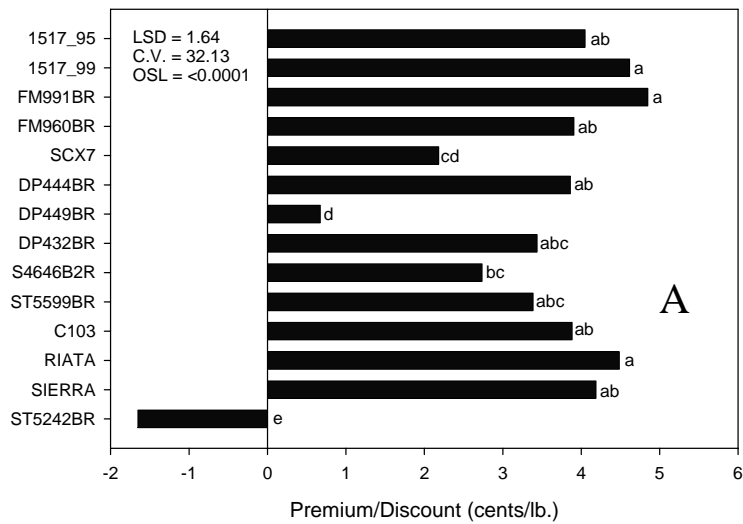


Figure 9. Statistical means separation and analysis of variance results for A) premium/discount, B) total crop value, and C) lint yield for the fourteen varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2004. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

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