

# Upland Cotton Variety Evaluations in Southeastern Arizona

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## Abstract

*Three separate Upland cotton variety evaluations were conducted in southeastern Arizona during the 2005 cotton growing season. Two locations were in Graham County, Thatcher and Ashurst, while the third location was in Cochise County in the community of Kansas Settlement. Eleven varieties were selected for both the Thatcher and Kansas Settlement locations while seven were planted at the Ashurst location. Varieties ranged in maturity from early to full at each of the three locations. All plots were arranged in a randomized complete block design with four replications. All three locations were planted on grower-cooperator fields and were managed in accordance to the individual grower styles. Plant measurements were collected over the course of the season at both the Thatcher and Ashurst locations. Lint yield was determined by harvesting the entire plot at each location and weighing the resultant seedcotton. Sub-samples were also collected at the time of harvest for percent lint estimates and fiber quality analysis. Lint yield levels at both the Ashurst and Thatcher locations were high. Due to poor initial germination, the Kansas Settlement location had to be replanted and was later maturing. Thus, lint yield was down some from the normal average in that area. At the Thatcher location lint yield ranged from 1200 to just over 1600 lbs. lint/acre with ST5242BR producing the highest lint yield and the highest crop value. In Ashurst the yields ranged from 950 to nearly 1350 lbs. lint/acre with Fiber Max FM960RR producing the highest lint yield. However, due to some fiber quality discounts it did not produce the highest crop value. Fiber Max FM989RR had excellent fiber quality and produced the highest crop value even though it produced a slightly lower yield. In Kansas Settlement lint yields ranged from 460 to approximately 850 lbs. lint/acre with the highest lint yield and total crop value being produced by Deltapine DP444BR. This is consistent with the earlier nature of this variety.*

## 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**

Three separate studies were conducted in the southeastern region of the state. Two of them were conducted in Graham County while the third was conducted in Cochise County. The two trials in Graham County were located in Thatcher with Layton Farms and Ranches as the cooperator while the second evaluation took place in Ashurst with Jay Layton as the cooperator. The third trial in Cochise County was in Kansas Settlement with Milton Schmidt as the cooperator.

### **Thatcher Location**

The evaluation conducted at the Thatcher location included 11 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 on 29 April 2005 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.

### **Ahurst Location**

The evaluation conducted at the Ashurst location included 7 varieties. All varieties in this trial were only RoundupReady™ varieties. Table 2 lists the varieties along with their associated maturity ratings and transgenic traits. These varieties were planted on 28 April 2005 in four, 38" row plots that extended the full length of the irrigation run of approximately 1,630 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 and included the same measurements that were collected at the Thatcher location.

### **Kansas Settlement Location**

A total of 11 varieties were included in the Cochise County evaluation (Table 3). Varieties were planted on 14 April 2005 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 not collected.

At all three locations yield estimates were made by harvesting the 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 the three locations were analyzed according to procedures outlined by the SAS Institute 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

Lint yield levels at this location ranged from 1200 to just over 1600 lbs. lint/acre (Table 4). The variety ST5242BR from Stoneville produced the highest lint yield and the highest crop value. Consistent with other years, the FiberMax varieties produced exceptionally high fiber quality which is reflected in premiums associated with these varieties. Plant measurement data revealed slightly below average vigor in the crop demonstrated by the low height to node ratios (HNR) in Figure 1. This low vigor was due in part to the exceptionally high fruit retention (FR) levels for all varieties in this trial across the course of the season (Figure 2). The number of nodes above top fresh bloom (NAWB) gives somewhat of an indication of the maturity level of the variety. The varieties FM960B2R, ST5599BR, ST5242BR, and ST4575BR appeared to have matured slightly earlier than the other varieties in this evaluation (Figure 3). Figure 4-6 provide a graphical depiction of the yield and fiber quality data for this location.

### Ashurst

In Ashurst lint yields ranged from 950 to nearly 1350 lbs. lint/acre with Fiber Max FM960RR producing the highest lint yield (Table 5). However, due to some fiber quality discounts, specifically fiber strength and staple length, it did not produce the highest crop value. Fiber Max FM989RR had excellent fiber quality and produced the highest crop value even though it produced a slightly lower yield. Both FR and HNR levels for all varieties in this study exhibited similar trends as those observed at the Thatcher location with low HNR and exceptionally high FR. Maturity levels for these varieties varied significantly. The varieties DP432R and FM960R appeared to mature ahead of the other varieties as evidenced by NAWB measurements (Figure 6). Graphical representations of lint yield and fiber quality are presented in Figures 7-9.

### Kansas Settlement

Due to poor initial germination the Kansas Settlement location had to be replanted and was later maturing so lint yield was down some from the normal average in that area. In Kansas Settlement lint yields ranged from 460 to approximately 850 lbs. lint/acre with the highest lint yield and total crop value being produced by Deltapine DP444BR (Table 6). This is consistent with the early nature of this variety. Graphical representations of lint yield and fiber quality are presented in Figures 10-12.

Table 1. Listing of varieties with corresponding maturity ratings and transgenic traits included in the Graham County variety evaluation in Thatcher, AZ, 2005.

<b>Variety</b>	<b>Company</b>	<b>Maturity Rating</b>	<b>Genetic Traits</b>
ST5242BR	Monsanto/Stoneville	Early-Medium	BG, RR
FM981LL	FiberMax	Medium	LL
ST4575BR	Monsanto/Stoneville	Early-Medium	BG, RR
DP494R	Delta and Pine Land	Medium-Full	RR
DP488BR	Delta and Pine Land	Medium	BG, RR
DP655BR	Delta and Pine Land	Medium-Full	BG, RR
FM989B2R	FiberMax	Medium-Full	BG2, RR
ST5599BR	Monsanto/Stoneville	Medium	BG, RR
FM960B2R	FiberMax	Medium	BG2, RR
DP555BR	Delta and Pine Land	Medium-Full	BG, RR
FM991B2R	FiberMax	Full	BG2, RR

Table 2. Listing of varieties with corresponding maturity ratings and transgenic traits included in the Graham County variety evaluation in Ashurst, AZ, 2005.

<b>Variety</b>	<b>Company</b>	<b>Maturity Rating</b>	<b>Genetic Traits</b>
FM960RR	FiberMax	Medium	RR
FM989RR	FiberMax	Medium-Full	RR
DP5690RR	Delta and Pine Land	Medium-Full	RR
DP494RR	Delta and Pine Land	Medium-Full	RR
DP432RR	Delta and Pine Land	Early	RR
FM991RR	FiberMax	Full	RR
DP434RR	Delta and Pine Land	Early	RR

Table 3. Listing of varieties with corresponding maturity ratings and transgenic traits included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2005.

<b>Variety</b>	<b>Company</b>	<b>Maturity Rating</b>	<b>Genetic Traits</b>
DP444BR	Delta and Pine Land	Early	BG, RR
ST5242BR	Monsanto/Stoneville	Early-Medium	BG, RR
ST5599BR	Monsanto/Stoneville	Medium	BG, RR
151799WS	New Mexico State	Medium-Full	WS
ST4575BR	Monsanto/Stoneville	Early-Medium	BG, RR
FM989B2R	FiberMax	Medium-Full	BG2, RR
DP432R	Delta and Pine Land	Early	RR
FM981LL	FiberMax	Medium	LL
DP434R	Delta and Pine Land	Early	RR
FM960B2R	FiberMax	Medium	BG2, RR
PHY710R	Phytogen	Medium	RR

Table 4. Lint yield and fiber quality results for the Upland cotton variety test conducted in Thatcher, AZ, 2005.

Variety	Lint Yield lbs./acre		Turn-out %	Staple 32nds	Micronaire	Strength g/tex	Length inches	Uniformity %	Premium Points	Crop Value \$/acre
ST5242BR	1606.7	a*	36.4	35.3	4.2	27.1	1.09	81.5	487	\$912.46
FM981LL	1474.0	a b	34.0	36.7	4.0	30.7	1.14	80.7	628	\$842.64
ST4575BR	1457.5	a b	37.1	35.0	4.1	28.0	1.10	81.9	482	\$828.21
DP494R	1384.5	b	36.8	36.0	4.2	30.6	1.13	81.5	610	\$804.14
DP488BR	1364.7	b c	35.0	36.3	3.9	29.2	1.13	80.1	558	\$786.36
DP655BR	1352.4	b c	34.3	37.0	4.0	30.3	1.15	81.2	653	\$835.19
FM989B2R	1343.7	b c	34.6	36.3	3.8	31.4	1.13	81.4	637	\$784.23
ST5599BR	1335.4	b c	35.5	35.3	3.9	29.1	1.10	80.1	368	\$744.42
FM960B2R	1321.7	b c	34.9	37.7	3.9	31.9	1.18	82.2	640	\$771.85
DP555BR	1311.0	b c	36.8	35.7	3.7	28.1	1.11	80.5	553	\$754.08
FM991B2R	1211.3	c	33.5	37.3	3.8	31.3	1.18	82.1	633	\$706.53
LSD§	172.5		1.7	1.4	NS	1.4	0.04	2.0	118	\$101.38
OSL†	0.0195		0.0016	0.0064	0.6004	0.0001	0.0023	0.2649	0.001	0.0305
CV‡	7.4		2.9	2.1	7.9	2.7	2.2	1.4	11.9	7.3

\*Means followed by the same letter are not statistically different according to a Fisher's least significant difference means separation test.

§ Least Significant Difference

† Observed Significance Level

‡ Coefficient of Variation

Table 5. Lint yield and fiber quality results for the Upland cotton variety test conducted in Ashurst, AZ, 2005.

Variety	Lint Yield lbs./acre		Turn-out %	Staple 32nds	Micronaire	Strength g/tex	Length inches	Uniformity %	Premium Points	Crop Value \$/acre
FM960RR	1342.6	a*	35.4	32.5	3.8	28.7	1.02	78.05	-253	\$664.15
FM989RR	1335.1	a	34.7	35.5	3.4	31.7	1.10	79.50	268	\$730.51
DP5690RR	1186.7	b	32.5	35.5	3.6	30.0	1.10	79.80	366	\$660.54
DP494RR	1171.2	b c	34.0	35.5	4.0	29.3	1.11	79.80	340	\$649.04
DP432RR	1158.3	b c	33.2	34.0	3.9	27.0	1.05	80.10	216	\$627.31
FM991RR	1079.4	c	31.8	36.0	3.8	30.6	1.13	79.70	450	\$609.90
DP434RR	951.5	d	34.3	37.5	3.4	31.4	1.16	81.90	306	\$524.02
LSD§	104.0		1.1	0.8	0.1	0.1	0.03	1.0	100	\$60.40
OSL†	0.0001		0.0001	0.0001	0.0001	0.0063	0.0001	0.0001	0.0001	0.0001
CV‡	6.2		2.3	1.6	2.4	5.4	1.7	0.9	27.4	6.7

\*Means followed by the same letter are not statistically different according to a Fisher's least significant difference means separation test.

§ Least Significant Difference

† Observed Significance Level

‡ Coefficient of Variation

Table 6. Lint yield and fiber quality results for the Upland cotton variety test conducted in Kansas Settlement, AZ, 2005.

Variety	Lint Yield lbs./acre		Turn-out %	Staple 32nds	Micronaire	Strength g/tex	Length inches	Uniformity %	Premium Points	Crop Value \$/acre
DP444BR	842.8	a	39.4	34.7	3.3	28.3	1.08	80.3	67	\$438.00
ST5242BR	829.1	a	40.1	32.0	3.9	26.5	1.01	80.3	-257	\$430.00
ST5599BR	676.5	a b	38.9	34.7	3.7	28.4	1.08	79.3	207	\$352.00
151799WS	589.8	b c	33.7	37.7	3.6	32.8	1.16	82.4	495	\$307.00
ST4575BR	547.8	b c	40.1	34.7	4.0	28.9	1.08	80.7	320	\$285.00
FM989B2R	537.3	b c	37.3	34.7	3.6	29.9	1.08	79.2	308	\$280.00
DP432R	535.6	b c	37.3	35.0	3.8	30.2	1.09	80.7	418	\$279.00
FM981LL	527.3	b c	35.2	35.0	3.8	29.0	1.09	80.2	337	\$274.00
DP434R	510.2	b c	39.4	36.0	3.6	27.8	1.12	79.8	402	\$266.00
FM960B2R	504.0	b c	35.7	35.7	3.5	29.3	1.10	79.0	318	\$262.00
PHY710R	461.1	c	38.0	33.7	3.7	29.7	1.05	79.5	130	\$240.00
LSD§	195.0		2.1	1.1	0.1	0.6	0.03	0.9	205	\$101.00
OSL†	0.0046		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0047
CV‡	19.1		3.2	1.9	1.5	1.3	1.7	0.7	49.1	19.2

\*Means followed by the same letter are not statistically different according to a Fisher's least significant difference means separation test.

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† Observed Significance Level

‡ Coefficient of Variation

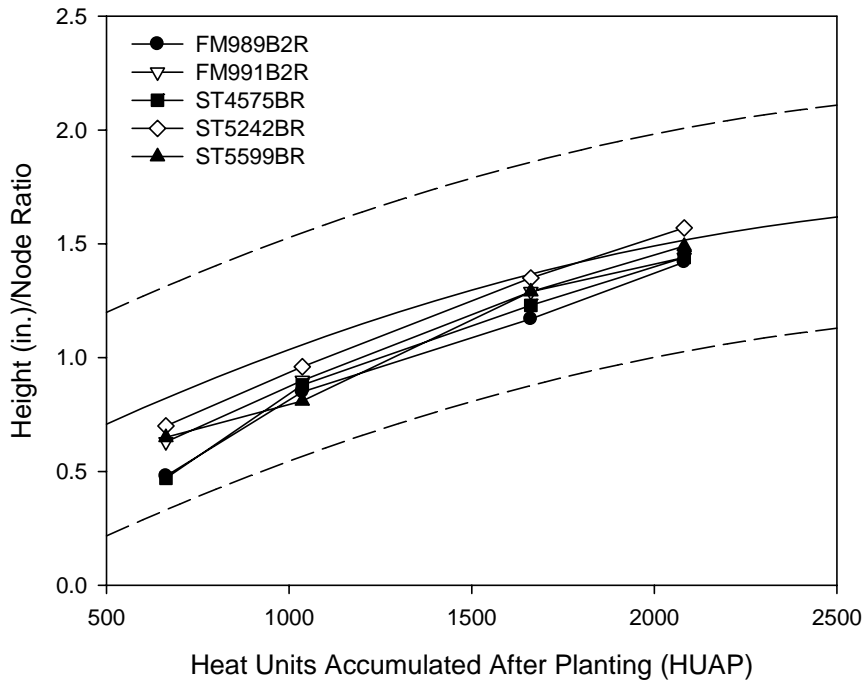
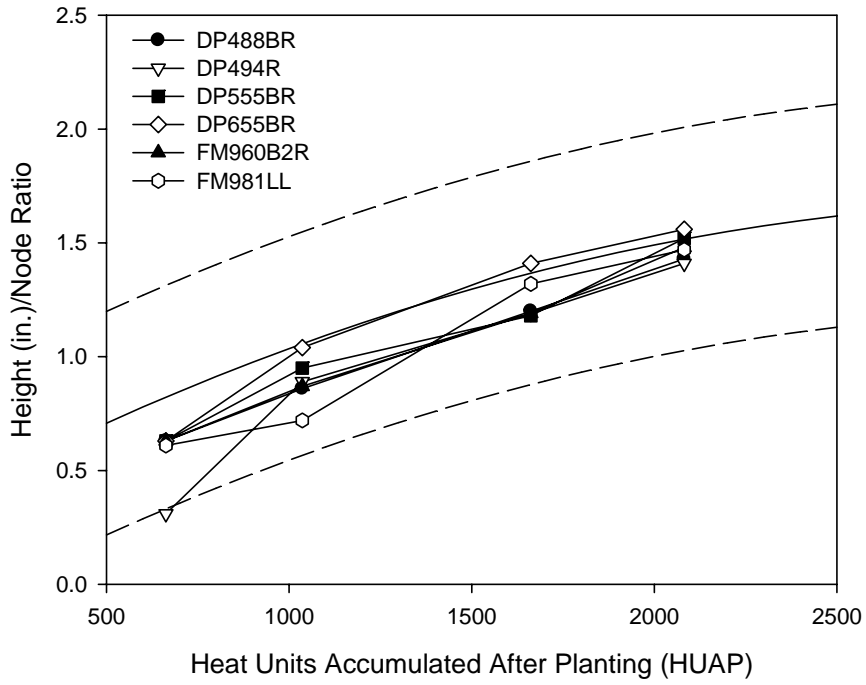


Figure 1. Height (in.) to node ratio trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004.



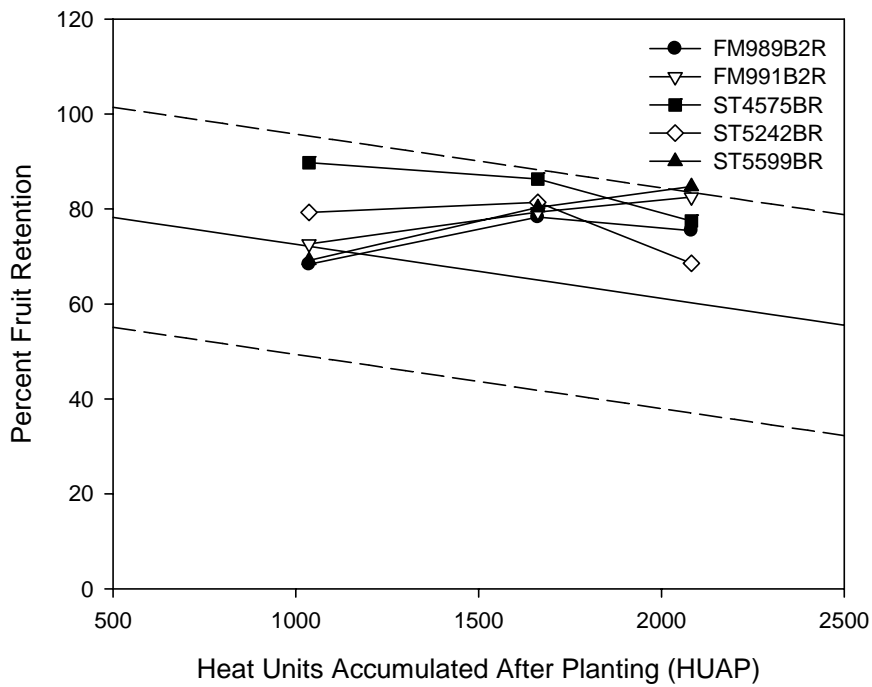
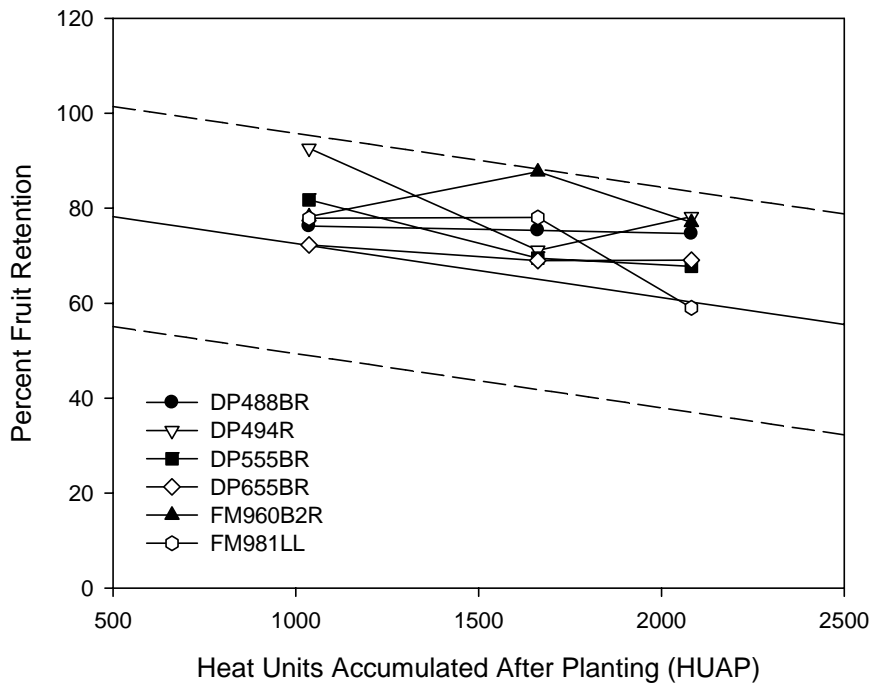


Figure 2. Percent fruit retention trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2004.

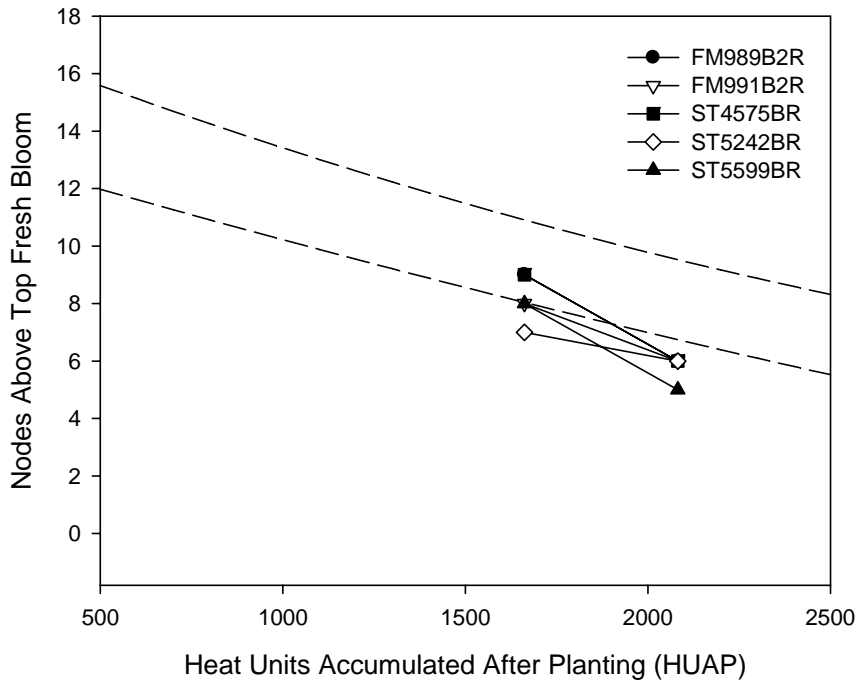
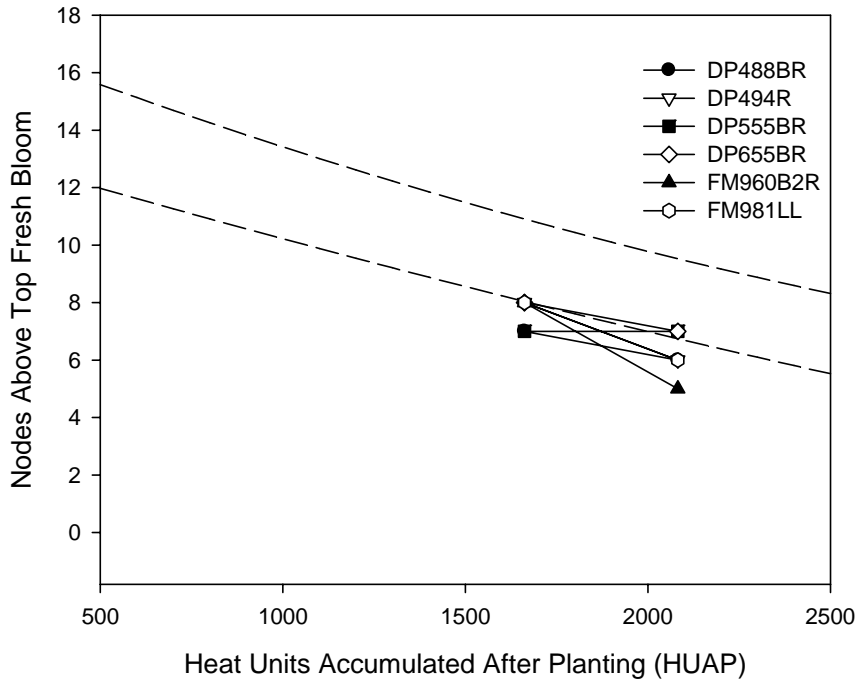


Figure 3. Number of nodes above top fresh bloom trends for each of the twelve varieties included in the Graham County variety evaluation in Thatcher, AZ, 2005.

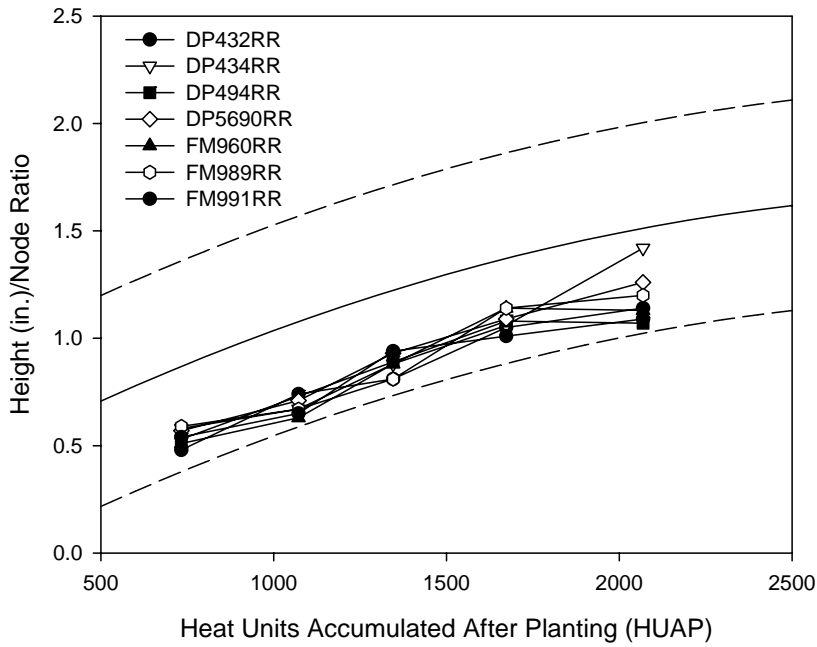


Figure 4. Height (in.) to node ratio trends for each of the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2004.

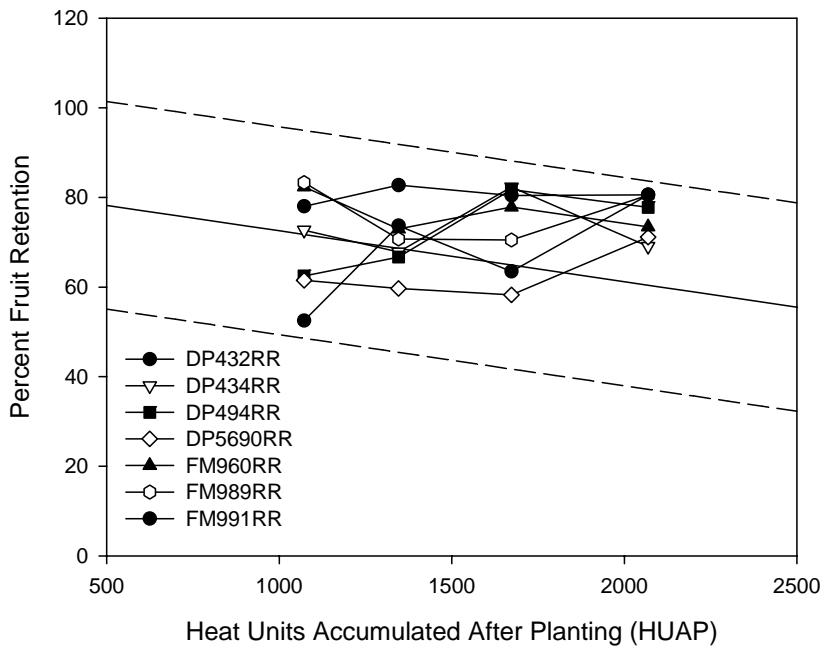


Figure 5. Percent fruit retention trends for each of the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2004.

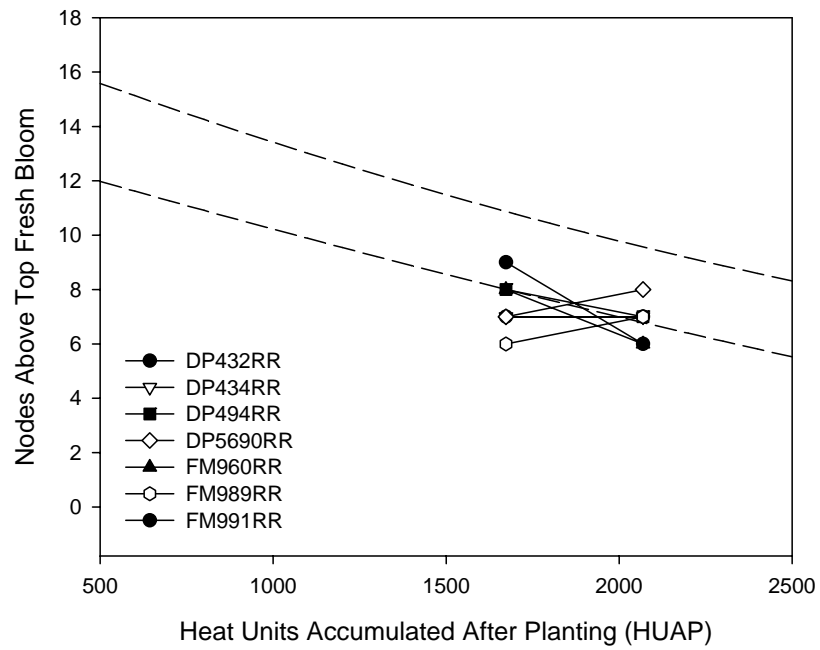


Figure 6. Number of nodes above top fresh bloom trends for each of the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2005.

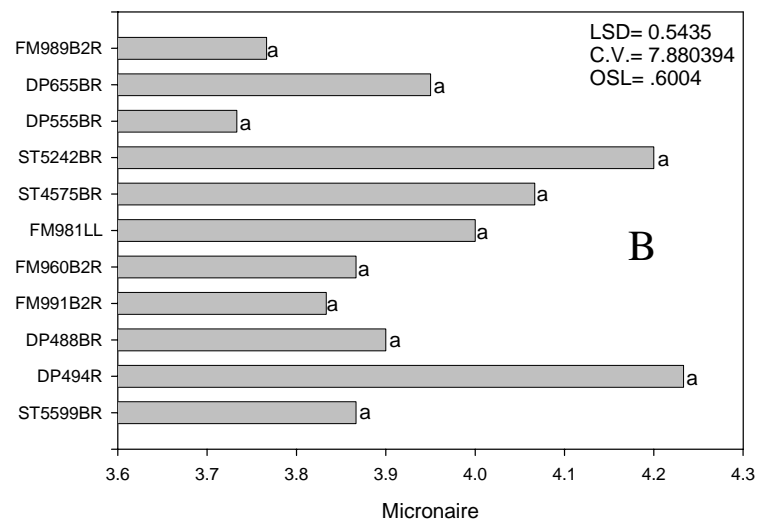
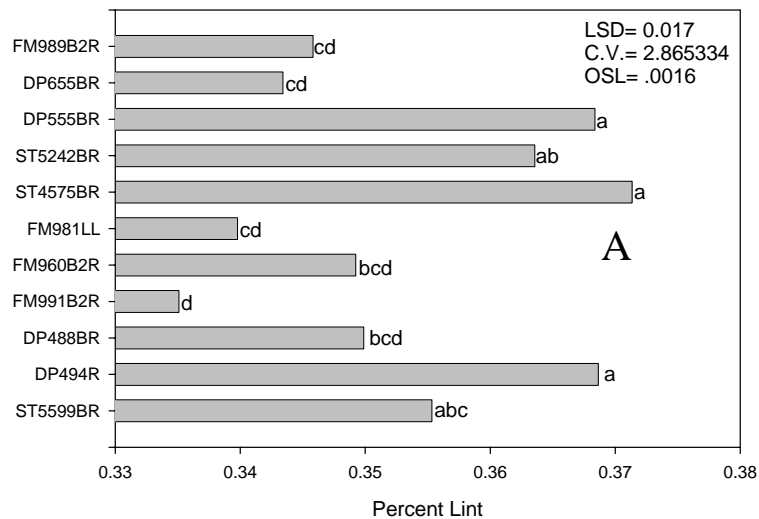
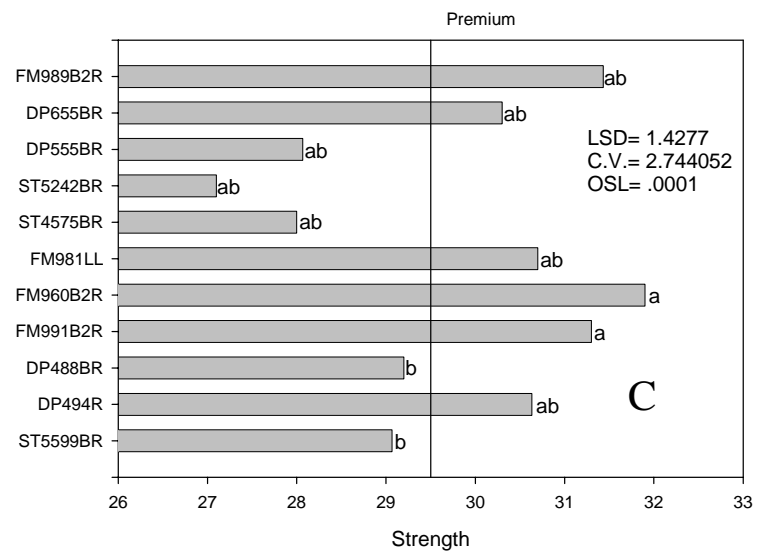


Figure 7. Statistical means separation and analysis of variance results for A) percent lint, B) micronaire, and C) fiber strength for the eleven varieties included in the Graham County variety evaluation in Thatcher, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

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



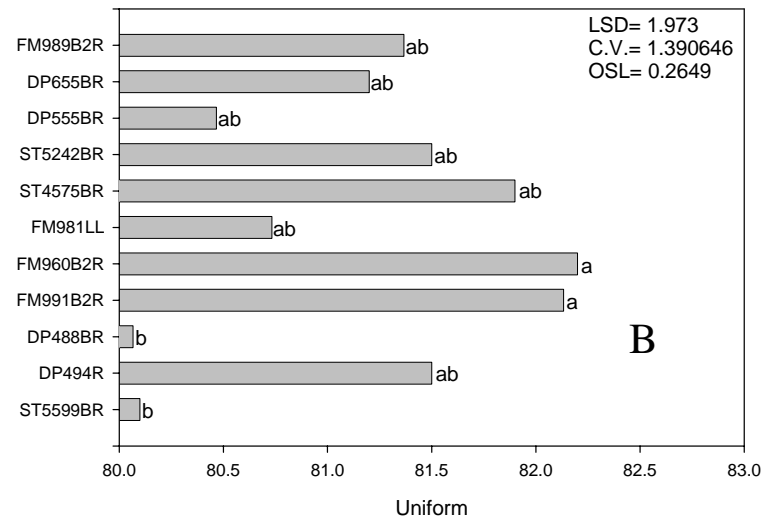
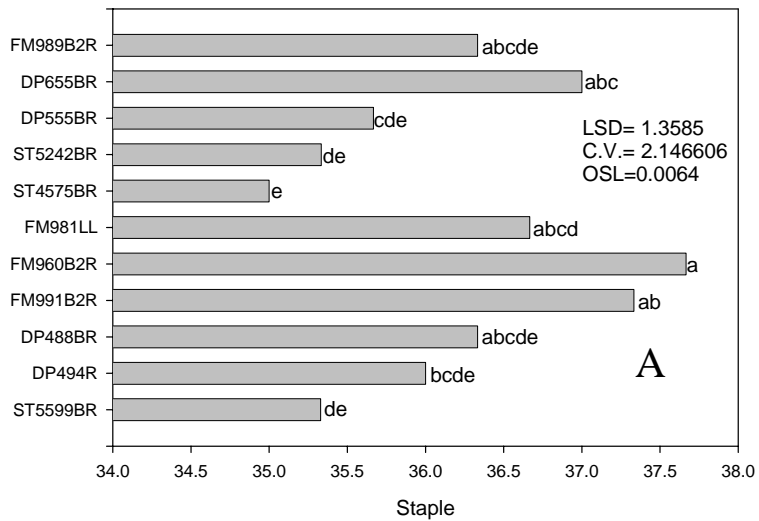


Figure 8. Statistical means separation and analysis of variance results for A) staple length, and B) uniformity index for the eleven varieties included in the Graham County variety evaluation in Thatcher, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

LSD = Least Significant Difference  
 CV = Coefficient of Variation  
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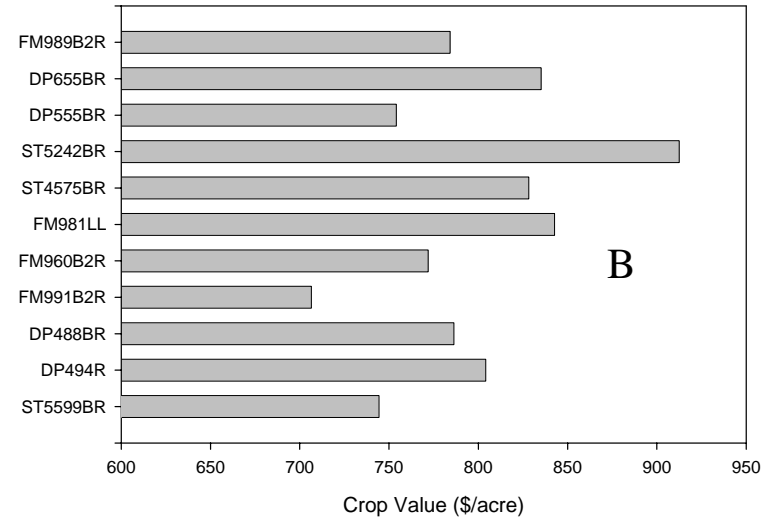
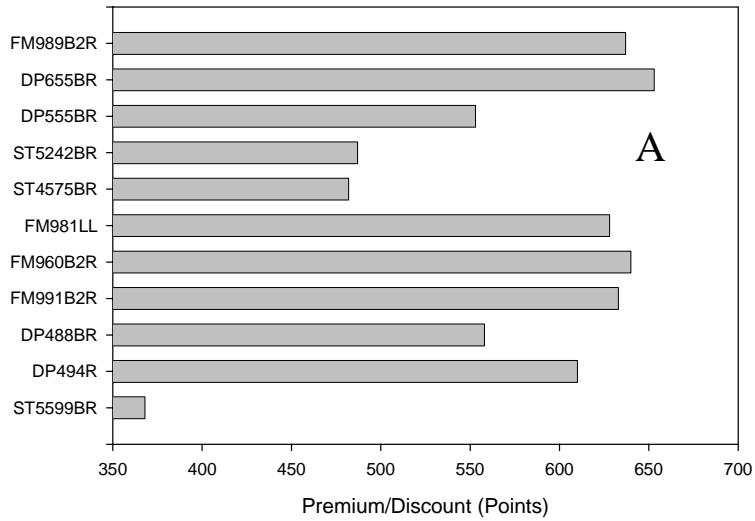
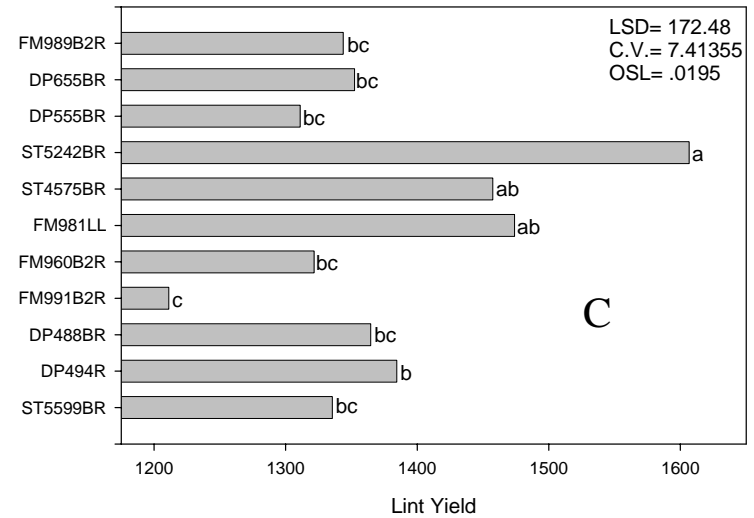


Figure 9. Statistical means separation and analysis of variance results for A) premium/discount, B) total crop value, and C) lint yield for the eleven varieties included in the Graham County variety evaluation in Thatcher, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

LSD = Least Significant Difference  
 CV = Coefficient of Variation  
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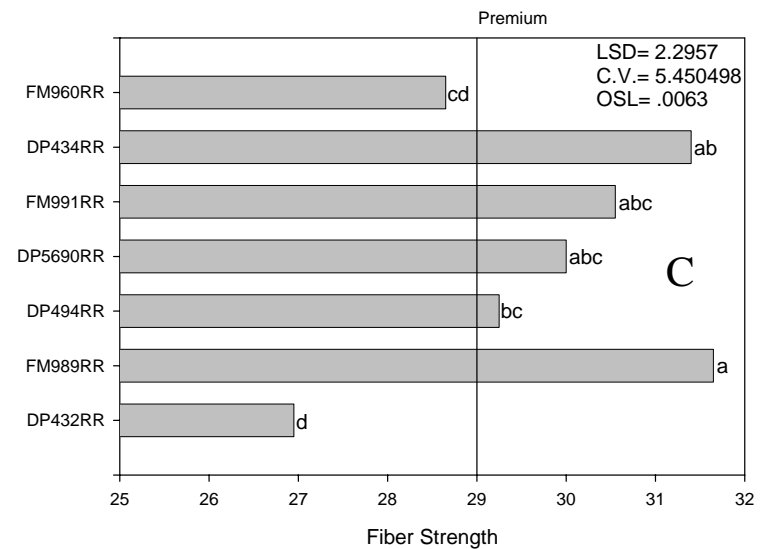
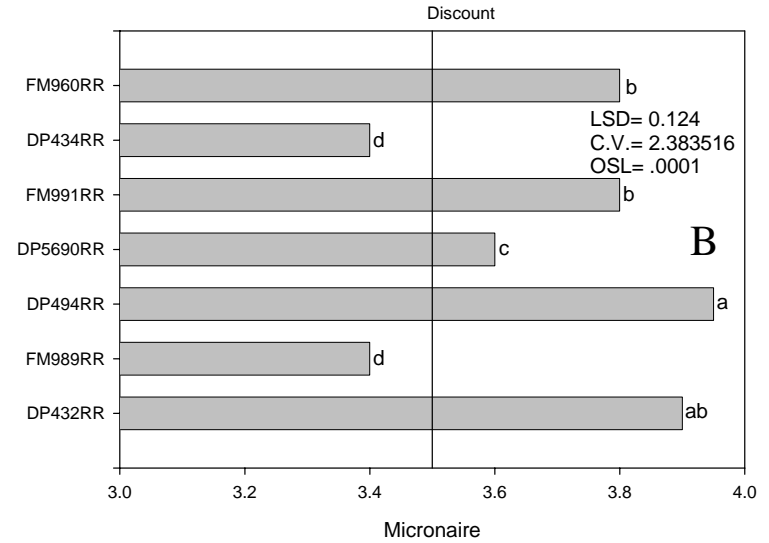
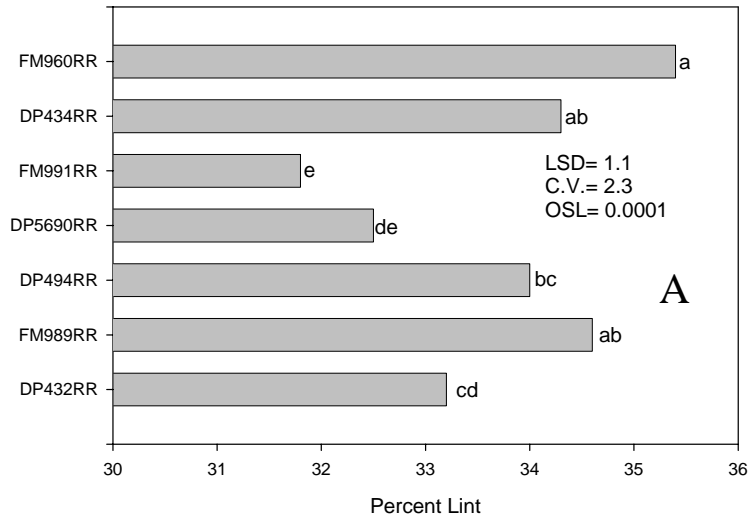


Figure 10. Statistical means separation and analysis of variance results for A) percent lint, B) micronaire, and C) fiber strength for the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

LSD = Least Significant Difference  
 CV = Coefficient of Variation  
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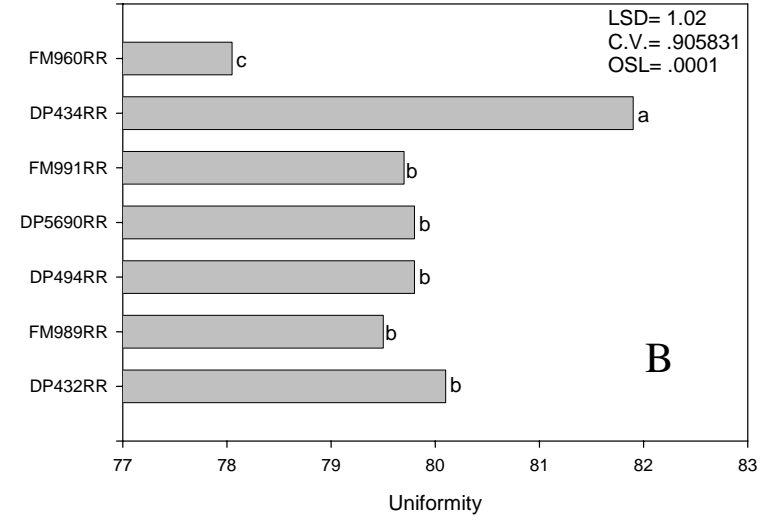
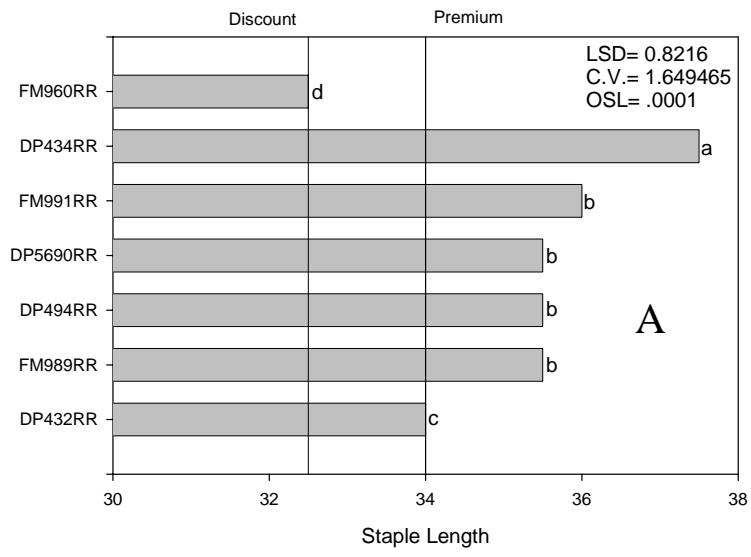


Figure 11. Statistical means separation and analysis of variance results for A) staple length, and B) uniformity index for the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.  
 LSD = Least Significant Difference  
 CV = Coefficient of Variation  
 OSL = Observed Significance Level

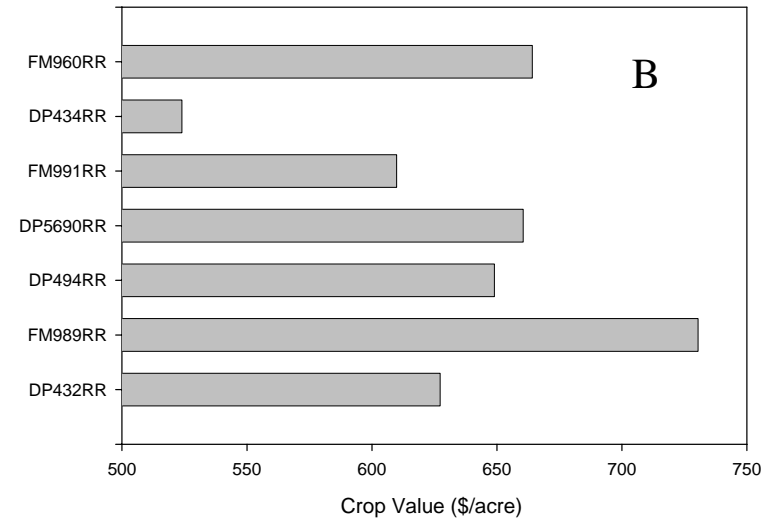
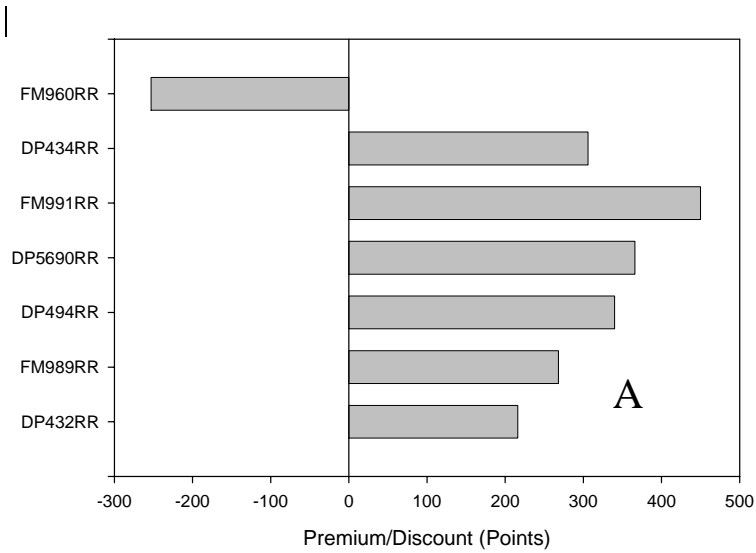
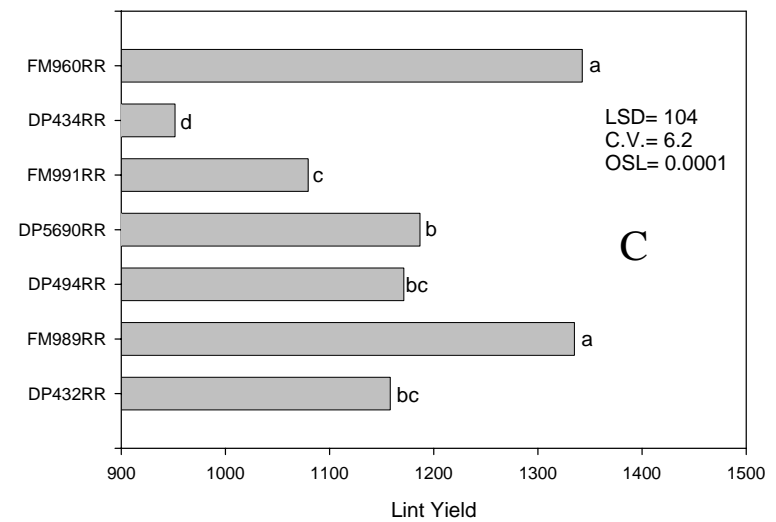


Figure 12. Statistical means separation and analysis of variance results for A) premium/discount, B) total crop value, and C) lint yield for the seven varieties included in the Graham County variety evaluation in Ashurst, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

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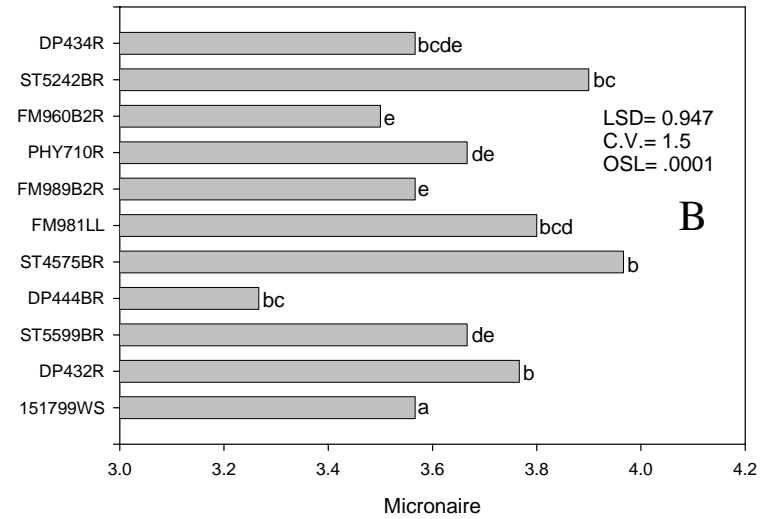
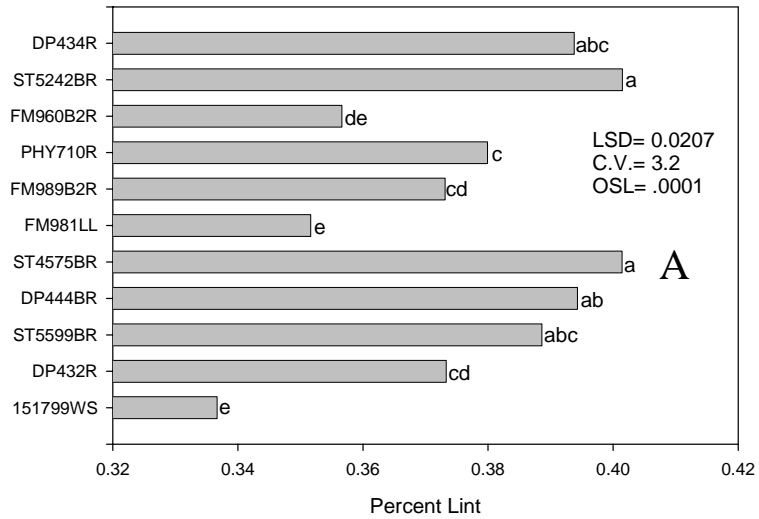
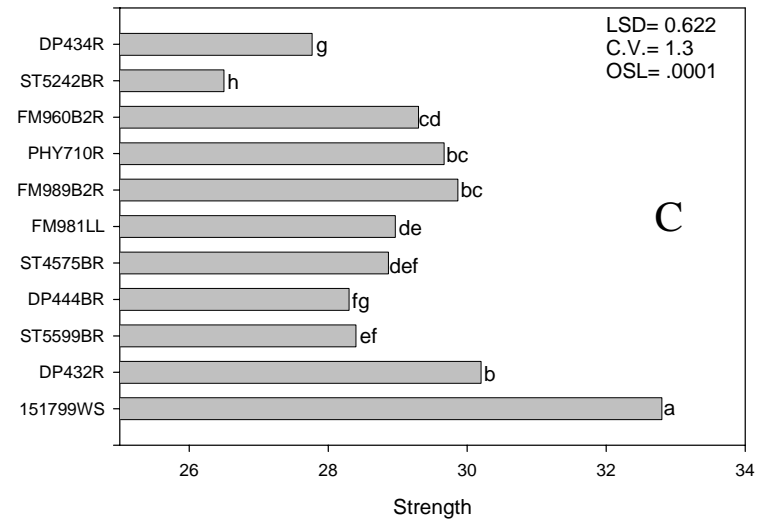


Figure 13. Statistical means separation and analysis of variance results for A) percent lint, B) micronaire, and C) fiber strength for the eleven varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

LSD = Least Significant Difference  
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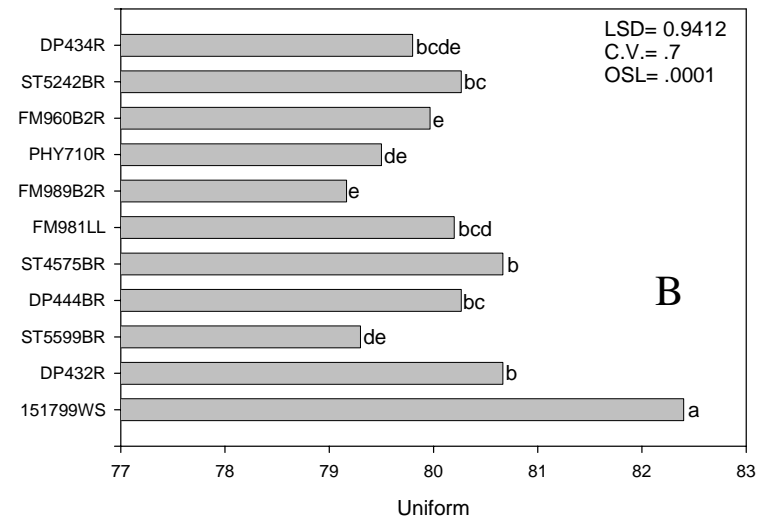
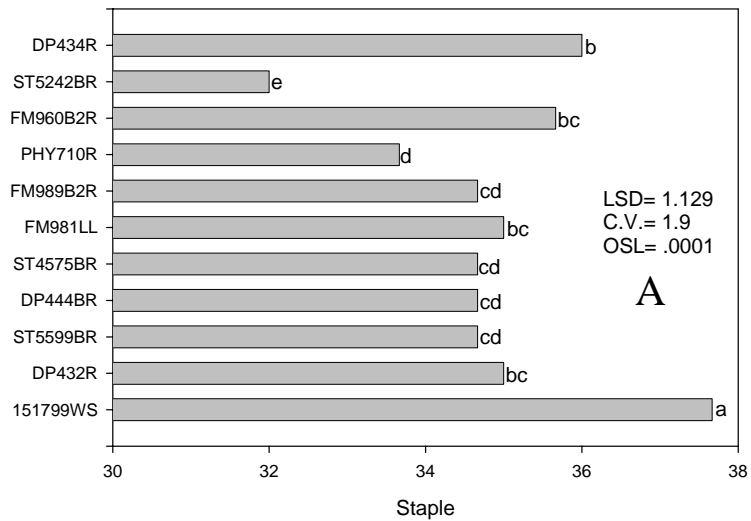


Figure 14. Statistical means separation and analysis of variance results for A) staple length, and B) uniformity index for the eleven varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

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

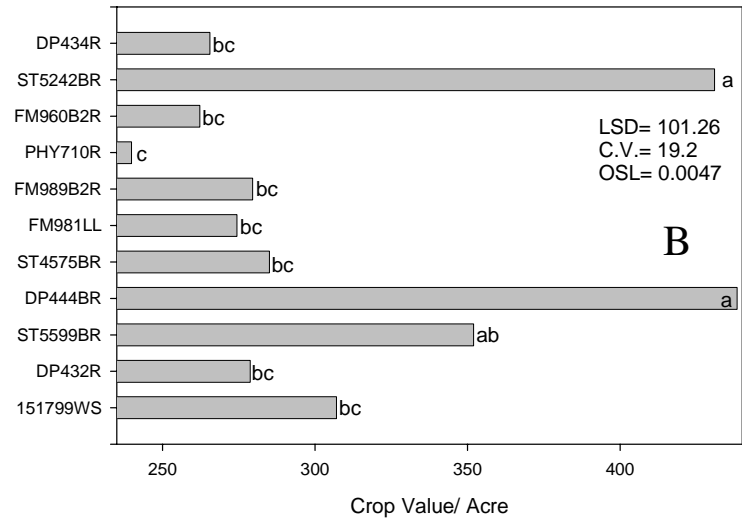
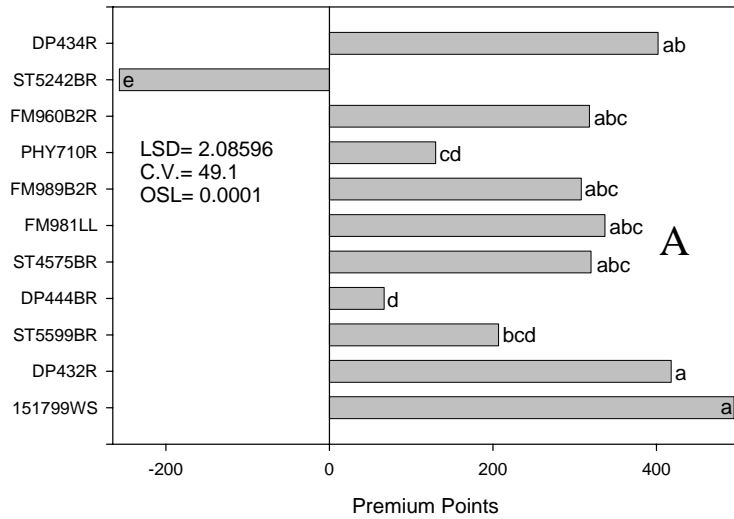


Figure 15. Statistical means separation and analysis of variance results for A) premium/discount, B) total crop value, and C) lint yield for the eleven varieties included in the Cochise County variety evaluation in Kansas Settlement, AZ, 2005. Means followed by the same letter are not significantly different according to a Fisher's least significant difference means separation test.

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

