

2009 Arizona Cotton Growers Association Breeding Program Preliminary and Advanced Strain Testing Program

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Abstract

A series of experiments were conducted across three locations in Arizona to evaluate advanced and preliminary strains from the Arizona Cotton Growers Breeding Program. These trials were conducted in Yuma, AZ (130 ft. above MSL); Maricopa, AZ (1170 ft. above MSL); and Safford, AZ (2900 ft. above MSL). Strains were planted in four row plots extending 38 feet in a randomized complete block design with a minimum of four replications. All data was subjected to statistical analysis to test for differences among strains for yield and fiber quality. Yield was down at the Yuma location in 2009 and in this trial ranged from a low of 812 to just over 1200 pounds lint per acre. Fiber quality was also off with many entries receiving discounts for lower fiber quality. Most of the discounts were due to short staple in higher micronaire. The Maricopa location experienced excellent yields for the 2009 season. The lowest yielding variety produced 1257 and the highest yielding just under 2000 pounds lint per acre. Fiber quality was also excellent for this location with only one entry receiving a discount. The Safford location produced average yields for the 2009 season. Yields ranged from 995 to just under 1600 pounds of lint per acre. Fiber quality was a mixed bag with several entries receiving discounts for fiber quality due primarily to higher micronaire and short staple. At all three locations the Arizona Cotton Growers Association (ACGA) preliminary advanced strains did extremely well when compared to the commercial control entries with respect to both lint yield and fiber quality.

Introduction

One of the most critical decisions a cotton producer will make during the course of the season is which variety is best suited to the region and growing style of a particular operation. With the advent of transgenic technologies and the introduction of new varieties that decision can be very difficult. The decision of a seed company to bring a variety to market and release it for general consumption is made after several years of testing through a breeding program. One of the last steps of a breeding program prior to commercial release is testing of the advanced strains across environments.

The Arizona Cotton Growers Association (ACGA) breeding program is currently in a state of transition without a breeder under contract. However a significant amount of germplasm exists that was developed by the previous breeder which has not been extensively evaluated. The purpose of this project is to continue with the evaluation of preliminary and advanced strain genetic materials that have been developed from the Arizona Cotton Growers Association breeding program. The data generated from these projects has and will continue to provide valuable information to the current program. It allows for decisions to be made with respect to current and future advances in germplasm based upon yield and fiber quality performance characteristics of the genetic material.

Conducting this program in conjunction with, but independent of, the Arizona Upland Cotton Advanced Strains testing program allows for a cost effective method of conducting the evaluations. It also provides quality, unbiased data to support the decision making of the ACGA breeding program. A testing program conducted at multiple locations provides for a powerful database to evaluate the genetic material in question with an opportunity to examine the stability of the strains

across varying yield potential conditions.

Materials and Methods

Three separate field trials were conducted in 2009 across the cotton producing regions of Arizona. These locations included Yuma (130 ft above MSL), Maricopa (1170 ft. above MSL), and Safford (2900 ft above MSL). Plot dimensions were four rows wide and extended 38 feet in length. Row spacing varied among locations with 38, 40, and 42 inch row spacing at Safford, Maricopa, and Yuma respectively. All plots were arranged in a randomized complete block design with four replications. Plots were planted 200 seeds per 40 feet of row length to achieve a plant population of 3-5 plants per linear foot. Further details of each experiment including planting dates, irrigation termination dates, defoliation and harvest dates are contained in Table 1.

Final plant height data was collected from each entry near harvest. Yield was determined by harvesting the center two rows of each experimental unit and weighed with a hanging basket equipped with load cells. A large grab sample (approximately 8 lbs) was also collected from each experimental unit from which percent lint was determined by ginning the sample on a small research gin at the Maricopa Agricultural Center. Fiber quality was determined by the UADA-AMS cotton classing office in Visalia, CA. A premium or discount for each entry was then determined based upon fiber quality data and the USDA CCC (Commodity Credit Corporation) loan schedule. This premium/discount was then applied to a base price of 52 cents per pound and a final crop value was calculated by multiplying the base price plus the premium/discount by the total lint yield of the variety. At harvest, a 50 boll hand-picked sample was also collected from each experimental unit to determine seedcotton weight per boll providing an indication of boll size. All data collected was summarized and analyzed according to statistical procedures as outlined by the SAS Institute.

Results and Conclusions

Yuma

The Yuma location was planted later than usual on 4 March and irrigated to initiate germination on 7 March. Cool conditions in February delayed a normal optimum planting of mid-February. Early season vigor and growth was low with abnormally cool conditions in May and June. Temperatures rose dramatically in July and August during peak bloom resulting in heat induced fruit loss. These conditions resulted in lower than average yields for this region. Final irrigation was applied on 5 August and was defoliated two weeks later on 21 August. Plots were harvested on 3 September. Average final plant height is presented in Figure 1 for the Yuma location and ranges from 35 to 50 inches. Final lint yield and fiber quality data are presented in Table 2 for the Yuma location. Lint yield ranged from a low of 812 pounds to just over 1200 pounds lint per acre. Several varieties received discounts for fiber quality due primarily short staple. Figure 2 presents a scatter plot of lint yield versus premiums associated with fiber quality. Horizontal and vertical reference lines represent average values for lint yield and premium respectively. The upper right-hand quadrant represents varieties that performed better than average with respect to both lint yield and fiber quality. The distribution of this data shows that the majority of the varieties in this trial fell in the upper left-hand quadrant and in the lower right-hand quadrant indicating that the higher-yielding varieties produced lower fiber quality while the lower yielding varieties produced higher fiber quality.

Maricopa

Plots were established at the Maricopa site on 20 April and were planted into a window of relatively good weather for

germination. Excellent early season vigor and fruit set provided the foundation for an excellent crop. The lack of monsoon activity in July and August and thereby the lower humidity levels allowed for retention of much of the fruit that was set during that time. Final irrigation for these plots was applied on 7 September with defoliation occurring on 1 October. Plots were harvested on 27 October. Data for average final plant height is presented in Figure 3 and ranged from 35 to 45 inches. Final lint yield and fiber quality data are presented in Table 3 along with statistical analysis data. Lint yield results in this trial were exceptional for the 2009 season with a low of 1257 pounds and high of just under 2000 pounds lint per acre. Fiber quality at this location and for these entries was also excellent for 2009 with only one variety receiving a slight discount of 0.6 cents per pound. Figure 4 presents a scatter plot of lint yield and premium for the Maricopa location with the vertical line representing the average of the premium and the horizontal reference line representing the average of the lint yield. Distribution of the data at the Maricopa location was clustered right around the average of the trial with no clear trend in yield and fiber quality relationships.

Safford

Plots were established in Safford on 21 April 2009 by planting into moist soil mulch. Seedlings emerged approximately 10 days later. Cooler than average temperatures following planting along with cooler than average temperatures during the months of May and June led to slow growth and less vigor than normal. However, the warmer than average temperatures during the months of July and August and the first part of September made up for the cooler temperatures early in the season. A good fruit load was established and a slightly better than average crop year was experienced at the Safford location. Final irrigation was applied on 25 August with defoliation occurring on 13 October. Plots were harvested on 12 November. Final average plant height data is presented in Figure 5 and ranged from 25 to 40 inches. All final yield and fiber quality data is presented in Table 4 for the Safford location. Lint yields for this particular trial in 2009 were much improved from previous years of looking at Arizona Cotton Growers Association (ACGA) preliminary and advanced strains. Yields in 2009 ranged from 995 pounds just under 1600 pounds lint per acre. Several entries in this trial did suffer some discounts due to fiber quality primarily as a result of higher micronaire and lower fiber staple. Figure 6 presents the scatter plot of data including lint yield and premium associated with fiber quality with horizontal and vertical reference lines again representing the average value for lint yield and premium respectively. The data from the Safford location does not show any relationship with respect to fiber quality and lint yield with data fairly randomly distributed around the intersection of the two mean reference lines. It is interesting to note however, that many of these ACGA entries performed significantly better than the control varieties where this test was located in 2009.

Table 1. Significant crop management dates for each ACGA preliminary and advanced strain evaluation location conducted during the 2009 growing season.

| Location: | Yuma | Maricopa | Safford |
|------------------|------------------|-----------------|------------------|
| Planting Date: | 7 March 2009 | 20 April 2009 | 21 April 2009 |
| Final Irrigation | 5 August 2009 | 7 September | 25 August 2009 |
| Defoliation | 21 August | 1 October | 13 October 2009 |
| Harvest Date: | 3 September 2009 | 27 October 2009 | 12 November 2009 |

Table 2. Yield, fiber quality, and boll weight mean data along with statistical analysis for each of the ACGA preliminary and advanced strains evaluated in Yuma, AZ, 2009.

| Variety | Variety Identifier | Lint Yield | Means Separation * | Lint Turnout | Boll Weight | HVI Color | Staple | Strength | Length | Uniformity | Micronaire | Leaf Grade | Premium | Value |
|-------------------------------|--------------------|--------------|--------------------|--------------|-------------|-----------|-----------|-------------|-------------|-------------|------------|------------|------------|-----------------|
| | | lbs/acre | | Percent | grams | | 32nds | g/tex | Inches | Percent | | | cent/lb | \$/acre |
| 0157-2031-3B-701 | ACGA251 | 1200.4 | a | 33.7 | 4.72 | 41 | 35 | 30.0 | 1.10 | 81.3 | 5.1 | 2 | 0.1 | \$626.41 |
| 0144-2086-3B-701 | ACGA250 | 1198.5 | a | 32.6 | 4.84 | 31 | 35 | 30.9 | 1.07 | 81.7 | 5.1 | 2 | 0.4 | \$623.27 |
| 0112-2014-313-601-701 | ACGA267 | 1189.7 | a | 31.9 | 4.69 | 21 | 32 | 26.8 | 1.01 | 78.9 | 4.4 | 2 | -1.8 | \$595.83 |
| 0101-2165-303-701 | ACGA242 | 1177.7 | a b | 33.5 | 4.37 | 31 | 35 | 30.1 | 1.09 | 80.9 | 4.4 | 1 | 2.9 | \$643.04 |
| 0122-2033-303-701 | ACGA246 | 1177.5 | a b c | 33.3 | 4.60 | 31 | 35 | 29.7 | 1.08 | 81.7 | 4.9 | 2 | 2.6 | \$637.92 |
| 0114-2001-304-601-701 | ACGA268 | 1174.6 | a b c d | 33.1 | 5.22 | 31 | 33 | 27.8 | 1.04 | 80.1 | 4.4 | 2 | -0.2 | \$608.29 |
| 0122-2033-307-701 | ACGA247 | 1167.7 | a b c d e | 32.7 | 5.30 | 31 | 35 | 29.0 | 1.07 | 81.0 | 5.0 | 1 | 1.5 | \$619.42 |
| 0109-2026-302-601-701 | ACGA263 | 1167.1 | a b c d e | 30.9 | 5.20 | 41 | 35 | 29.3 | 1.08 | 80.1 | 4.7 | 2 | 1.3 | \$621.16 |
| 39-501-601-701-801 | ACGA039 | 1164.7 | a b c d e | 33.5 | 5.10 | 31 | 34 | 29.8 | 1.07 | 80.4 | 4.8 | 2 | 1.4 | \$619.71 |
| 0120-2029-301-501-601-701-801 | ACGA082 | 1156.5 | a b c d e | 30.4 | 5.03 | 31 | 36 | 32.7 | 1.12 | 81.2 | 5.0 | 2 | 2.4 | \$623.16 |
| 0115-2100-300-501-601-701 | ACGA269 | 1154.6 | a b c d e | 31.6 | 4.60 | 31 | 34 | 26.3 | 1.07 | 79.4 | 4.4 | 2 | 0.9 | \$605.77 |
| 0119-2006-307-601-701 | ACGA273 | 1122.6 | a b c d e f | 32.0 | 4.82 | 31 | 35 | 31.4 | 1.10 | 81.8 | 5.1 | 2 | 1.3 | \$594.31 |
| 0101-2141-301-501-601-701 | ACGA253 | 1106.2 | a b c d e f g | 32.1 | 5.20 | 31 | 34 | 26.7 | 1.06 | 79.1 | 4.4 | 2 | 1.9 | \$592.85 |
| 0116-2015-309-501-601-701-801 | ACGA070 | 1089.1 | a b c d e f g h | 30.2 | 5.55 | 31 | 36 | 33.1 | 1.12 | 81.1 | 5.3 | 2 | 1.7 | \$579.18 |
| 0101-2100-302-501-601-701 | ACGA252 | 1086.6 | a b c d e f g h | 32.4 | 4.73 | 31 | 34 | 27.9 | 1.06 | 79.7 | 4.6 | 2 | 1.7 | \$580.52 |
| 0118-2B-304-601-701 | ACGA272 | 1080.8 | a b c d e f g h | 31.1 | 4.76 | 31 | 34 | 27.6 | 1.04 | 80.3 | 4.6 | 2 | 1.4 | \$574.67 |
| 0116-2015-302-501-601-701 | ACGA271 | 1076.7 | a b c d e f g h | 30.2 | 5.42 | 31 | 36 | 32.2 | 1.12 | 81.0 | 5.0 | 2 | 2.4 | \$581.52 |
| 0106-2004-3B-701 | ACGA243 | 1076.3 | a b c d e f g h | 33.4 | 4.74 | 31 | 34 | 29.8 | 1.07 | 80.3 | 5.2 | 2 | -0.6 | \$548.27 |
| 0109-2026-310-601-701 | ACGA264 | 1060.9 | a b c d e f g h | 28.3 | 5.49 | 31 | 36 | 32.9 | 1.14 | 81.6 | 5.1 | 2 | 2.3 | \$572.10 |
| 0119-2016-303-601-701 | ACGA274 | 1043.8 | b c d e f g h i | 33.2 | 4.51 | 31 | 36 | 32.4 | 1.13 | 82.0 | 4.9 | 3 | 4.1 | \$581.00 |
| 0122-2036-303-701 | ACGA248 | 1036.9 | c d e f g h i | 32.2 | 5.12 | 31 | 34 | 30.0 | 1.07 | 81.7 | 4.8 | 2 | 1.5 | \$551.91 |
| 0112-2016-301-701 | ACGA244 | 1036.7 | d e f g h i | 29.7 | 5.27 | 31 | 36 | 32.6 | 1.11 | 82.3 | 5.2 | 2 | 2.4 | \$559.15 |
| 0102-2032-302-601-701 | ACGA254 | 1036.6 | e f g h i | 30.3 | 5.51 | 31 | 34 | 30.1 | 1.07 | 81.6 | 5.0 | 2 | 0.3 | \$539.98 |
| 0106-2008-301-601-701 | ACGA257 | 1028.3 | e f g h i | 31.7 | 5.09 | 31 | 35 | 31.3 | 1.10 | 81.6 | 5.2 | 2 | 1.7 | \$547.83 |
| 0109-2024-301-601-701 | ACGA261 | 1012.6 | f g h i j | 30.8 | 4.82 | 31 | 34 | 29.2 | 1.06 | 80.3 | 4.9 | 2 | 1.1 | \$532.05 |
| 0106-2008-305-601-701 | ACGA259 | 1007.6 | f g h i j | 28.2 | 5.04 | 31 | 37 | 31.4 | 1.14 | 81.5 | 4.8 | 2 | 5.1 | \$569.97 |
| 0106-2008-303-601-701 | ACGA258 | 997.0 | f g h i j | 28.4 | 5.02 | 31 | 36 | 32.1 | 1.12 | 81.9 | 5.0 | 2 | 2.4 | \$537.26 |
| 0104-2019-301-601-701 | ACGA256 | 980.5 | g h i j k | 30.4 | 4.62 | 31 | 34 | 30.4 | 1.07 | 81.0 | 4.7 | 2 | 2.7 | \$533.31 |
| 0116-2015-306-501-601-701-801 | ACGA068 | 967.5 | g h i j k | 30.1 | 5.57 | 31 | 35 | 31.6 | 1.10 | 81.9 | 5.2 | 2 | 1.1 | \$510.66 |
| 0112-2014-309-601-701 | ACGA266 | 963.0 | h i j k | 28.5 | 4.47 | 31 | 33 | 30.4 | 1.04 | 81.8 | 4.9 | 2 | -0.5 | \$496.65 |
| 0109-2024-304-601-701 | ACGA262 | 961.7 | h i j k | 31.2 | 5.08 | 31 | 34 | 30.3 | 1.08 | 81.4 | 5.0 | 2 | 1.5 | \$509.70 |
| ST45542RF | ST45542RF | 961.5 | h i j k | 31.0 | 4.73 | 31 | 35 | 31.3 | 1.08 | 81.8 | 5.0 | 3 | 2.3 | \$518.79 |
| 0116-2B-326-701 | ACGA245 | 960.2 | h i j k | 30.7 | 4.99 | 31 | 35 | 33.8 | 1.08 | 83.0 | 5.1 | 2 | 2.3 | \$517.47 |
| 0116-2011-309-501-601-701 | ACGA270 | 954.5 | h i j k | 28.6 | 5.12 | 31 | 37 | 33.4 | 1.15 | 82.3 | 5.0 | 2 | 3.2 | \$520.53 |
| 0122-2015-305501-601-701-801 | ACGA078 | 915.1 | i j k l | 30.5 | 5.03 | 31 | 36 | 30.5 | 1.10 | 80.6 | 5.0 | 2 | 2.2 | \$491.40 |
| 0106-2011-308-601-701 | ACGA260 | 881.3 | j k l | 28.3 | 4.32 | 21 | 35 | 30.7 | 1.10 | 80.0 | 4.5 | 2 | 4.0 | \$489.94 |
| DP161B2RF | DP161B2RF | 878.2 | j k l | 30.3 | 4.46 | 41 | 37 | 31.5 | 1.14 | 81.5 | 4.5 | 3 | 3.0 | \$481.85 |
| 0109-2027-302-601-701 | ACGA265 | 854.1 | k l | 28.9 | 5.17 | 31 | 34 | 29.3 | 1.06 | 80.1 | 4.8 | 2 | 1.8 | \$457.28 |
| 0144-2036-304-701 | ACGA249 | 843.2 | k l | 27.0 | 5.08 | 31 | 36 | 33.0 | 1.13 | 81.8 | 4.9 | 2 | 4.3 | \$470.09 |
| 0102-2035-302-601-701 | ACGA255 | 812.0 | l | 28.0 | 5.03 | 41 | 34 | 31.6 | 1.07 | 81.7 | 5.1 | 2 | -1.4 | \$411.58 |
| LSD§ | | 140.8 | | 1.3 | 0.4 | --- | 1.0 | 1.4 | 0.03 | 1.0 | 0.2 | 0.1 | 2.5 | \$77.40 |
| OSL† | | 0.0001 | | 0.0001 | 0.0001 | --- | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0002 | 0.0001 |
| CV‡ | | 9.6 | | 2.9 | 6.0 | --- | 2.0 | 3.2 | 1.8 | 0.9 | 2.8 | 17.6 | 125.2 | 9.9 |

*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

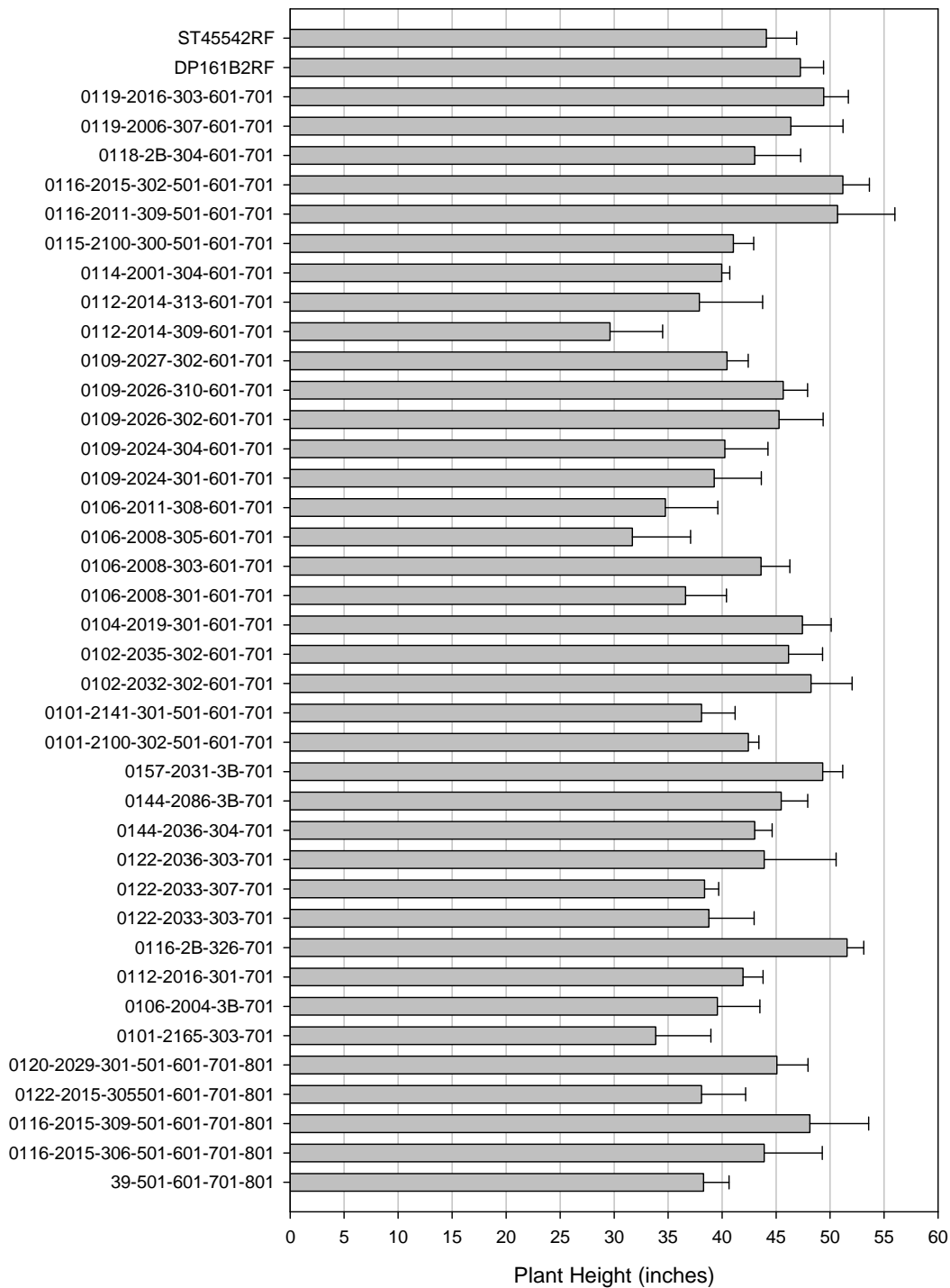
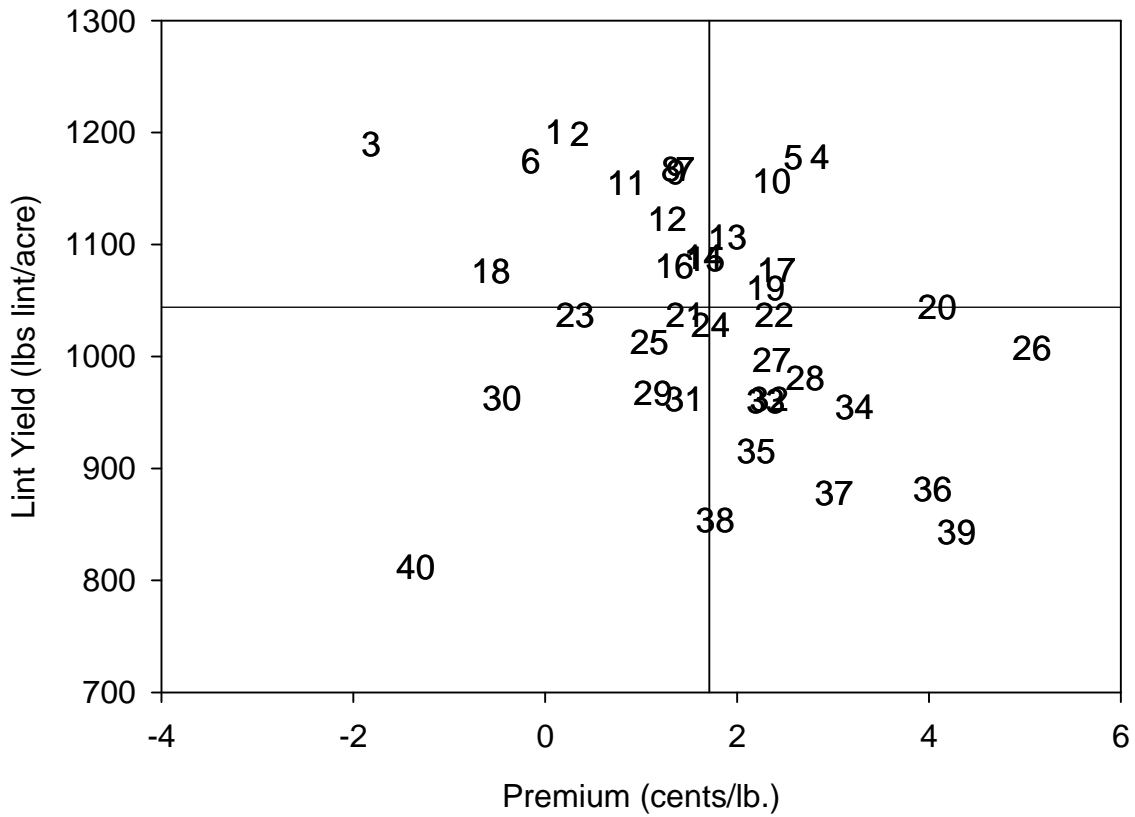


Figure 1. Mean final plant height (inches) along with the standard deviation for each of the ACMA Preliminary and advanced strains evaluated in Yuma, AZ, 2009.



| | | | |
|----------------------------------|----------------------------------|----------------------------------|---------------------------------|
| 1 0157-2031-3B-701 | 11 0115-2100-300-501-601-701 | 21 0122-2036-303-701 | 31 0109-2024-304-601-701 |
| 2 0144-2086-3B-701 | 12 0119-2006-307-601-701 | 22 0112-2016-301-701 | 32 ST45542RF |
| 3 0112-2014-313-601-701 | 13 0101-2141-301-501-601-701 | 23 0102-2032-302-601-701 | 33 0116-2B-326-701 |
| 4 0101-2165-303-701 | 14 0116-2015-309-501-601-701-801 | 24 0106-2008-301-601-701 | 34 0116-2011-309-501-601-701 |
| 5 0122-2033-303-701 | 15 0101-2100-302-501-601-701 | 25 0109-2024-301-601-701 | 35 0122-2015-305501-601-701-801 |
| 6 0114-2001-304-601-701 | 16 0118-2B-304-601-701 | 26 0106-2008-305-601-701 | 36 0106-2011-308-601-701 |
| 7 0122-2033-307-701 | 17 0116-2015-302-501-601-701 | 27 0106-2008-303-601-701 | 37 DP161B2RF |
| 8 0109-2026-302-601-701 | 18 0106-2004-3B-701 | 28 0104-2019-301-601-701 | 38 0109-2027-302-601-701 |
| 9 39-501-601-701-801 | 19 0109-2026-310-601-701 | 29 0116-2015-306-501-601-701-801 | 39 0144-2036-304-701 |
| 10 0120-2029-301-501-601-701-801 | 20 0119-2016-303-601-701 | 30 0112-2014-309-601-701 | 40 0102-2035-302-601-701 |

Figure 2. Lint yield (lbs/acre) plotted as a function of fiber quality premium/discount (cents/lb). Vertical and horizontal lines represent the mean value for the two parameters. Varieties that fall in the upper right quadrant formed by the mean lines produced higher than average lint yield and fiber quality. Each of the ACGA preliminary and advanced strain entries are plotted for the Yuma, AZ location in 2009.

Table 3. Yield, fiber quality, and boll weight mean data along with statistical analysis for each of the ACGA preliminary and advanced strains evaluated in Maricopa, AZ, 2009.

| Variety | Variety Identifier | Lint Yield | Means Separation * | Lint Turnout | Boll Weight | HVI Color | Staple | Strength | Length | Uniformity | Micronaire | Leaf Grade | Premium | Value |
|-------------------------------|--------------------|---------------|--------------------|--------------|-------------|-----------|-----------|-------------|-------------|-------------|------------|------------|------------|-------------------|
| | | lbs/acre | | Percent | grams | | 32nds | g/tex | Inches | Percent | | | cent/lb | \$/acre |
| 0116-28-326-701 | ACGA246 | 1993.3 | a | 34.5 | 5.26 | 31 | 36 | 31.4 | 1.11 | 82.2 | 4.9 | 3 | 3.0 | \$1,095.38 |
| 39-501-601-701-801 | ACGA039 | 1981.5 | a | 34.0 | 4.48 | 31 | 37 | 31.8 | 1.15 | 81.5 | 4.7 | 2 | 4.9 | \$1,127.69 |
| 0122-2033-307-701 | ACGA248 | 1974.9 | a | 32.6 | 5.07 | 31 | 35 | 30.6 | 1.11 | 82.0 | 5.0 | 2 | 1.7 | \$1,062.77 |
| 0109-2026-302-601-701 | ACGA264 | 1973.9 | a | 34.4 | 5.14 | 31 | 37 | 33.1 | 1.17 | 81.7 | 5.3 | 2 | 1.8 | \$1,060.23 |
| 0119-2016-303-601-701 | ACGA276 | 1970.5 | a | 34.2 | 4.25 | 31 | 36 | 33.0 | 1.14 | 81.6 | 4.9 | 2 | 3.3 | \$1,087.89 |
| ST45542RF | ST45542RF | 1969.6 | a | 33.7 | 5.18 | 21 | 37 | 32.4 | 1.14 | 82.9 | 4.9 | 3 | 4.9 | \$1,119.87 |
| 0144-2036-304-701 | ACGA250 | 1951.0 | a b | 32.9 | 4.43 | 31 | 36 | 32.4 | 1.11 | 81.1 | 5.1 | 2 | 2.1 | \$1,056.17 |
| 0119-2006-307-601-701 | ACGA275 | 1942.4 | a b | 33.6 | 4.48 | 31 | 35 | 30.8 | 1.10 | 81.1 | 4.8 | 2 | 4.1 | \$1,089.60 |
| 0116-2011-309-501-601-701 | ACGA272 | 1936.5 | a b | 33.1 | 4.48 | 31 | 36 | 30.4 | 1.12 | 81.8 | 4.7 | 2 | 4.5 | \$1,094.06 |
| 0109-2024-301-601-701 | ACGA262 | 1916.2 | a b c | 33.0 | 4.68 | 31 | 37 | 33.2 | 1.14 | 82.4 | 5.1 | 2 | 1.7 | \$1,030.67 |
| 0106-2004-38-701 | ACGA243 | 1902.7 | a b c d | 34.2 | 4.06 | 31 | 36 | 31.8 | 1.13 | 81.4 | 4.8 | 3 | 3.7 | \$1,059.34 |
| DP161B2RF | DP161B2RF | 1898.5 | a b c d e | 32.8 | 4.10 | 31 | 37 | 31.7 | 1.16 | 81.6 | 4.6 | 3 | 4.4 | \$1,069.80 |
| 0120-2029-301-501-601-701-801 | ACGA082 | 1893.0 | a b c d e | 32.3 | 3.73 | 31 | 37 | 33.5 | 1.14 | 82.6 | 4.9 | 3 | 3.3 | \$1,047.72 |
| 0122-2033-303-701 | ACGA247 | 1876.8 | a b c d e | 34.7 | 5.08 | 21 | 36 | 30.5 | 1.11 | 81.2 | 4.9 | 2 | 4.7 | \$1,064.34 |
| 0116-2015-309-501-601-701-801 | ACGA070 | 1871.7 | a b c d e | 32.3 | 4.82 | 31 | 37 | 33.0 | 1.15 | 81.9 | 5.2 | 3 | 1.7 | \$1,005.10 |
| 0144-2086-38-701 | ACGA251 | 1852.7 | a b c d e | 32.5 | 4.02 | 31 | 37 | 31.3 | 1.14 | 82.2 | 4.9 | 2 | 3.8 | \$1,035.42 |
| 0116-2015-302-501-601-701 | ACGA273 | 1846.0 | a b c d e f g | 32.7 | 3.83 | 31 | 37 | 33.3 | 1.15 | 83.3 | 4.5 | 3 | 4.7 | \$1,046.22 |
| 0106-2011-308-601-701 | ACGA261 | 1826.2 | a b c d e f g h | 32.5 | 4.52 | 31 | 37 | 33.3 | 1.16 | 82.3 | 4.9 | 2 | 4.1 | \$1,025.42 |
| 0102-2035-302-601-701 | ACGA256 | 1818.1 | a b c d e f g h | 33.1 | 4.54 | 31 | 36 | 30.5 | 1.11 | 81.5 | 4.7 | 3 | 3.5 | \$1,008.18 |
| 0116-2015-306-501-601-701-801 | ACGA068 | 1814.8 | a b c d e f g h i | 30.6 | 4.87 | 31 | 37 | 32.8 | 1.15 | 82.7 | 4.8 | 3 | 4.5 | \$1,024.93 |
| 0104-2019-301-601-701 | ACGA257 | 1812.6 | a b c d e f g h i | 31.8 | 4.36 | 31 | 36 | 31.6 | 1.13 | 81.5 | 5.2 | 2 | 1.1 | \$961.55 |
| 0119-2023-308-601-701 | ACGA245 | 1811.4 | a b c d e f g h i | 31.9 | 4.62 | 31 | 36 | 33.0 | 1.11 | 82.2 | 5.1 | 2 | 2.5 | \$988.22 |
| 0118-28-304-601-701 | ACGA274 | 1808.1 | a b c d e f g h i | 31.5 | 4.50 | 31 | 38 | 33.0 | 1.17 | 82.6 | 4.8 | 2 | 5.0 | \$1,030.34 |
| 0109-2024-304-601-701 | ACGA263 | 1807.2 | a b c d e f g h i | 31.4 | 4.31 | 31 | 36 | 30.9 | 1.14 | 81.0 | 4.4 | 3 | 3.8 | \$1,008.75 |
| 0157-2031-38-701 | ACGA252 | 1757.0 | b c d e f g h i j | 32.9 | 4.27 | 31 | 35 | 28.9 | 1.10 | 80.1 | 4.5 | 2 | 3.8 | \$980.23 |
| 0101-2100-302-501-601-701 | ACGA253 | 1753.6 | b c d e f g h i j | 32.8 | 4.80 | 21 | 36 | 29.4 | 1.12 | 79.8 | 4.4 | 2 | 4.4 | \$989.87 |
| 0114-2001-304-601-701 | ACGA270 | 1723.6 | c d e f g h i j | 29.6 | 4.42 | 31 | 37 | 32.9 | 1.18 | 82.1 | 4.8 | 3 | 3.2 | \$951.41 |
| 0122-2036-303-701 | ACGA249 | 1718.3 | c d e f g h i j | 28.6 | 4.84 | 31 | 37 | 33.7 | 1.16 | 81.6 | 5.1 | 2 | 1.9 | \$924.86 |
| 0101-2141-301-501-601-701 | ACGA254 | 1711.8 | d e f g h i j | 31.0 | 4.98 | 31 | 35 | 32.3 | 1.11 | 82.3 | 4.8 | 3 | 3.4 | \$948.03 |
| 0102-2032-302-601-701 | ACGA255 | 1698.9 | d e f g h i j | 28.7 | 5.16 | 31 | 37 | 33.8 | 1.14 | 82.3 | 4.9 | 2 | 3.5 | \$942.37 |
| 0109-2026-310-601-701 | ACGA265 | 1695.9 | e f g h i j | 28.9 | 4.77 | 21 | 36 | 30.9 | 1.13 | 80.7 | 4.8 | 2 | 4.7 | \$962.30 |
| 0122-2015-305501-601-701-801 | ACGA078 | 1674.5 | f g h i j | 30.8 | 4.42 | 31 | 38 | 33.7 | 1.19 | 82.5 | 4.7 | 2 | 4.3 | \$942.53 |
| 0106-2008-303-601-701 | ACGA259 | 1673.3 | f g h i j | 29.8 | 4.39 | 31 | 38 | 32.7 | 1.19 | 82.6 | 4.9 | 2 | 3.8 | \$934.19 |
| 0112-2014-313-601-701 | ACGA268 | 1642.7 | g h i j | 33.9 | 4.81 | 31 | 35 | 31.3 | 1.10 | 81.2 | 4.7 | 3 | 3.5 | \$911.81 |
| 0120-2029-301-501-601-701 | ACGA271 | 1639.9 | h i j | 30.7 | 5.08 | 31 | 37 | 33.2 | 1.16 | 82.3 | 5.2 | 2 | 1.9 | \$882.48 |
| 0101-2165-303-701 | ACGA242 | 1612.5 | i j | 33.1 | 3.98 | 31 | 36 | 31.6 | 1.11 | 80.9 | 4.0 | 2 | 4.7 | \$914.80 |
| 0106-2008-301-601-701 | ACGA258 | 1600.5 | j | 30.0 | 4.73 | 31 | 37 | 32.6 | 1.15 | 82.4 | 4.9 | 3 | 2.7 | \$876.03 |
| 0112-2014-309-601-701 | ACGA267 | 1595.4 | j | 33.8 | 4.86 | 21 | 36 | 31.4 | 1.12 | 81.7 | 4.7 | 2 | 5.0 | \$907.91 |
| 0106-2008-305-601-701 | ACGA260 | 1570.1 | j | 28.6 | 3.70 | 31 | 36 | 30.8 | 1.13 | 80.3 | 4.6 | 2 | 3.8 | \$874.95 |
| 0109-2027-302-601-701 | ACGA266 | 1257.9 | k | 29.4 | 4.34 | 31 | 34 | 31.3 | 1.06 | 81.8 | 5.0 | 2 | -0.6 | \$648.01 |
| LSD§ | | 204.1 | | 2.1 | 0.5 | --- | 0.9 | 1.3 | 0.03 | 0.9 | 0.2 | 0.6 | 1.9 | \$114.70 |
| OSL† | | 0.0001 | | 0.0001 | 0.0001 | --- | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 |
| CV‡ | | 8.1 | | 4.6 | 8.1 | --- | 1.8 | 2.8 | 2.0 | 0.8 | 3.1 | 17.4 | 39.6 | 8.2 |

*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

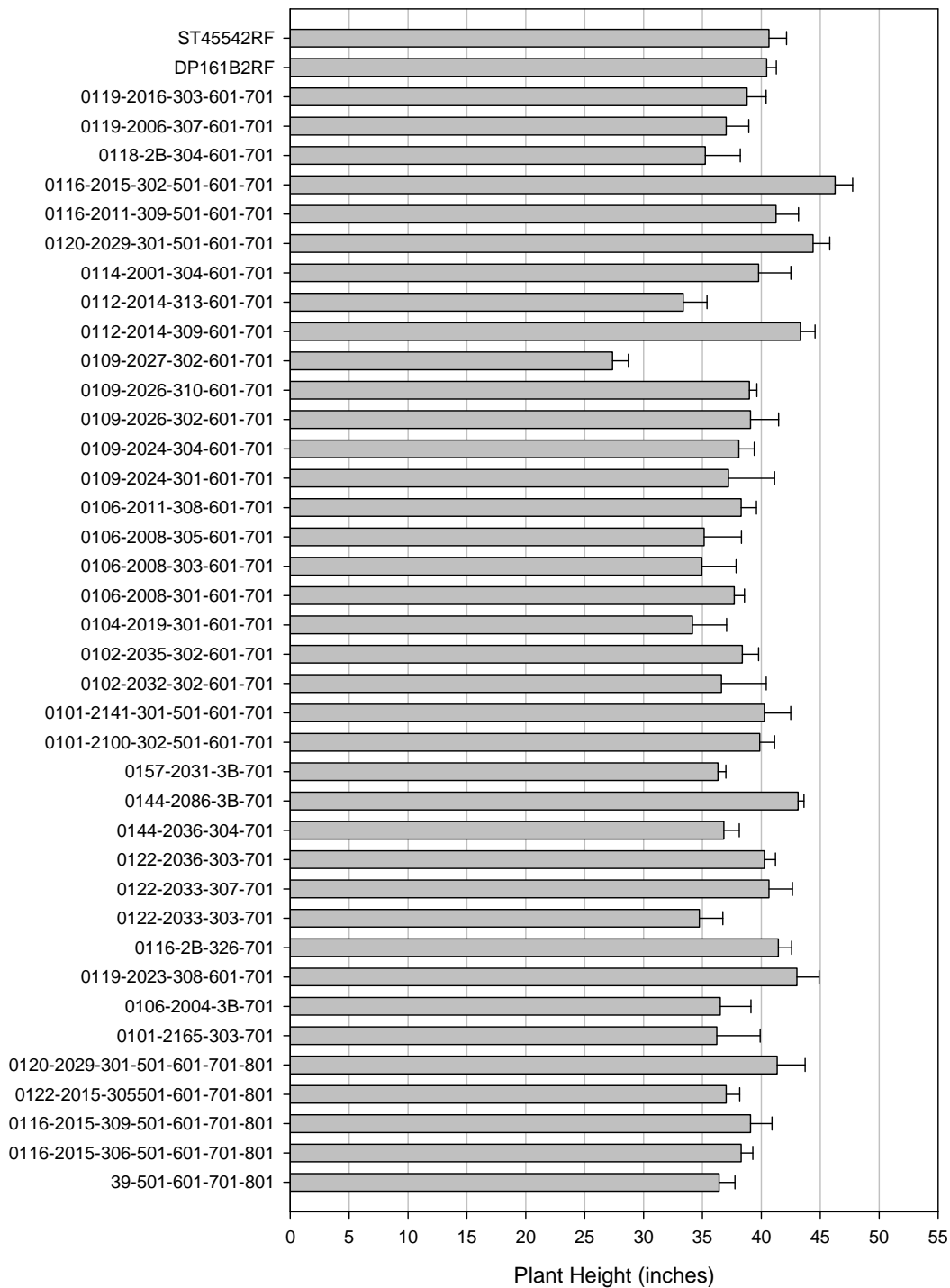
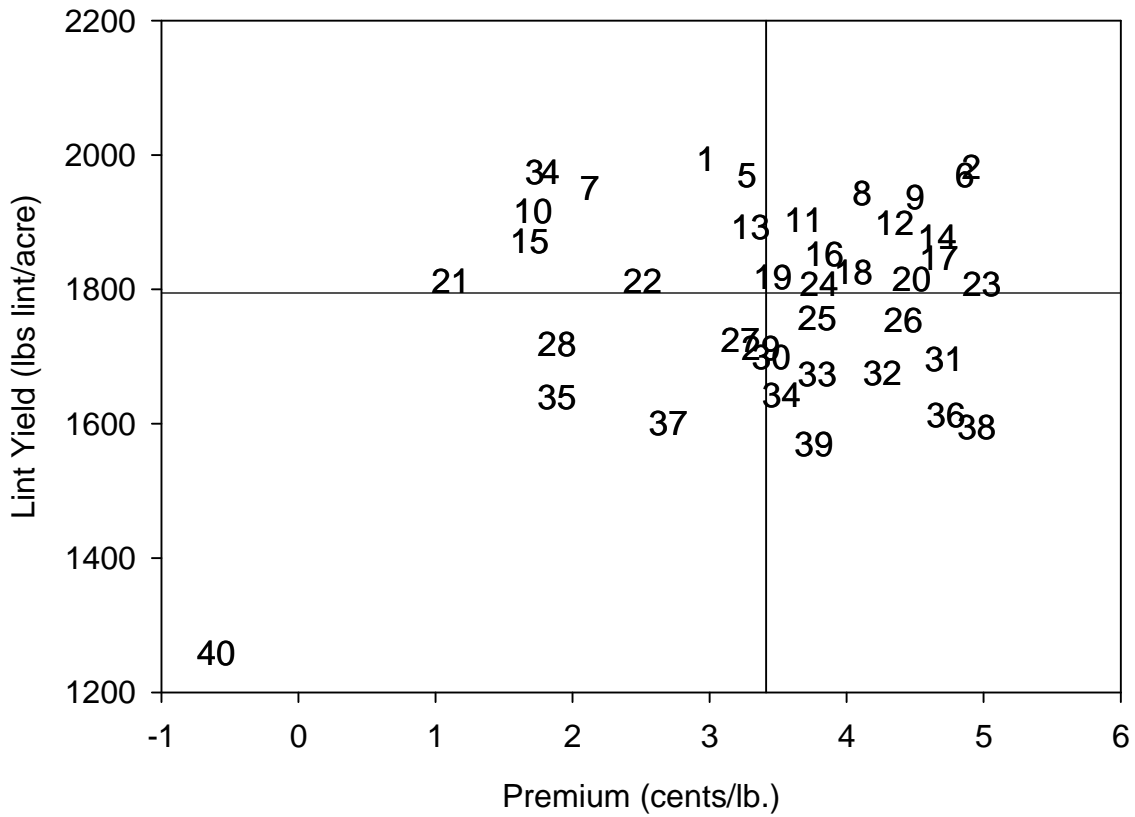


Figure 3. Mean final plant height (inches) along with the standard deviation for each of the ACMA Preliminary and advanced strains evaluated in Maricopa, AZ, 2009.



| | | | |
|-----------------------------|----------------------------------|------------------------------|---------------------------------|
| 1 0116-2B-326-701 | 11 0106-2004-3B-701 | 21 0104-2019-301-601-701 | 31 0109-2026-310-601-701 |
| 2 39-501-601-701-801 | 12 DP161B2RF | 22 0119-2023-308-601-701 | 32 0122-2015-305501-601-701-801 |
| 3 0122-2033-307-701 | 13 0120-2029-301-501-601-701-801 | 23 0118-2B-304-601-701 | 33 0106-2008-303-601-701 |
| 4 0109-2026-302-601-701 | 14 0122-2033-303-701 | 24 0109-2024-304-601-701 | 34 0112-2014-313-601-701 |
| 5 0119-2016-303-601-701 | 15 0116-2015-309-501-601-701-801 | 25 0157-2031-3B-701 | 35 0120-2029-301-501-601-701 |
| 6 ST45542RF | 16 0144-2086-3B-701 | 26 0101-2100-302-501-601-701 | 36 0101-2165-303-701 |
| 7 0144-2036-304-701 | 17 0116-2015-302-501-601-701 | 27 0114-2001-304-601-701 | 37 0106-2008-301-601-701 |
| 8 0119-2006-307-601-701 | 18 0106-2011-308-601-701 | 28 0122-2036-303-701 | 38 0112-2014-309-601-701 |
| 9 0116-2011-309-501-601-701 | 19 0102-2035-302-601-701 | 29 0101-2141-301-501-601-701 | 39 0106-2008-305-601-701 |
| 10 0109-2024-301-601-701 | 20 0116-2015-306-501-601-701-801 | 30 0102-2032-302-601-701 | 40 0109-2027-302-601-701 |

Figure 4. Lint yield (lbs/acre) plotted as a function of fiber quality premium/discount (cents/lb). Vertical and horizontal lines represent the mean value for the two parameters. Varieties that fall in the upper right quadrant formed by the mean lines produced higher than average lint yield and fiber quality. Each of the ACGA preliminary and advanced strain entries are plotted for the Maricopa, AZ location in 2009.

Table 4. Yield, fiber quality, and boll weight mean data along with statistical analysis for each of the ACGA preliminary and advanced strains evaluated in Safford, AZ, 2009.

| Variety | Variety Identifier | Lint Yield | Means Separation * | Lint Turnout | Boll Weight | HVI Color | Staple 32nds | Strength g/tex | Length Inches | Uniformity Percent | Micronaire | Leaf Grade | Premium cent/lb | Value \$/acre |
|-------------------------------|--------------------|---------------|--------------------|--------------|-------------|-----------|--------------|----------------|---------------|--------------------|------------|------------|-----------------|-----------------|
| 39-501-601-701-801 | ACGA039 | 1598.7 | a | 37.2 | 4.4 | 31 | 34 | 28.9 | 1.07 | 80.5 | 4.9 | 2 | 1.9 | \$856.58 |
| 0116-28-326-701 | ACGA246 | 1570.9 | a b | 38.0 | 5.9 | 31 | 33 | 27.9 | 1.03 | 80.4 | 5.2 | 2 | -2.6 | \$776.20 |
| 0122-2033-307-701 | ACGA248 | 1476.4 | a b | 35.4 | 4.6 | 21 | 34 | 29.2 | 1.06 | 82.1 | 4.7 | 2 | 1.7 | \$791.12 |
| 0109-2026-310-601-701 | ACGA265 | 1451.7 | a b d | 34.8 | 4.9 | 21 | 34 | 28.0 | 1.06 | 79.2 | 5.0 | 2 | 0.7 | \$772.21 |
| 0116-2015-309-501-601-701-801 | ACGA070 | 1440.0 | a b d e | 33.3 | 4.9 | 31 | 37 | 32.7 | 1.14 | 81.5 | 4.9 | 2 | 4.1 | \$808.09 |
| 0122-2033-303-701 | ACGA247 | 1422.9 | b d e | 36.5 | 4.1 | 31 | 33 | 27.3 | 1.03 | 78.8 | 4.8 | 2 | -1.5 | \$716.95 |
| 0102-2035-302-601-701 | ACGA256 | 1396.5 | d e f | 35.5 | 4.9 | 31 | 34 | 28.7 | 1.06 | 79.9 | 4.5 | 2 | 1.7 | \$749.28 |
| 0144-2036-304-701 | ACGA250 | 1377.5 | d e f | 35.7 | 4.5 | 31 | 34 | 32.4 | 1.07 | 81.0 | 4.7 | 2 | 2.2 | \$746.69 |
| 0106-2004-38-701 | ACGA243 | 1367.5 | d e f g | 36.6 | 5.2 | 31 | 36 | 31.6 | 1.11 | 81.6 | 4.8 | 2 | 4.8 | \$777.33 |
| 0120-2029-301-501-601-701 | ACGA271 | 1366.3 | d e f g | 34.1 | 4.4 | 31 | 35 | 30.7 | 1.09 | 81.3 | 5.2 | 2 | 0.0 | \$712.53 |
| 0118-28-304-601-701 | ACGA275 | 1341.9 | d e f g h | 35.9 | 4.9 | 31 | 33 | 27.6 | 1.04 | 80.7 | 5.0 | 2 | -1.3 | \$681.01 |
| 0109-2026-302-601-701 | ACGA264 | 1341.8 | d e f g h | 35.0 | 4.5 | 31 | 35 | 31.1 | 1.09 | 80.2 | 5.3 | 2 | 1.1 | \$713.39 |
| 0102-2032-302-601-701 | ACGA255 | 1325.7 | d e f g h i | 33.2 | 4.6 | 31 | 36 | 33.1 | 1.11 | 81.7 | 5.1 | 3 | 2.5 | \$721.57 |
| 0106-2008-305-601-701 | ACGA260 | 1321.1 | d e f g h i | 31.8 | 4.4 | 21 | 35 | 30.5 | 1.10 | 79.5 | 4.4 | 2 | 4.6 | \$748.07 |
| 0109-2024-304-601-701 | ACGA263 | 1304.5 | d e f g h i | 34.7 | 4.5 | 31 | 35 | 29.3 | 1.09 | 80.1 | 4.6 | 2 | 3.6 | \$723.91 |
| 0101-2141-301-501-601-701 | ACGA254 | 1303.7 | d e f g h i | 33.8 | 5.1 | 21 | 33 | 28.9 | 1.04 | 80.6 | 5.2 | 2 | -2.1 | \$651.37 |
| 0116-2011-309-501-601-701 | ACGA272 | 1302.1 | d e f g h i | 35.7 | 4.9 | 31 | 34 | 28.8 | 1.05 | 80.6 | 4.8 | 2 | 1.2 | \$694.11 |
| 0144-2086-38-701 | ACGA251 | 1297.5 | d e f g h i | 36.1 | 4.9 | 31 | 35 | 29.5 | 1.09 | 81.5 | 4.9 | 2 | 2.6 | \$707.92 |
| 0114-2001-304-601-701 | ACGA270 | 1291.8 | d e f g h i | 33.6 | 4.4 | 21 | 36 | 31.3 | 1.13 | 81.2 | 4.8 | 3 | 5.0 | \$736.21 |
| 0157-2031-38-701 | ACGA252 | 1289.7 | d e f g h i | 36.2 | 5.0 | 31 | 34 | 28.4 | 1.07 | 80.6 | 4.8 | 3 | 2.3 | \$699.43 |
| 0122-2036-303-701 | ACGA249 | 1268.5 | e f g h i j | 32.2 | 4.6 | 31 | 35 | 30.7 | 1.08 | 80.6 | 5.2 | 2 | 0.9 | \$671.40 |
| 0122-2015-305501-601-701-801 | ACGA078 | 1266.3 | e f g h i j | 34.3 | 5.0 | 21 | 35 | 30.7 | 1.09 | 80.6 | 5.0 | 2 | 1.4 | \$678.30 |
| 0116-2015-306-501-601-701-801 | ACGA068 | 1244.3 | f g h i j k | 34.2 | 4.8 | 21 | 34 | 29.5 | 1.07 | 80.1 | 5.0 | 2 | 0.5 | \$652.12 |
| 0116-2015-302-501-601-701 | ACGA273 | 1238.6 | f g h i j k | 35.2 | 5.1 | 31 | 36 | 31.6 | 1.11 | 82.2 | 5.1 | 2 | 2.5 | \$674.42 |
| DP161B2RF | DP161B2RF | 1234.7 | f g h i j k | 33.7 | 4.1 | 31 | 35 | 29.7 | 1.10 | 80.7 | 4.7 | 2 | 4.5 | \$697.07 |
| 0119-2023-308-601-701 | ACGA245 | 1232.7 | f g h i j k | 36.2 | 4.6 | 21 | 34 | 31.1 | 1.05 | 81.5 | 4.9 | 3 | 1.2 | \$655.75 |
| 0101-2100-302-501-601-701 | ACGA253 | 1195.7 | g h i j k l | 34.9 | 4.2 | 21 | 33 | 25.9 | 1.03 | 78.6 | 4.9 | 2 | -1.6 | \$601.98 |
| 0104-2019-301-601-701 | ACGA257 | 1190.0 | h i j k l | 35.4 | 4.8 | 31 | 35 | 30.2 | 1.08 | 80.6 | 5.0 | 2 | 1.2 | \$632.28 |
| 0109-2024-301-601-701 | ACGA262 | 1180.0 | h i j k l m | 36.0 | 5.2 | 31 | 35 | 30.0 | 1.08 | 80.4 | 5.1 | 2 | 1.1 | \$627.04 |
| 0120-2029-301-501-601-701-801 | ACGA082 | 1172.8 | h i j k l m | 34.8 | 4.8 | 21 | 35 | 29.4 | 1.08 | 80.3 | 5.0 | 2 | 2.4 | \$637.64 |
| 0106-2011-308-601-701 | ACGA261 | 1167.8 | i j k l m n | 34.1 | 4.3 | 21 | 33 | 28.4 | 1.02 | 79.9 | 4.9 | 2 | -0.6 | \$600.00 |
| 0119-2006-307-601-701 | ACGA276 | 1159.7 | i j k l m n | 36.6 | 4.3 | 31 | 35 | 30.6 | 1.10 | 81.7 | 4.9 | 2 | 3.7 | \$645.42 |
| 0101-2165-303-701 | ACGA242 | 1154.6 | i j k l m n | 36.2 | 4.2 | 21 | 34 | 29.0 | 1.07 | 79.8 | 4.2 | 2 | 2.2 | \$625.48 |
| ST45542RF | ST45542RF | 1111.2 | j k l m n | 34.2 | 4.6 | 21 | 35 | 29.8 | 1.09 | 81.4 | 4.7 | 2 | 3.5 | \$616.03 |
| 0106-2008-303-601-701 | ACGA259 | 1087.2 | k l m n | 32.7 | 4.6 | 21 | 36 | 29.5 | 1.12 | 81.4 | 5.0 | 2 | 3.3 | \$601.56 |
| 0112-2014-313-601-701 | ACGA268 | 1072.1 | k l m n | 36.9 | 4.6 | 21 | 33 | 28.8 | 1.04 | 80.6 | 4.5 | 2 | 0.7 | \$564.27 |
| 0106-2008-301-601-701 | ACGA258 | 1026.9 | l m n | 33.2 | 5.1 | 31 | 36 | 30.7 | 1.11 | 80.8 | 4.6 | 2 | 5.0 | \$585.23 |
| 0112-2014-309-601-701 | ACGA267 | 1013.4 | m n | 35.8 | 5.6 | 31 | 34 | 29.1 | 1.05 | 79.8 | 4.3 | 2 | 1.8 | \$545.01 |
| 0109-2027-302-601-701 | ACGA266 | 995.8 | n | 32.7 | 3.9 | 31 | 33 | 28.5 | 1.03 | 80.4 | 4.9 | 2 | 0.0 | \$518.39 |
| LSD‡ | | 173.9 | | 1.3 | 0.7 | --- | 1.2 | 1.6 | 0.04 | 1.0 | 0.3 | 0.6 | 3.2 | \$99.60 |
| OSL† | | 0.0001 | | 0.0000 | 0.0001 | --- | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0001 | 0.0039 | 0.0001 | 0.0001 |
| CV‡ | | 9.8 | | 2.7 | 10.1 | --- | 2.6 | 4.0 | 2.4 | 0.9 | 4.3 | 19.1 | 136.8 | 10.4 |

*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

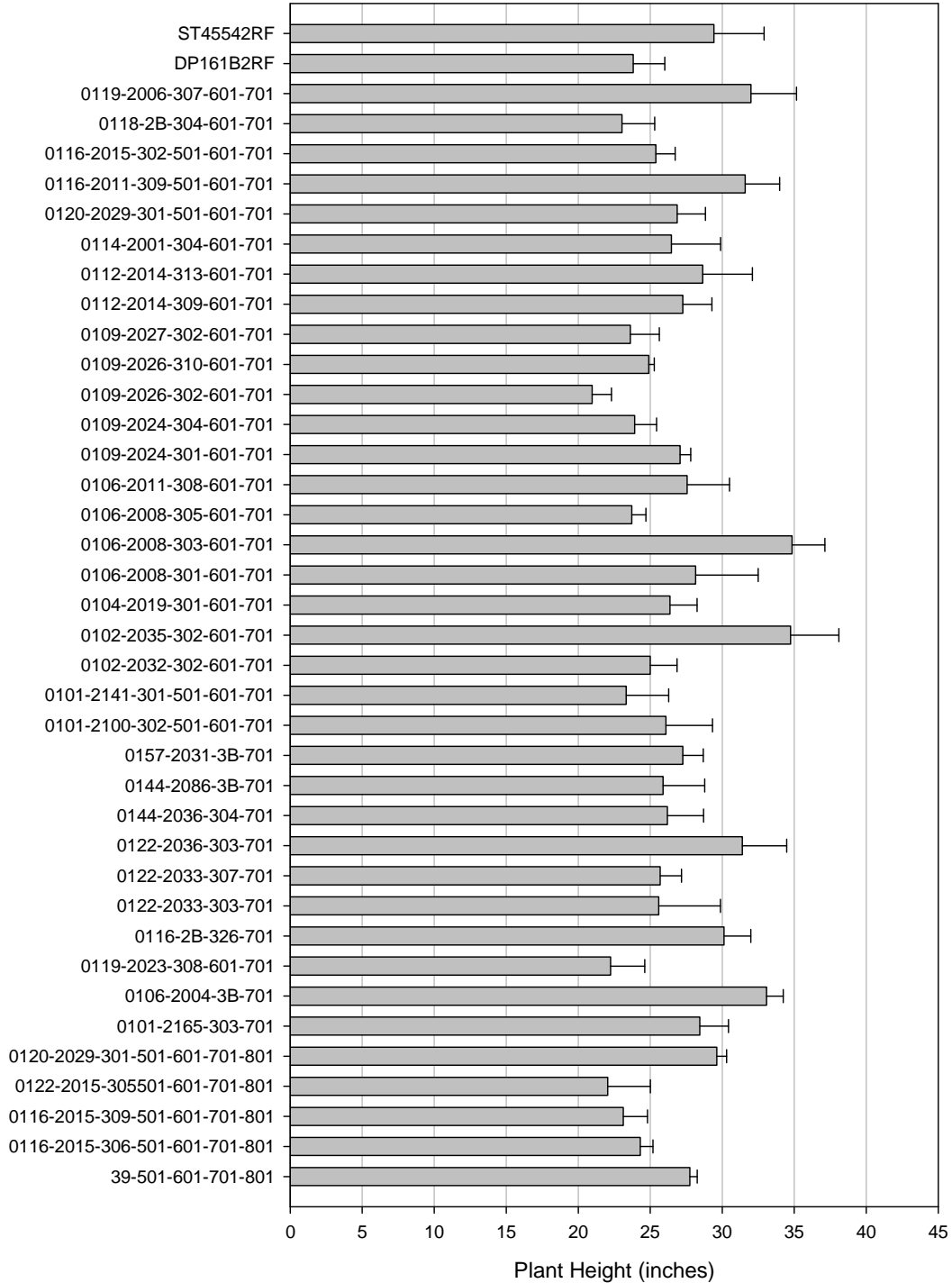
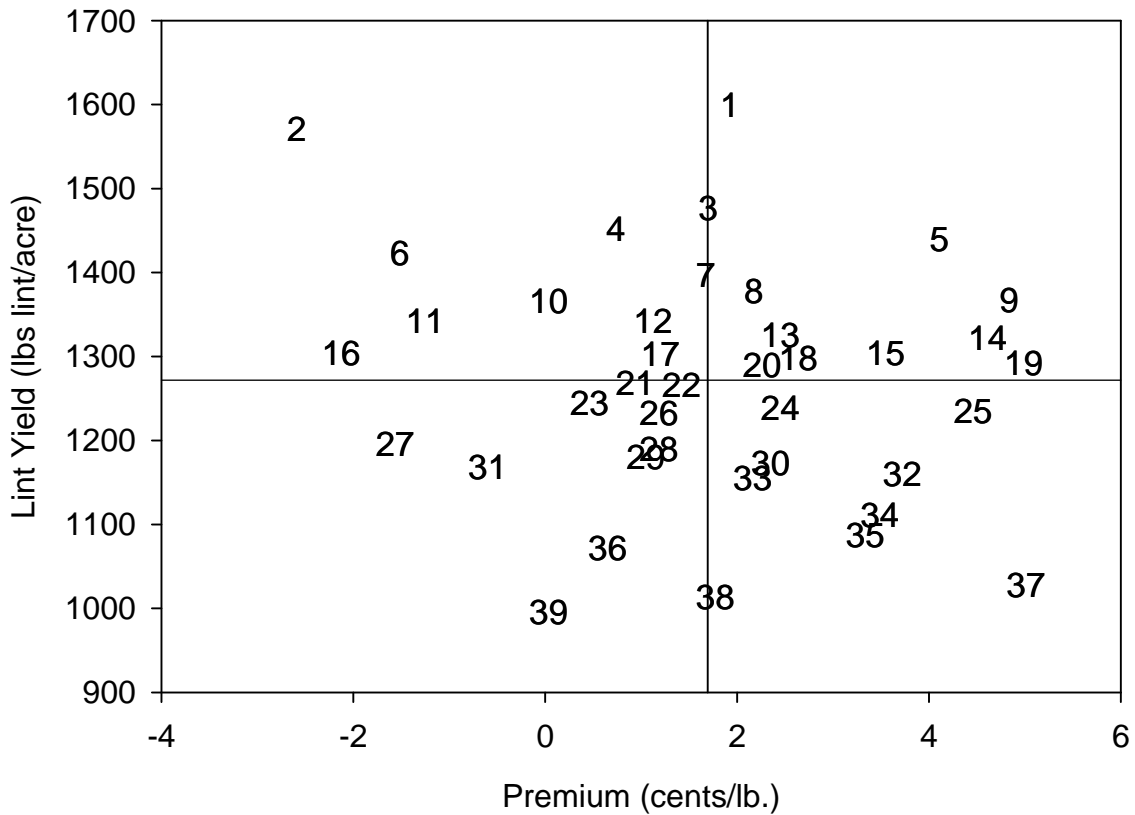


Figure 5. Mean final plant height (inches) along with the standard deviation for each of the ACGA Preliminary and advanced strains evaluated in Safford, AZ, 2009.



| | | | |
|---------------------------------|------------------------------|----------------------------------|--------------------------|
| 1 39-501-601-701-801 | 11 0118-2B-304-601-701 | 21 0122-2036-303-701 | 31 0106-2011-308-601-701 |
| 2 0116-2B-326-701 | 12 0109-2026-302-601-701 | 22 0122-2015-305501-601-701-801 | 32 0119-2006-307-601-701 |
| 3 0122-2033-307-701 | 13 0102-2032-302-601-701 | 23 0116-2015-306-501-601-701-801 | 33 0101-2165-303-701 |
| 4 0109-2026-310-601-701 | 14 0106-2008-305-601-701 | 24 0116-2015-302-501-601-701 | 34 ST45542RF |
| 5 0116-2015-309-501-601-701-801 | 15 0109-2024-304-601-701 | 25 DP161B2RF | 35 0106-2008-303-601-701 |
| 6 0122-2033-303-701 | 16 0101-2141-301-501-601-701 | 26 0119-2023-308-601-701 | 36 0112-2014-313-601-701 |
| 7 0102-2035-302-601-701 | 17 0116-2011-309-501-601-701 | 27 0101-2100-302-501-601-701 | 37 0106-2008-301-601-701 |
| 8 0144-2036-304-701 | 18 0144-2086-3B-701 | 28 0104-2019-301-601-701 | 38 0112-2014-309-601-701 |
| 9 0106-2004-3B-701 | 19 0114-2001-304-601-701 | 29 0109-2024-301-601-701 | 39 0109-2027-302-601-701 |
| 10 0120-2029-301-501-601-701 | 20 0157-2031-3B-701 | 30 0120-2029-301-501-601-701-801 | |

Figure 6. Lint yield (lbs/acre) plotted as a function of fiber quality premium/discount (cents/lb). Vertical and horizontal lines represent the mean value for the two parameters. Varieties that fall in the upper right quadrant formed by the mean lines produced higher than average lint yield and fiber quality. Each of the ACGA preliminary and advanced strain entries are plotted for the Safford, AZ location in 2009.