2009 Arizona Upland Cotton Advanced Strain Testing Program

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Abstract

A series of experiments were conducted across three locations in Arizona to evaluate approximately 40 commercial cotton strains during the 2009 cotton growing season. 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. Data collected included yield, fiber quality, and average boll size data. All data was subjected to statistical analysis to test for differences among strains for yield and fiber quality. Yields from Yuma were lower than average and ranged from 756 lbs to 1,314 lbs lint per acre. Cool temperatures in June coupled with abnormally high levels of heat stress during peak bloom (July) dramatically affected crop set in the Yuma valley during 2010. Production in Maricopa, with a later season, benefited from the cooler early season and relatively dry heat during July and August. Yield at the Maricopa location ranged from a low of 1,430 to slightly under 2,300 lbs lint per acre with several new varieties performing extremely well. Production at Safford was near normal for that region. The relatively dry warm conditions in July and August led to full crop maturity and average yields ranging from just over 1,200 to approximately 1,700 lbs. lint per acre. Again at this location several new varieties performed well at this location also indicating that new high performing varieties are available to replace the loss of original Bollgard varieties.

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. This is one of the last opportunities for a seed company to evaluate a particular strain before release to the public and is critical for the development of varieties that are well-suited for the cotton producing regions of the United States. Arizona cotton growing conditions provide an excellent environment for seed production so it is in the best interest of the seed company to develop varieties that are well-suited to the hot, dry growing conditions of the desert southwest.

The Arizona Upland Cotton Advanced Strains Testing Program provides critical, unbiased information to the seed company on the performance of varieties that will likely be grown in Arizona for seed production in the subsequent years. It also provides the Arizona cotton industry with an unbiased view of plant materials that are being considered for release into the public market prior to their actual release. This situation provides an opportunity to influence the decisions as to which varieties will be advanced for release, helping to ensure high yielding and high fiber quality varieties for the Arizona cotton growing industry. One of the unique aspects of this program is the range in conditions under which these strains are being evaluated. Three locations are selected for testing of these strains that range from slightly above sea level (100 ft, Yuma) to over 2800 ft elevation (Safford) providing for a very diverse set of climatic conditions for variety performance evaluation.

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 of each entry is presented in Figure 1 and ranged from 30 to 50 inches. Table 2 contains all yield and fiber quality data for the Yuma location along with statistical parameters. Average lint yield in this trial ranged from 755 pounds of lint per acre to just over 1300 pounds lint per acre. The top eight performing varieties in terms of lint yield were not statistically different from each other. Of the top eight varieties only one was a commercially available variety during the 2009 season all the remaining were experimental varieties. Two of the top eight varieties were entries from the Arizona cotton growers Association breeding program. Two of the top eight varieties are new varieties from Monsanto that will be released for the 2010 season. The remaining three of the top eight varieties are experimental varieties from Monsanto whose fate is has yet to be determined. Several varieties received discounts for fiber quality as a result a low staple and high micronaire (Table 2).

Figure 2 is a scatter plot with average premium associated with fiber quality along the horizontal axis and average lint yield along the vertical axis. The horizontal and vertical reference lines represent the mean of both lint yield and premium respectively. Varieties that fall into the upper right-hand quadrant represent varieties that performed better than average with respect to lint yield and fiber quality. This figure shows strong clusters of varieties in the upper left-hand quadrant and the lower right-hand quadrant indicating that varieties that performed well with respect to yield did not do well with

respect to fiber quality while varieties that performed less than average in terms of yield had higher than average 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. Average final plant height is shown in Figure 3 and ranged from 35 to 45 inches. High levels of fruit retention over the course of the season resulted in shorter plants and less overall vegetative growth.

Final lint yield in this trial ranged from just over 1400 pounds lint per acre just under 2300 (Table 3). All yield and fiber quality data plus statistical parameters are listed in Table 3 for the Maricopa location. Only one variety received a discount for fiber quality which was due to high micronaire and a high leaf grade. All other entries received premiums for fiber quality. The top 16 varieties in this trial were not statistically different from each other and ranged in yield from 2077 pounds to 2293 pounds lint per acre. The two commercially available control varieties were also in this group of 16. The top five yielding varieties are all new varieties from Phytogen. Two varieties that will be released by Monsanto for the 2010 season were also in the top 16.

Figure 4 is a scatter plot of lint yield and fiber premium with lint yield on the vertical axis and average premium associated with fiber quality on the horizontal axis. Reference lines indicating the average of lint yield (horizontal) and fiber premium (vertical) delineate the four quadrants in this graph. Varieties that lie in the upper right-hand quadrant performed better than average with respect to both lint yield and fiber quality. It is interesting to note in this graph strong tendencies of varieties that lie in the upper right-hand quadrant. This is an indication that many varieties performed extremely well in this trial with respect to both lint yield and fiber quality and many of these varieties are new for the 2010 season.

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 21 October. Plots were harvested on 21 November. Average final plant height data is presented in Figure 5 and ranged from 25 to 35 inches.

Final lint yield and fiber quality data is presented in Table 4. Lint yield in this trial ranged from slightly over 1200 pounds to just over 1600 pounds lint per acre. Only two of the 35 varieties entered in this trial received a discount for fiber quality. This discount was very small (0.1 cents per pound) and was due primarily to lower uniformity and shorter staple in that variety. The top nine performing varieties in this trial with respect to lint yield were not significantly different from each other and ranged in yield from 1535 two 1695 pounds lint per acre. Of these top nine varieties three are new varieties for 2010 from Phytogen, one new variety for 2010 from Monsanto and three Arizona cotton growers varieties from their breeding program. The other two varieties in the top nine were commercially available varieties in 2009 and were from Bayer CropScience. These two are Fibermax varieties that performed very well both in terms of fiber quality and lint yield.

Figure 6 is a scatter plot of lint yield, plotted on the vertical axis and premium associated with fiber quality plotted on the horizontal axis. The vertical and horizontal reference lines represent the average values for premium and lint yield

respectively. Once again, varieties that fall in the upper right-hand quadrant formed by these reference lines performed better than average with respect to both lint yield and fiber quality. The distribution of data in this graph is different from the distributions at the other two locations. At this location, a linear trend upwards is observed with the majority of varieties falling in the lower left and the upper right-hand quadrants indicating that lower yielding varieties possessed lower fiber quality while higher-yielding varieties possessed higher fiber quality.

Table 1. Significant crop management dates for each 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 varieties and advanced strains evaluated in Yuma, AZ, 2009.

Seed Company	Variety	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
ACGA	0143-2017-301-601	1314.4	a	42.7	4.9	31	34	29.2	1.06	80.3	4.5	3	1.3	$619.52
Monsanto	DP1032B2RF	1277.8	a	35.9	4.1	31	34	28.4	1.06	80.2	5.0	2	0.4	$550.36
Bayer CropScience	ST5458B2RF	1239.5	a b	36.3	5.3	31	34	28.6	1.05	80.5	5.0	3	-1.3	$434.67
Monsanto	09R619B2R2	1206.3	a b c	37.8	4.4	21	34	27.2	1.05	81.0	5.0	1	0.1	$699.25
ACGA	0136-2026-303-601	1204.0	a b c	35.4	5.0	31	34	28.3	1.05	81.4	4.9	2	1.3	$578.01
Monsanto	DP1048B2RF	1198.4	a b c	36.4	4.6	31	35	28.5	1.08	80.8	4.9	2	3.5	$547.06
Monsanto	09R621B2R2	1195.2	a b c	36.6	4.8	31	34	28.1	1.07	81.3	5.0	1	-0.2	$673.87
Monsanto	09R796B2R2	1181.5	a b c d	37.4	4.7	31	33	29.0	1.04	80.7	4.8	2	-0.1	$664.73
ACGA	0112-2012-302-601	1119.3	b c d e	32.5	4.9	31	34	29.7	1.07	80.5	4.3	2	2.2	$613.26
Dow AgroSciences	PHY375WRF	1105.8	b c d e	34.3	4.2	31	33	27.2	1.03	81.3	4.8	3	-0.3	$525.55
ACGA	0112-2009-306-601	1104.0	b c d e	33.2	5.2	31	35	30.5	1.10	81.2	4.7	2	4.1	$619.29
Dow AgroSciences	PHY367WRF	1096.8	b c d e f	34.3	4.6	31	33	28.0	1.04	80.6	4.5	2	0.6	$643.87
Bayer CropScience	FM9180B2F	1095.9	b c d e f	42.6	4.8	31	34	29.4	1.06	80.7	4.0	2	2.2	$556.61
ACGA	0117-2006-306-601	1084.4	b c d e f	32.3	4.1	31	35	30.3	1.09	81.4	5.3	2	0.4	$607.68
ACGA	0125-2010-306-601	1081.4	c d e f	32.0	4.7	31	34	27.1	1.05	80.1	4.6	2	1.0	$604.82
Control	**ST4554B2F**	**1081.3**	**c d e f**	**32.4**	**4.7**	**31**	**34**	**31.7**	**1.06**	**81.9**	**5.1**	**3**	**-0.5**	**$424.90**
Monsanto	DP1050B2RF	1071.8	c d e f g	36.0	4.4	21	34	28.1	1.07	80.6	5.0	2	0.3	$547.11
Monsanto	09R549B2R2	1063.1	c d e f g	35.7	4.6	31	36	31.0	1.12	81.8	4.9	2	4.9	$551.06
Bayer CropScience	ST4498B2RF	1058.0	c d e f g	32.8	4.5	31	33	31.1	1.04	82.0	4.9	3	0.1	$479.37
ACGA	0127-2100-305-601	1026.6	d e f g	32.9	4.9	31	34	27.9	1.07	80.2	4.4	2	2.4	$594.69
Bayer CropScience	ST4288B2RF	1023.9	e f g	35.2	4.8	31	34	28.6	1.05	80.3	4.3	2	1.5	$497.95
Control	**DP161B2RF**	**1017.4**	**e f g h**	**33.0**	**4.2**	**31**	**36**	**30.0**	**1.10**	**80.4**	**5.0**	**2**	**2.2**	**$432.92**
Bayer CropScience	FM1740B2F	997.6	e f g h	36.3	4.9	31	33	27.6	1.03	81.0	4.4	2	-0.1	$572.27
ACGA	0143-2036-303-601	993.7	e f g h	34.3	4.2	31	34	28.6	1.07	80.6	5.0	2	0.0	$573.32
ACGA	0113-2026-309-601	976.5	e f g h	31.3	5.1	31	36	29.7	1.11	80.9	4.8	2	4.1	$628.46
Bayer CropScience	ST5288B2RF	970.0	e f g h	33.1	4.4	31	33	25.1	1.02	79.4	4.6	3	-2.4	$475.71
ACGA	0105-2005-303-601	965.8	e f g h	30.6	5.0	31	36	30.2	1.11	81.4	4.6	2	5.0	$628.87
Dow AgroSciences	PHY5922WRF	948.5	f g h	33.5	3.9	31	35	31.4	1.08	82.5	5.2	2	1.2	$504.75
Monsanto	09R303B2R2	944.0	f g h i	32.0	4.6	31	34	27.9	1.07	81.3	4.7	3	0.6	$551.29
Bayer CropScience	FM840B2F	925.7	g h i j	30.6	4.5	31	37	30.7	1.13	81.2	4.6	3	4.8	$559.33
Dow AgroSciences	PHY565WRF	866.1	h i j k	32.0	4.0	31	35	30.7	1.08	81.4	4.8	3	3.2	$517.55
Bayer CropScience	FM9160B2F	792.9	i j k	30.7	4.4	31	35	27.4	1.08	81.1	3.9	3	2.9	$557.13
Bayer CropScience	FM1845LLB2	773.0	j k	31.3	5.3	31	36	31.3	1.11	82.1	4.9	3	3.9	$568.16
Dow AgroSciences	PHY525WRF	755.5	k	33.0	4.6	21	35	30.9	1.10	81.0	4.6	2	4.3	$517.75
LSD§		155.4		1.8	0.5	---	1	1.2	0.02	0.9	0.2	0	2.4	$86.80
OSL†		0.0001		0.0001	0.0001	---	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
CV‡		10.5		3.9	7.6	---	2.2	2.9	1.9	0.7	3.5	15.2	108.5	11.0

*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

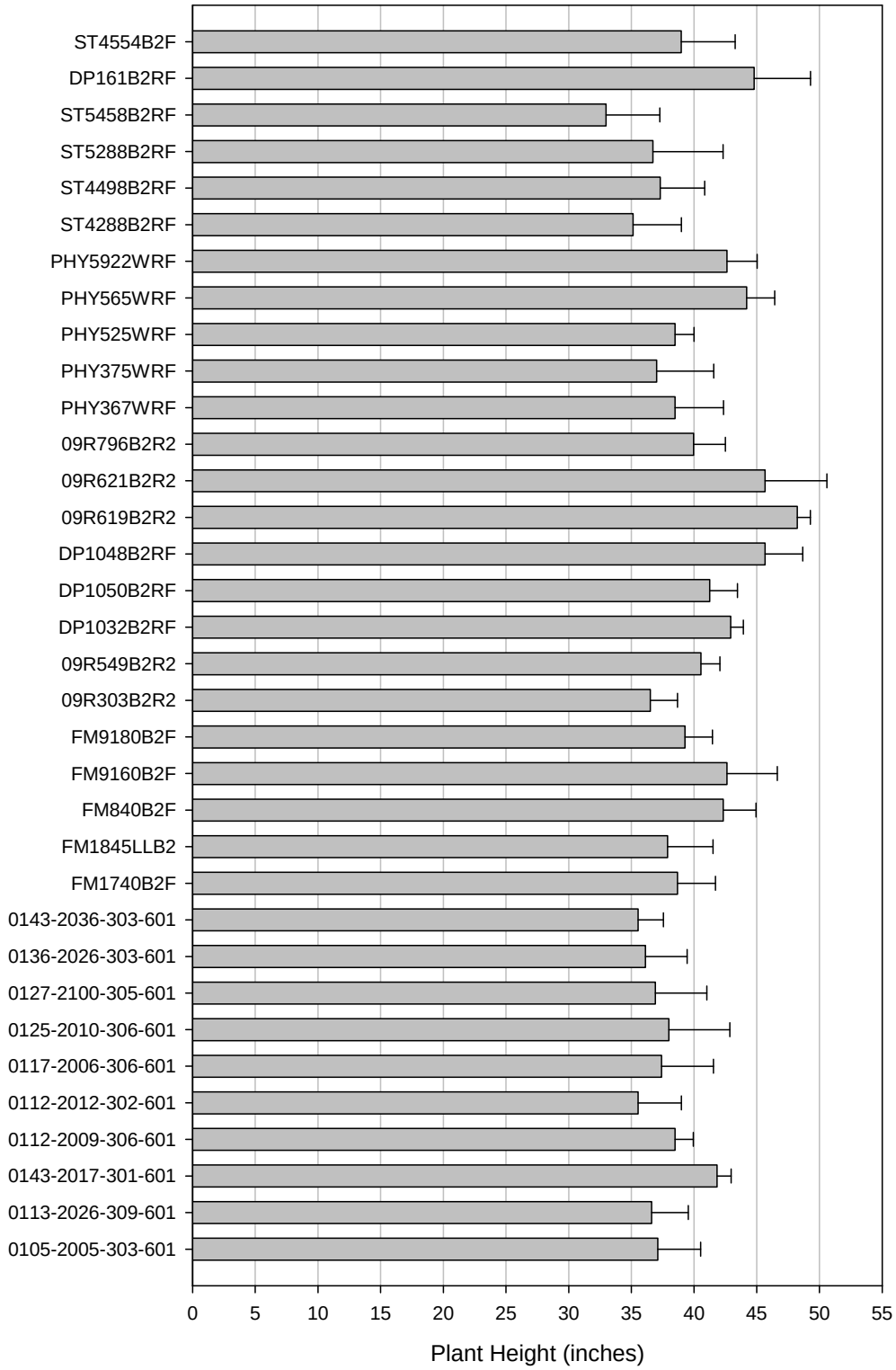
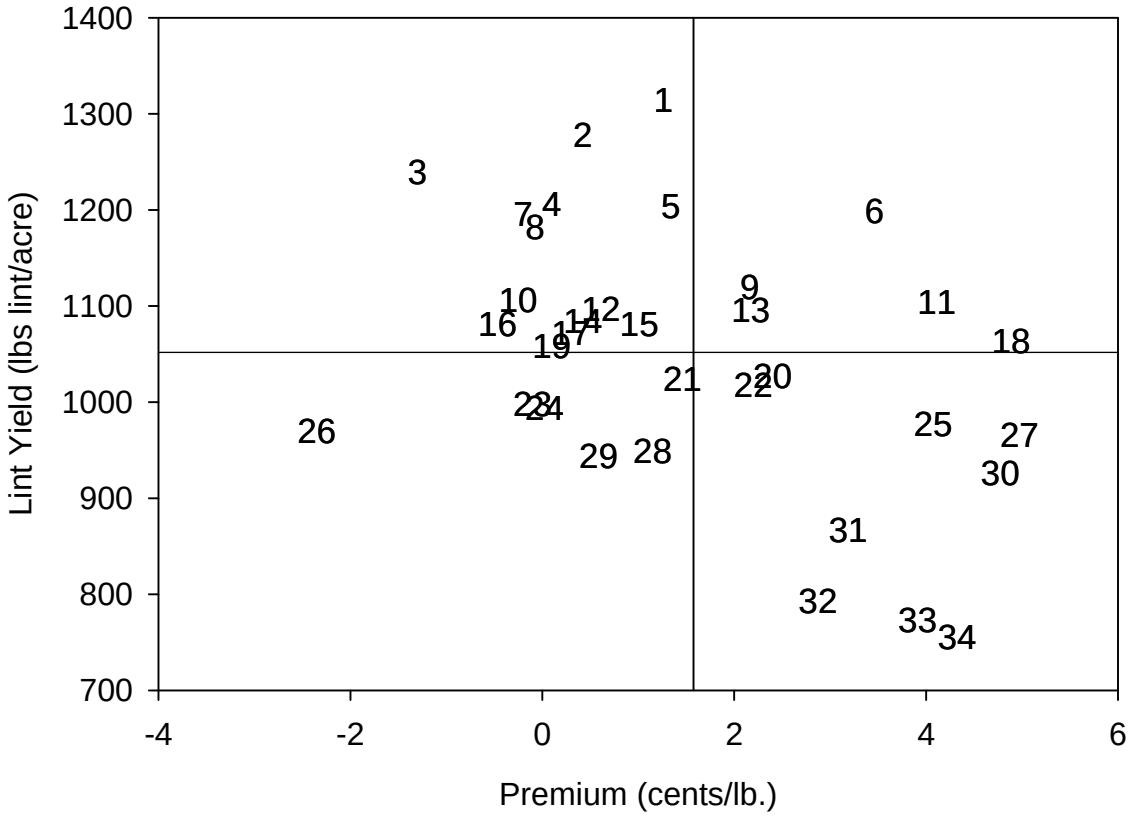


Figure 1. Mean final plant height (inches) along with the standard deviation for each of the varieties and advanced strains evaluated in Yuma, AZ, 2009.



1	0143-2017-301-601	**11**	0112-2009-306-601	**21**	ST4288B2RF	**31**	PHY565WRF
2	DP1032B2RF	**12**	PHY367WRF	**22**	DP161B2RF	**32**	FM9160B2F
3	ST5458B2RF	**13**	FM9180B2F	**23**	FM1740B2F	**33**	FM1845LLB2
4	09R619B2R2	**14**	0117-2006-306-601	**24**	0143-2036-303-601	**34**	PHY525WRF
5	0136-2026-303-601	**15**	0125-2010-306-601	**25**	0113-2026-309-601		
6	DP1048B2RF	**16**	ST4554B2F	**26**	ST5288B2RF		
7	09R621B2R2	**17**	DP1050B2RF	**27**	0105-2005-303-601		
8	09R796B2R2	**18**	09R549B2R2	**28**	PHY5922WRF		
9	0112-2012-302-601	**19**	ST4498B2RF	**29**	09R303B2R2		
10	PHY375WRF	**20**	0127-2100-305-601	**30**	FM840B2F		

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 varieties 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 varieties and advanced strains evaluated in Maricopa, AZ, 2009.

Seed Company	Variety	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
Dow AgroSciences	PHY565WRF	2293.5	a	33.2	3.5	31	36	32.7	1.12	81.8	4.6	3	4.1	$1,287.70
Dow AgroSciences	PHY5922WRF	2278.1	a	33.6	3.8	21	36	32.0	1.12	82.8	4.8	2	5.5	$1,311.39
Dow AgroSciences	PHY375WRF	2277.5	a	35.3	4.3	31	35	27.9	1.08	80.7	4.6	3	3.2	$1,257.72
Dow AgroSciences	PHY367WRF	2254.5	a	35.3	3.9	31	37	31.4	1.14	82.3	4.6	3	4.4	$1,270.91
Dow AgroSciences	PHY525WRF	2236.8	a	34.5	3.9	31	36	32.7	1.12	81.2	4.4	2	4.1	$1,255.56
Monsanto	DP1050B2RF	2223.8	a b	36.8	4.2	31	36	28.9	1.11	81.5	4.9	2	4.7	$1,259.64
ACGA	0143-2036-303-601	2192.6	a b c	36.9	4.4	31	36	31.9	1.12	81.3	5.0	3	2.7	$1,199.37
Control	**DP161B2RF**	**2186.1**	**a b c**	**32.5**	**3.9**	**31**	**37**	**32.3**	**1.17**	**81.8**	**4.7**	**3**	**4.2**	**$1,229.91**
Monsanto	09R796B2R2	2173.5	a b c d	35.8	5.2	31	35	30.3	1.09	82.3	4.9	3	3.0	$1,195.27
Monsanto	DP1032B2RF	2170.5	a b c d e	36.7	4.1	31	35	29.5	1.11	80.3	4.8	2	3.9	$1,214.52
Monsanto	DP1048B2RF	2112.2	a b c d e f	36.8	3.6	21	36	29.6	1.13	82.3	4.8	2	5.4	$1,212.18
Control	**ST4554B2F**	**2088.9**	**a b c d e f g**	**33.3**	**4.4**	**21**	**35**	**32.3**	**1.10**	**81.3**	**4.8**	**3**	**4.2**	**$1,172.78**
ACGA	0136-2026-303-601	2085.8	a b c d e f g	31.9	4.8	21	35	30.4	1.08	81.4	5.2	2	1.4	$1,112.58
Bayer CropScience	ST4498B2RF	2079.8	a b c d e f g h	34.5	4.7	31	35	30.7	1.08	81.6	4.7	3	2.4	$1,134.51
Bayer CropScience	ST5458B2RF	2078.7	a b c d e f g h	33.3	4.7	31	35	30.4	1.08	80.1	5.0	3	0.6	$1,093.67
Monsanto	09R549B2R2	2077.2	a b c d e f g h	35.1	4.3	31	37	32.1	1.16	82.8	4.6	2	5.3	$1,190.95
Monsanto	09R619B2R2	2004.2	b c d e f g h i	37.2	3.7	31	35	28.3	1.09	81.8	4.9	2	3.8	$1,119.04
Monsanto	09R303B2R2	1972.8	c d e f g h i j	34.0	4.5	31	35	28.1	1.09	81.2	4.6	3	2.8	$1,081.96
Monsanto	09R621B2R2	1947.5	e f g h i j k	38.0	4.1	21	36	29.0	1.12	81.8	4.8	2	5.1	$1,112.20
Bayer CropScience	FM1740B2F	1941.6	e f g h i j k	35.5	4.2	31	35	29.6	1.07	81.1	4.8	2	3.7	$1,083.28
ACGA	0105-2005-303-601	1940.1	f g h i j k	31.3	4.4	31	36	31.1	1.13	81.3	4.5	3	4.8	$1,101.48
ACGA	0125-2010-306-601	1936.6	f g h i j k	34.2	4.4	31	36	30.0	1.11	81.2	4.7	2	4.9	$1,102.10
ACGA	0117-2006-306-601	1903.8	f g h i j k l	32.8	4.4	31	36	32.0	1.13	82.3	5.1	3	1.6	$1,020.83
ACGA	0143-2017-301-601	1894.0	f g h i j k l	32.5	4.6	31	35	30.4	1.10	81.4	4.8	2	4.0	$1,060.28
ACGA	0112-2009-306-601	1867.9	g h i j k l	31.5	4.5	31	36	31.2	1.11	80.4	4.8	2	3.8	$1,042.28
Bayer CropScience	FM9160B2F	1852.1	h i j k l m	32.5	4.3	31	36	30.7	1.13	82.3	4.1	3	4.4	$1,043.46
ACGA	0127-2100-305-601	1821.2	i j k l m	32.7	4.1	31	36	30.6	1.12	81.8	4.8	3	4.8	$1,035.15
ACGA	0113-2026-309-601	1747.7	j k l m	32.2	4.1	31	37	31.5	1.15	81.3	4.8	3	4.9	$994.98
Bayer CropScience	FM1845LLB2	1743.7	k l m	31.8	5.0	31	37	32.7	1.16	82.6	4.5	3	4.5	$985.20
Bayer CropScience	ST5288B2RF	1732.6	k l m	33.7	4.5	31	34	27.1	1.07	79.7	5.2	4	-2.0	$866.75
Bayer CropScience	FM840B2F	1692.0	l m n	31.5	4.8	31	36	31.0	1.13	81.2	4.5	3	4.0	$947.95
Bayer CropScience	FM9170B2F	1688.2	l m n	33.5	4.2	31	36	29.8	1.11	81.4	4.4	3	4.6	$955.83
Bayer CropScience	FM9180B2F	1626.7	m n o	30.8	4.1	31	36	30.9	1.13	81.5	4.0	3	4.9	$925.27
ACGA	0112-2012-302-601	1502.1	n o	28.6	4.7	31	35	31.3	1.10	81.8	4.7	3	4.3	$845.40
Bayer CropScience	ST4288B2RF	1431.2	o	29.2	4.5	31	36	29.1	1.10	81.0	4.4	4	2.9	$785.95
LSD§		229.0		2.3	0.5	---	1	1.1	0.03	1.1	0.2	0.5	1.7	$134.15
OSL†		0.0001		0.0001	0.0001	---	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
CV‡		8.2		4.7	8.8	---	2.0	2.6	1.9	0.9	3.5	14.7	33.0	8.6

*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

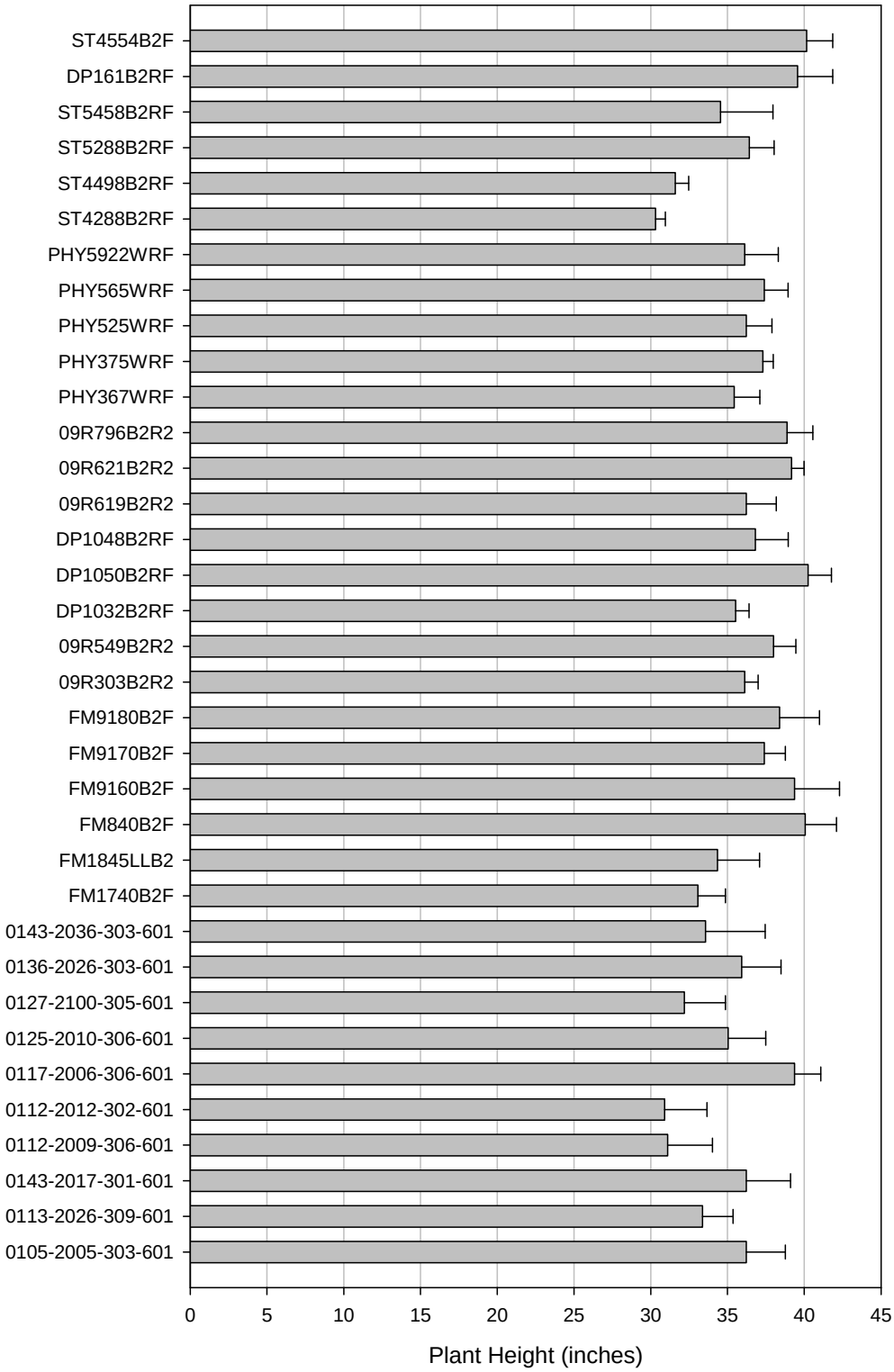
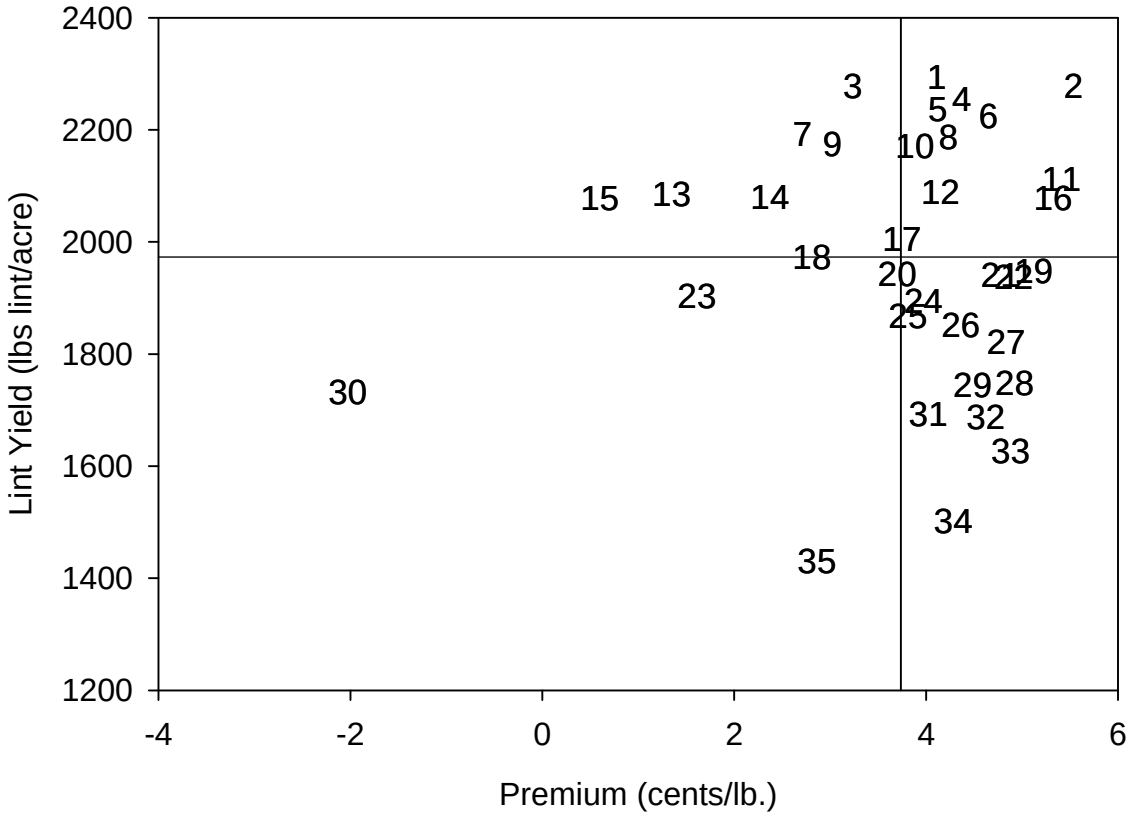


Figure 3. Mean final plant height (inches) along with the standard deviation for each of the varieties and advanced strains evaluated in Maricopa, AZ, 2009.



1	PHY565WRF	**11**	DP1048B2RF	**21**	0105-2005-303-601	**31**	FM840B2F
2	PHY5922WRF	**12**	ST4554B2F	**22**	0125-2010-306-601	**32**	FM9170B2F
3	PHY375WRF	**13**	0136-2026-303-601	**23**	0117-2006-306-601	**33**	FM9180B2F
4	PHY367WRF	**14**	ST4498B2RF	**24**	0143-2017-301-601	**34**	0112-2012-302-601
5	PHY525WRF	**15**	ST5458B2RF	**25**	0112-2009-306-601	**35**	ST4288B2RF
6	DP1050B2RF	**16**	09R549B2R2	**26**	FM9160B2F		
7	0143-2036-303-601	**17**	09R619B2R2	**27**	0127-2100-305-601		
8	DP161B2RF	**18**	09R303B2R2	**28**	0113-2026-309-601		
9	09R796B2R2	**19**	09R621B2R2	**29**	FM1845LLB2		
10	DP1032B2RF	**20**	FM1740B2F	**30**	ST5288B2RF		

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 varieties 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 varieties and advanced strains evaluated in Safford, AZ, 2009.

Seed Company	Variety	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
Bayer CropScience	FM9170B2F	1695.2	a	33.5	5.3	31	36	30.1	1.12	80.9	4.5	3	4.5	$957.26
Dow AgroSciences	PHY367WRF	1648.1	a b	35.3	4.5	21	35	29.3	1.10	81.1	4.5	3	4.4	$929.96
Dow AgroSciences	PHY565WRF	1632.7	a b c	33.2	4.3	31	36	30.5	1.11	82.2	4.4	3	4.7	$926.35
Bayer CropScience	FM9180B2F	1626.1	a b c d	30.8	5.5	21	35	29.2	1.09	80.7	4.8	3	2.5	$883.22
ACGA	0117-2006-306-601	1617.9	a b c d	32.8	5.2	21	35	28.9	1.08	81.0	4.8	2	2.8	$890.68
Dow AgroSciences	PHY5922WRF	1601.5	a b c d e	33.6	4.2	21	36	30.5	1.11	82.4	4.7	3	4.0	$896.82
ACGA	0105-2005-303-601	1578.1	a b c d e f	31.3	4.9	21	34	28.8	1.06	80.0	5.0	2	0.3	$827.33
Monsanto	DP1032B2RF	1537.9	a b c d e f g	36.7	4.8	31	36	29.9	1.10	80.7	4.6	3	3.6	$855.36
ACGA	0143-2036-303-601	1535.2	a b c d e f g	36.9	4.4	31	35	28.6	1.09	79.6	4.9	2	1.8	$826.45
ACGA	0127-2100-305-601	1511.7	b c d e f g h	32.7	4.8	31	34	29.2	1.05	80.5	4.9	3	1.4	$806.75
Monsanto	DP1048B2RF	1510.1	b c d e f g h	36.8	4.6	31	35	28.8	1.09	80.6	4.8	2	3.6	$841.34
Monsanto	09R619B2R2	1508.1	b c d e f g h i	37.2	4.6	21	35	27.3	1.10	81.7	4.8	2	3.8	$841.03
Bayer CropScience	ST5458B2RF	1507.0	b c d e f g h i	33.3	5.6	31	35	29.5	1.08	81.1	5.0	3	1.3	$803.71
Monsanto	DP1050B2RF	1504.9	b c d e f g h i	36.8	4.5	21	35	29.1	1.08	80.8	4.5	2	3.7	$840.29
Bayer CropScience	FM9160B2F	1498.0	b c d e f g h i	32.5	5.2	21	36	29.4	1.12	81.5	4.5	2	5.3	$857.98
Monsanto	09R621B2R2	1494.4	b c d e f g h i	38.0	4.6	21	36	28.7	1.11	80.9	4.7	3	4.4	$844.95
Bayer CropScience	ST4288B2RF	1491.5	b c d e f g h i	29.2	5.1	31	36	30.5	1.11	81.6	4.5	3	4.1	$838.50
Bayer CropScience	FM1845LLB2	1461.2	c d e f g h i j	31.8	5.2	31	35	30.8	1.10	81.7	4.6	3	4.4	$824.05
Bayer CropScience	FM1740B2F	1450.1	c d e f g h i j	35.5	4.9	21	34	28.3	1.07	80.7	4.9	3	1.3	$772.39
Bayer CropScience	ST5288B2RF	1444.2	d e f g h i j k	33.7	5.2	31	35	28.7	1.08	81.5	4.9	3	2.2	$783.40
ACGA	0125-2010-306-601	1429.7	e f g h i j k	34.2	4.6	21	34	29.4	1.08	80.5	4.8	2	2.3	$778.65
ACGA	0112-2012-302-601	1427.3	e f g h i j k	28.6	4.5	21	36	30.6	1.11	81.5	4.9	3	2.6	$777.05
Monsanto	09R549B2R2	1406.7	f g h i j k	35.1	4.7	21	34	28.7	1.06	79.7	5.0	2	-0.4	$727.04
Bayer CropScience	ST4498B2RF	1398.8	f g h i j k	34.5	5.4	31	34	29.6	1.06	81.9	4.8	4	-0.1	$724.31
Monsanto	09R303B2R2	1373.8	g h i j k l	34.0	3.8	21	39	32.9	1.19	82.6	4.5	2	4.6	$774.74
Control	**DP161B2RF**	**1366.9**	**g h i j k l**	**32.5**	**4.7**	**31**	**36**	**29.5**	**1.12**	**81.6**	**4.6**	**2**	**5.0**	**$778.96**
Dow AgroSciences	PHY525WRF	1355.2	g h i j k l	34.5	4.5	31	35	28.5	1.08	80.3	4.7	3	2.6	$738.82
Monsanto	09R796B2R2	1347.5	h i j k l	35.8	5.3	31	33	29.0	1.05	80.5	4.8	2	-0.1	$700.68
ACGA	0112-2009-306-601	1338.0	h i j k l	31.5	4.8	31	34	29.7	1.06	80.2	4.8	3	1.2	$710.72
ACGA	0136-2026-303-601	1337.8	h i j k l	31.9	5.0	21	34	28.5	1.07	80.7	4.7	3	1.4	$714.05
Control	**ST4554B2F**	**1337.6**	**h i j k l**	**33.3**	**4.9**	**21**	**35**	**29.3**	**1.08**	**80.4**	**4.8**	**3**	**2.6**	**$732.25**
ACGA	0143-2017-301-601	1325.2	i j k l	32.5	4.4	31	36	30.3	1.11	81.6	4.7	3	4.6	$749.17
Dow AgroSciences	PHY375WRF	1303.1	j k l	35.3	5.1	31	35	29.7	1.10	81.8	4.5	3	3.2	$717.80
Bayer CropScience	FM840B2F	1263.3	k l	31.5	5.0	31	35	29.3	1.09	81.2	4.5	3	3.1	$694.67
ACGA	0113-2026-309-601	1215.2	l	32.2	4.7	31	36	32.8	1.10	81.2	4.8	2	4.8	$690.85
LSD§		183.2		2.4	0.6	---	2	NS	0.06	1.4	0.2	0.7	3.1	$110.96
OSL†		0.0001		0.0001	0.0001	---	0.0126	0.1023	0.0177	0.0079	0.0001	0.0001	0.0020	0.0019
CV‡		8.9		4.6	8.7	---	4.3	6.4	3.7	1.3	3.7	19.2	76.3	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

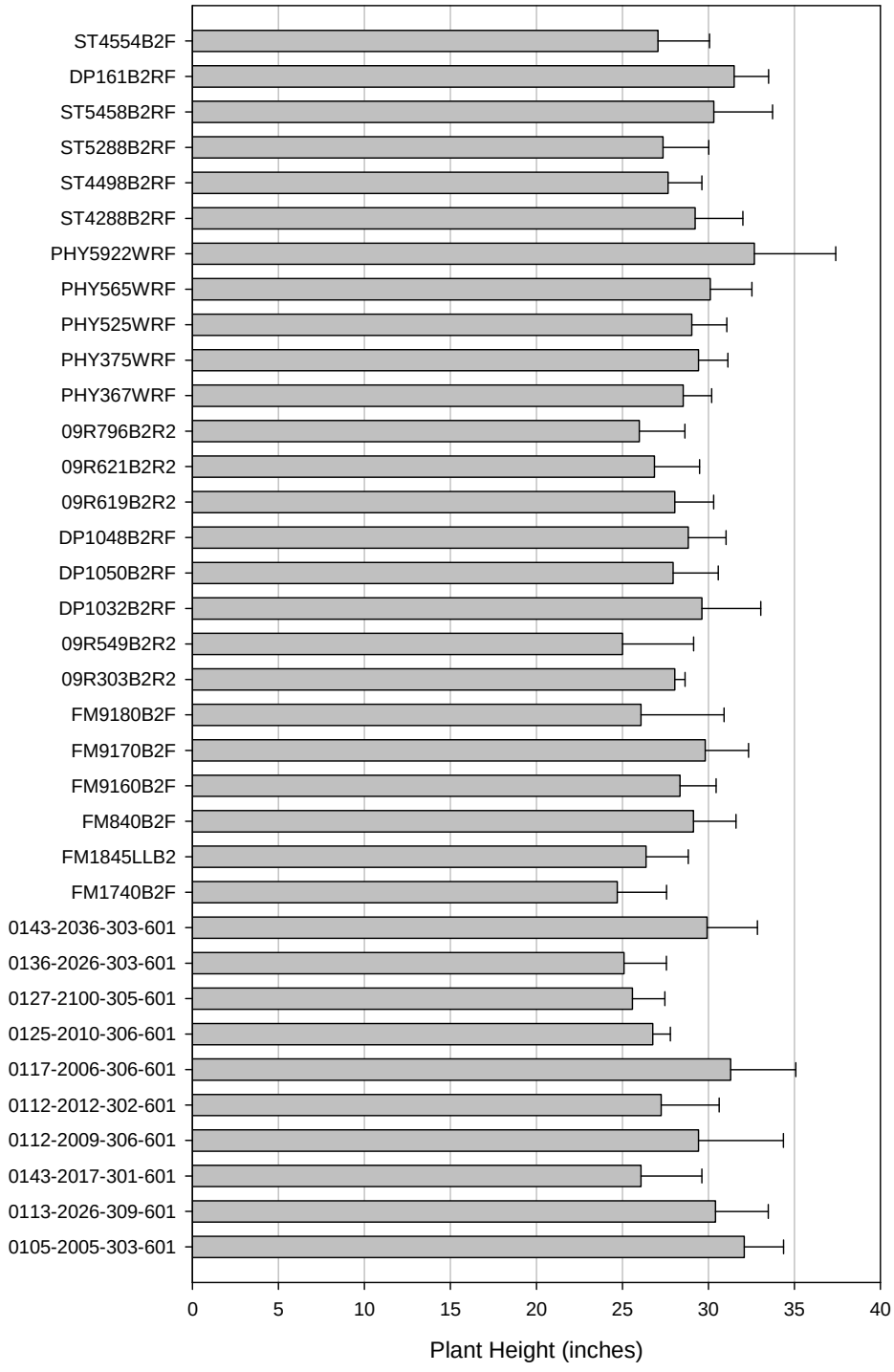
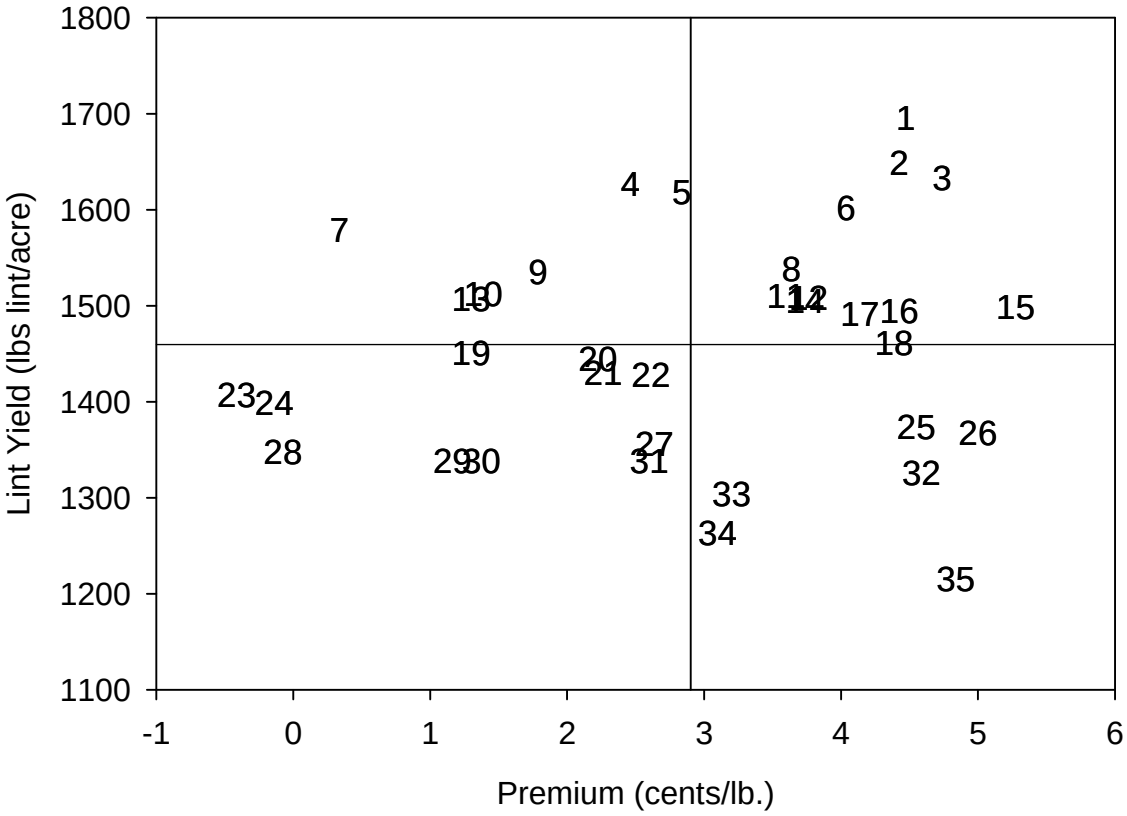


Figure 5. Mean final plant height (inches) along with the standard deviation for each of the varieties and advanced strains evaluated in Safford, AZ, 2009.



1	FM9170B2F	**11**	DP1048B2RF	**21**	0125-2010-306-601	**31**	ST4554B2F
2	PHY367WRF	**12**	09R619B2R2	**22**	0112-2012-302-601	**32**	0143-2017-301-601
3	PHY565WRF	**13**	ST5458B2RF	**23**	09R549B2R2	**33**	PHY375WRF
4	FM9180B2F	**14**	DP1050B2RF	**24**	ST4498B2RF	**34**	FM840B2F
5	0117-2006-306-601	**15**	FM9160B2F	**25**	09R303B2R2	**35**	0113-2026-309-601
6	PHY5922WRF	**16**	09R621B2R2	**26**	DP161B2RF		
7	0105-2005-303-601	**17**	ST4288B2RF	**27**	PHY525WRF		
8	DP1032B2RF	**18**	FM1845LLB2	**28**	09R796B2R2		
9	0143-2036-303-601	**19**	FM1740B2F	**29**	0112-2009-306-601		
10	0127-2100-305-601	**20**	ST5288B2RF	**30**	0136-2026-303-601		

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 varieties and advanced strain entries are plotted for the Safford, AZ location in 2009.