PROJECT NUMBER	**:**	TK 208/21
PROJECT TITLE	**:**	Evaluation of the effect of a particular planting date on production, fibre quality and colour of cotton (*Gossypium hirsutum* L.) cultivars produced in South Africa
REPORT YEAR	**:**	2013/2014
PROGRAMME MANAGER	**:**	Dr GJ Thompson
PROJECT LEADER	**:**	CE Fourie
CO-WORKERS	**:**	KC Phalane GV Matlala

INTRODUCTION

The cotton planting window for sowing becomes very narrow for optimal yield and fibre qualities. Finding the most suitable cultivar for a particular planting date can help to widen the window period for sowing.

Obtaining a vigorous stand is the first step for profitable cotton production. Soil temperature is one of the most important factors in determining the time of planting cotton. Cotton should not be planted before the top 30 mm of soil not maintained a temperature of 16 to 18°C or higher.

The results of the 2013/14 evaluation of cultivars that are most suitable for a particular planting date are presented in this report.

OBJECTIVE

The objective of the trial is to determine which cultivar is most suitable for a particular planting date. The effect on plant growth, yield, fibre qualities and the degree of whiteness (colour values) of the different cotton cultivars were determined at various planting dates.

LOCALITY

Groblersdal: ARC-Loskop Research Farm

The recommended locality presents one of the 8 different climatic zones experienced for cotton production in South Africa.

GENERAL PRODUCTION CONDITIONS

Maximum and Minimum temperatures

Cultivar adaptation and successful production are influenced by climatic conditions, especially temperatures during specific phases of the growing season. The minimum and maximum temperature data for October and November 2013 is given in Figures 1 and 2 below.

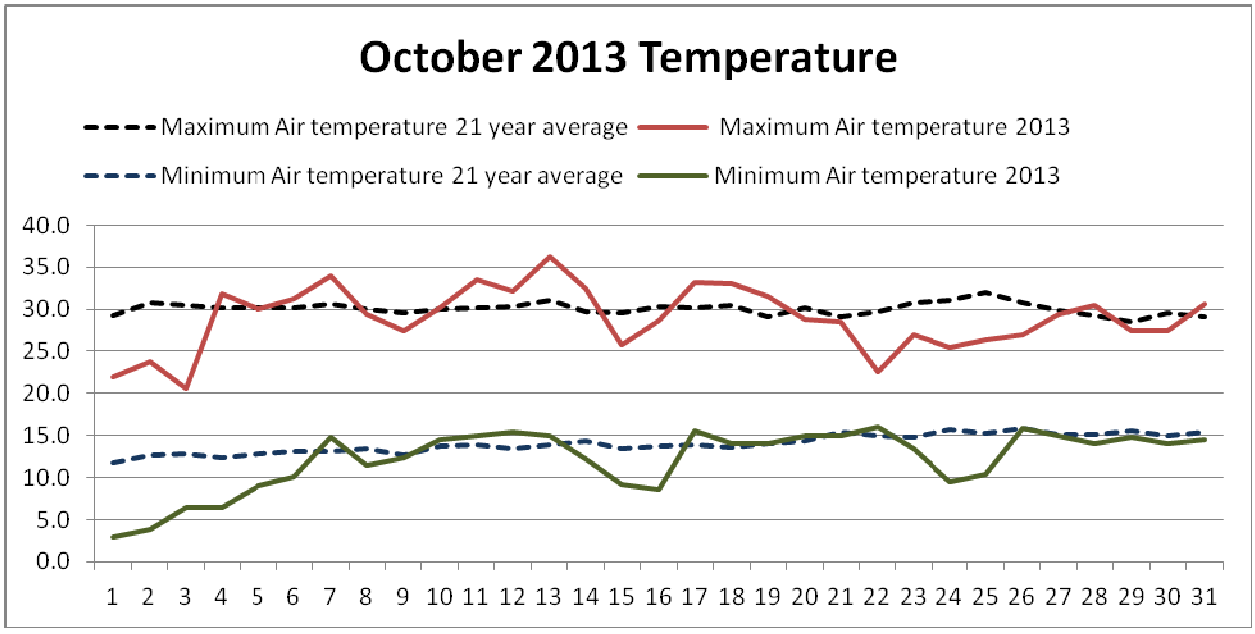

Figure 1. The minimum and maximum temperature data collected from the weather station at ARC-Loskop Research farm indicate that the maximum and minimum temperatures for October were lower than the long-term values. The minimum temperature was also lower during the first part of October 2013 than the long-term values.

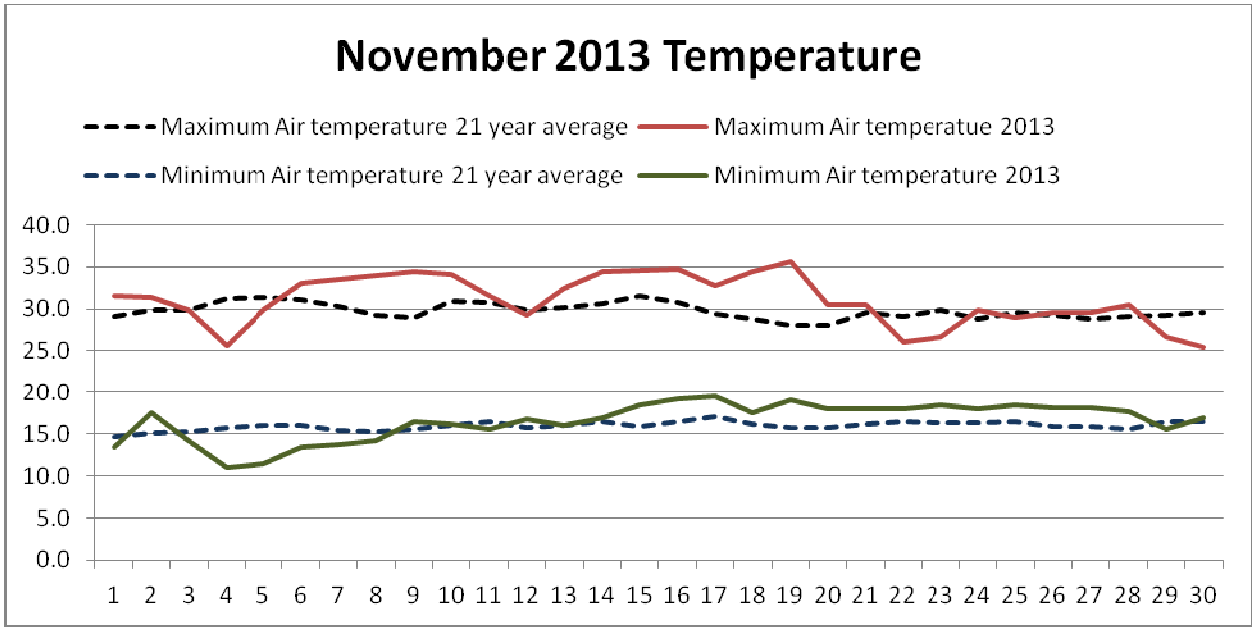

Figure 2. The minimum and maximum temperature data collected at the weather station for November 2013 indicated warmer temperatures than the long-term values.

Soil temperature

A soil temperature meter was installed the 30th of September 2013 to record soil temperatures during sowing season of the eight planting dates. A graph for the soil temperature is given in Figures 3 and 4 below.

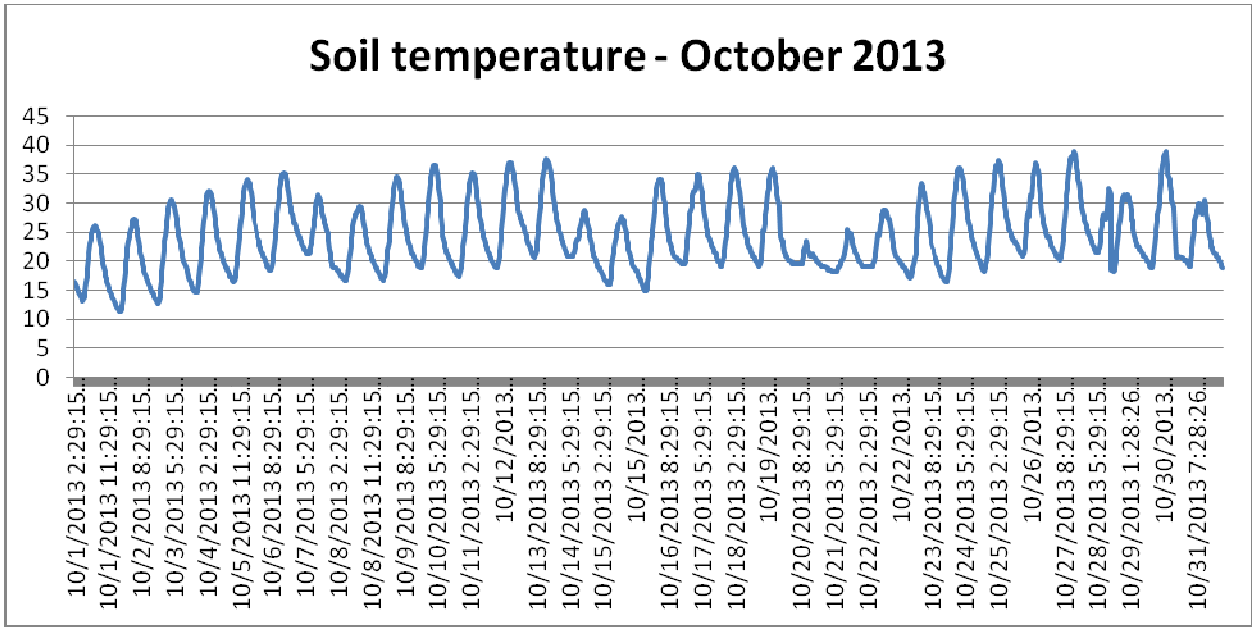

Figure 3. Cotton should not be planted before the top 30 mm of soil has not maintained a temperature of 16 to 18°C or higher. The soil temperature was beneath 16°C during the first part of October 2013

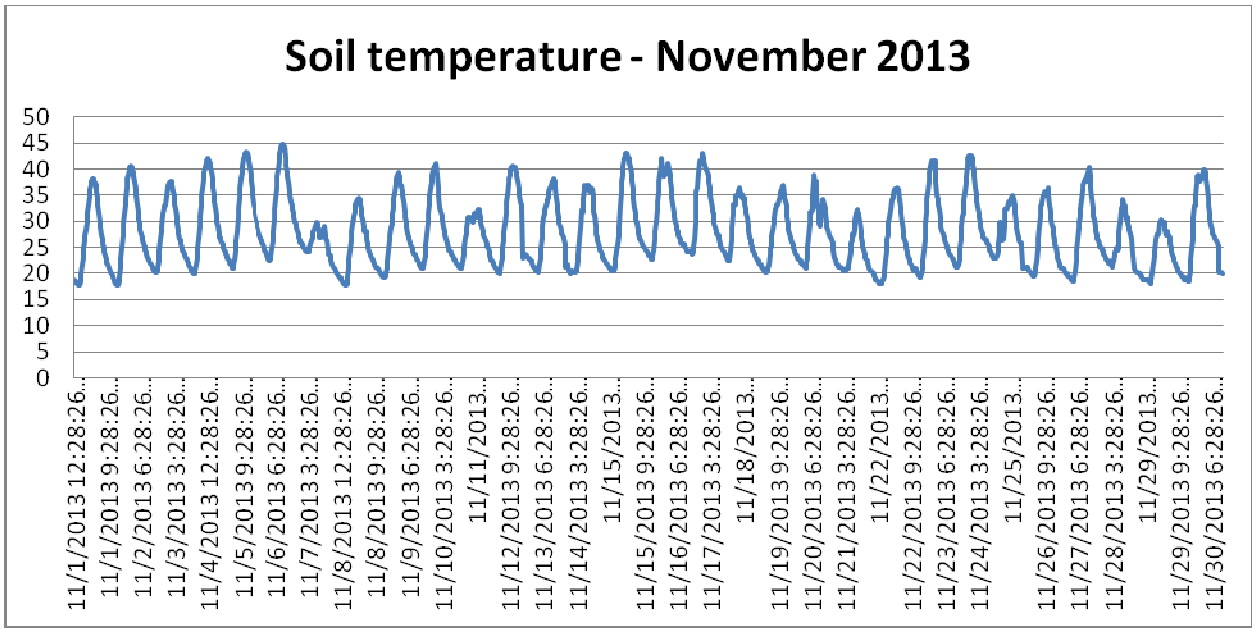

Figure 4. Soil temperatures for November 2013 were normal for sowing of cotton

Rainfall (mm)

A total of 927 mm rain was recorded during the growing season of the Plant Date Trials. Figure 5 indicates the rainfall for the 2013/14 cotton growing season with the highest rainfall for December 2013 (252 mm) and the first two weeks in March 2014 with (226 mm). A hailstorm and heavy rain (42 mm) just after planting on the 28th of October 2013 resulted in eroded soil and wash away of cotton seeds.

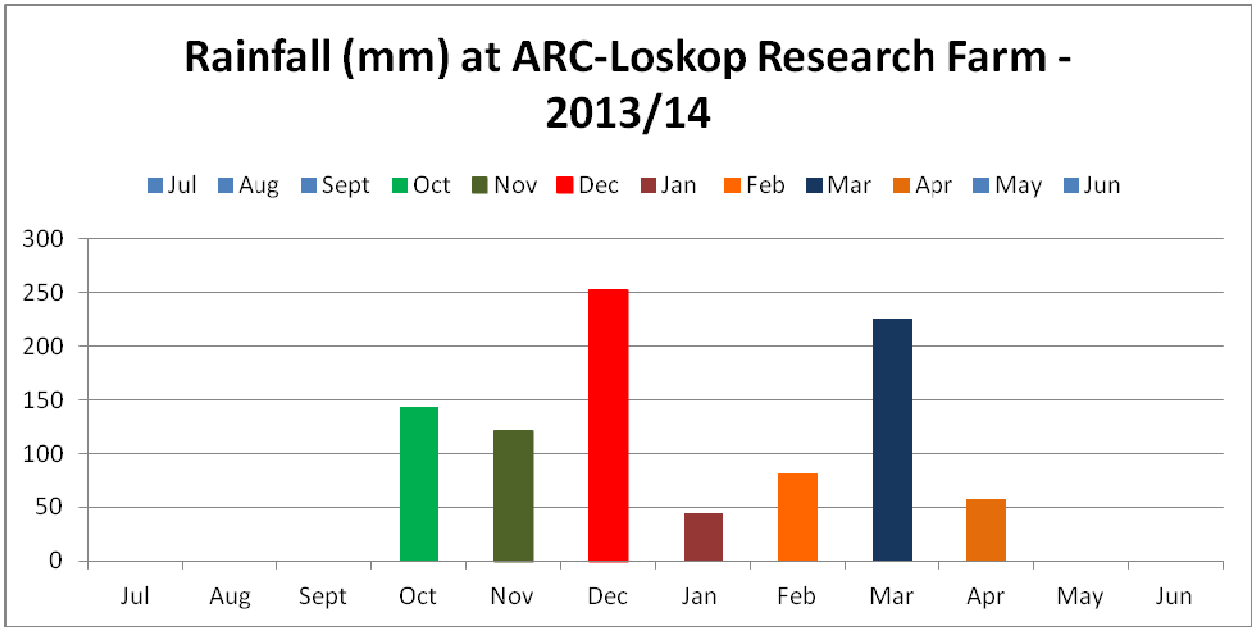

Figure 5. Rainfall for the 2013/14 cotton growing season at ARC-Loskop Research Farm

Planting Dates

In the field study eight planting dates were used. These planting dates are chosen to cover the available planting window for sowing cotton.

1. 7 October 2013,
2. 14 October 2013,
3. 22 October 2013,
4. 4 November 2013,
5. 11 November 2013,
6. 18 November 2013 and
7. 25 November 2013.

Cultivars

Cotton cultivars planted under irrigation consisted of 7 entries and these commercial cultivars that will be reported on are listed.

1. Delta12BRF (standard)
2. 13P3001B2RF
3. DP1240B2RF (new)
4. CandiaB2RF
5. 13P3005B2RF (new)
6. DP1441RF (Okra leaf)
7. DP210BRF (standard)

EXPERIMENTAL PROCEDURES

Trials were planted under commercial cotton production practices, where soil, climate and general production practices were used. All the planting date trials were handled in the same way through-out the sowing period. The planting date trials and cultivars were planted in a randomized block design with four replicates, and plots consisted of 2 rows of 5 m lengths, at an inter-row spacing of 90 cm and intra-row spacing of 15 cm.

All cultural practices, including fertilizer regimes, pest control and irrigation were treated the same. Target total fertilizer was 180 kg N/ha, 35 kg P/ha and 85 kg K/ha. Weed and insect control was applied as necessary.

Three application of 250 ml/ha each of the plant growth regulator, Mepiquat chloride (Pix), was applied with a knapsack on each planting date trial. The first application was spayed at 1st white flower, 2nd application was 3 weeks later and the 3rd application was again 3 weeks later. Plant establishments and any yield limiting factors were noted throughout. The plant height for each cultivar in a Planting Date was taken 150 days after planting.

Sub-samples of the harvested seed cotton were ginned for turnout data. Lint for samples was sent to Cotton SA for HVI fibre quality analysis.

STATISTICAL ANALYSIS

A randomized block design with four replications is used to accommodate treatments. Quantitative data was analysed using the program Gen Stat Release 11.1 (PC/Windows).

The empirical ranking of the entries are indicated in the tables, although this does not necessarily mean that the cultivars and planting dates differ significantly. For this purpose the LSD's (P0.05) are also included.

RESULTS

A cold front on the 1st of October 2013 kept soil temperatures below 13°C. From the compared analysis Plant date 1 resulted in very low average germination percentage of 10.8, and as the soil warmed, more seedlings emerge from the soil, but still the average germination percentage at 14 days was low at 49.9%. A hail storm and heavy rain on the 28th of October 2013 resulted in lower germination percentage in Plant dates 3 and 4 due to damage to the seedlings, eroded soil and wash away of seeds just after plant.

The average plant height that (measured 150 days after planting) was calculated over the different plant dates was 111.5 cm. The cultivar CandiaB2RF had the shortest significantly plant height of 99.3 cm. The cultivars 13P3001B2RF, DP1441RF, and 13P3005B2RF were strong growers with an average plant height of 116 cm or higher.

Average boll size over planting dates for cultivars was 6.12 grams. Boll sizes for the planting dates 5, 6 and 7 were small with a weight of 5.93 g and 5.82 g and 5.98 g respectively compared to the other planting dates that were above 6.0 grams per boll. The cultivar DP1441 RF average boll size of 6.89 g over planting dates weighing significantly more than the other cultivars.

A hailstorm on the 28th of October 2013 resulted in hail damage to seedlings and reduced reducing yields for planting date 1, 2, 3 and 4.

The average yield over planting dates for cultivars was 5334.1 kg/ha. From the combined analysis, the cultivars 13P3005B2RF, 13P3001B2RF and DP210BRF had the highest yields. The cultivar 13P3005B2RF had the highest significantly yield over seven of the eight planting dates with an average yield of 5941.0 kg/ha. The cultivar CandiaB2RF had the highest average yield for the eighth planting date with a yield of 5126.4 kg/ha.

The average fibre percentage over planting dates for cultivars was 41.7%. The planting date 7 had the highest significantly fibre percentage of 43.44%. From the combined analysis for planting dates over cultivars, cultivars, DP1441RF, CandiaB2RF and 13P3001B2RF at Planting Date 7 with fibre percentage of 45.62%, 45.60% and 45.40% respectively had significantly higher fibre percentage.

The cultivars, Delta12BRF had result the longest average fibre length of average 31.168 mm followed by CandiaB2RF with a fibre length of 31.07 mm. From the combined analysis for planting dates over planting dates, planting date 8 resulted in two cultivars, 13P3001B2RF and CandiaB2RF, with significantly higher fibre lengths of 32.07 mm and 32.00 mm respectively.

The cultivar Delta1240B2RF gave significantly the strongest fibres of 34.36 g/tex. From the combined analysis for planting dates over cultivars, Delta1240B2RF at planting date 2 and 6 resulted in significantly stronger fibres of 35.7 and 35.6 g/tex.

The uniformity index values of 83 to 85 indicates a high degree of uniformity and >85 indicates a very high degree of uniformity. Almost all the Cultivars over planting dates resulted in index values above 83 except for Delta12BRF and DP210BRF and DP1441RF which resulted index values below 83 at planting dates 7 and 8. Their uniformity index value classified them as intermediate.

When sowing cotton too early, very thick fibres with micronaires above 4.5 µgram was resulted. Planting Date 1, 2 and 3 resulted in average micronaires of 4.8 µgram, 4.5 µgram and 4.6 µgram respectively. The cultivar Candia B2RF had the best micronaire average over the planting dates with of 3.8 µgram.

Each planting date trial was hand pick when ready and cotton fibres were not exposed to too long to field weathering. Thus, the degree of Reflection (Rd ≥ 75) and yellowness (+b < 9) are in the respective norms.

CONCLUSION

It is very difficult to find a particular cultivar suited for planting early in the cotton growing season because environmental conditions such as hail and heavy rains had an influence on cultivar performance. Two cultivars, namely 13P3005B2RF and CandiaB2RF performed very

well in the yield, the latter cultivar especially for late planting. The results showed different cultivar parameters suited different planting dates.

PROPOSED RESEARCH FOR 2014/15

This trial was a first cotton season trial and a second season for this trial is needed because environmental conditions are unpredicted and not controllable. The trial will be planted at Groblersdal: ARC-Loskop Research Farm and Northern Cape Province.

Table 1. Germination percentage 7 days after planting

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	9.3	80.4	80.0	32.9	90.0	82.9	89.3	92.5	69.6	7
2	13P3001B2RF	12.1	85.4	85.7	42.1	94.3	88.6	96.1	94.6	74.9	2
3	DP 1240 B2RF	10.4	76.1	72.1	40.0	95.0	85.7	96.1	94.6	71.3	6
4	Candia B2RF	12.1	85.4	86.4	42.5	93.2	84.6	95.4	96.1	74.5	3
5	13P3005B2RF	3.9	83.2	83.9	46.1	97.9	84.6	90.4	93.6	72.9	5
6	DP1441RF	12.9	91.8	90.7	47.5	97.1	88.6	96.8	98.2	77.9	1
7	DP210BRF	15.0	85.0	87.1	42.9	92.9	85.4	90.0	90.4	73.6	4
Average		10.8	83.9	83.7	42.0	94.3	85.8	93.4	94.3		
Ranking		8	5	6	7	1	4	3	2		
CV %		1.15									
LSD_t(0.05)(PD x Cult)		3.39									
LSD_t(0.05)(Cult x PD)		2.13									

Table 2. Germination percentage 14 days after planting

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	31.1	83.2	59.3	38.6	90.0	96.4	95.0	97.9	73.9	7
2	13P3001B2RF	54.3	91.1	68.6	44.6	93.2	97.5	96.8	95.7	80.2	2
3	DP 1240 B2RF	52.5	84.6	58.9	47.9	95.0	95.0	98.6	96.1	78.6	5
4	Candia B2RF	48.9	90.4	66.1	50.0	93.9	96.4	97.5	96.1	79.9	3
5	13P3005B2RF	48.2	89.6	62.5	47.9	98.2	97.1	96.4	96.8	79.6	4
6	DP1441RF	47.9	91.1	75.0	55.0	96.4	95.4	97.5	98.2	82.1	1
7	DP210BRF	45.7	88.9	55.0	50.7	95.0	97.5	95.7	96.8	78.2	6
Average		46.9	88.4	63.6	47.8	94.5	96.5	96.8	96.8		
Ranking		8	5	6	7	4	3	2	1		
CV %		1.06									
LSD_t(0.05)(PD x Cult)		1.62									
LSD_t(0.05)(Cult x PD)		10.15									

Table 3. Plant height (cm) was taken 150 days after planting

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	102.9	109.5	104.3	112.9	120.8	111.3	108.9	112.2	110.3	5
2	13P3001B2RF	112.9	111.4	111.4	125.1	122.7	129.7	112.2	116.2	117.7	1
3	DP 1240 B2RF	103.6	108.5	106.7	116.2	113.6	118.2	111.5	112.1	111.3	4
4	Candia B2RF	92.8	94.7	89.8	105.4	106.6	117.8	102.2	96.6	100.7	7
5	13P3005B2RF	119.2	113.9	112.3	123.9	124.8	125.4	111.3	102.4	116.6	3
6	DP1441RF	108.2	116.3	108.2	123.3	122.1	117.2	117.7	119.6	116.6	2
7	DP210BRF	112.4	101.6	102.6	108.5	115.9	120.5	104.2	107.7	109.1	6
Average		107.4	108.0	105.0	116.4	118.0	120.0	109.7	109.5		
Ranking		8	7	6	3	2	1	5	4		
CV %		5.57									
LSD_t(0.05)(PD x Cult)		3.07									
LSD_t(0.05)(Cult x PD)		3.28									

Table 4. Boll size (g)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	6.1	6.0	6.0	5.9	5.9	5.4	5.5	5.9	5.83	6
2	13P3001B2RF	6.2	6.4	6.2	6.2	5.8	5.8	5.9	6.8	6.17	2
3	DP 1240 B2RF	6.4	5.5	6.6	6.4	5.8	5.9	5.9	6.5	6.12	4
4	Candia B2RF	6.2	5.5	5.5	5.4	5.3	5.2	5.4	6.2	5.59	7
5	13P3005B2RF	6.2	6.0	6.0	6.3	6.1	5.8	6.2	6.5	6.14	3
6	DP1441RF	6.9	6.6	6.9	6.9	6.8	6.8	6.9	7.2	6.88	1
7	DP210BRF	6.5	6.3	6.4	6.2	5.3	5.7	6.0	6.2	6.09	5
Average		6.4	6.0	6.2	6.2	5.9	5.8	6.0	6.5		
Ranking		2	5	3	4	7	8	6	1		
CV %		5.13									
LSD_t(0.05)(PD x Cult)		0.155									
LSD_t(0.05)(Cult x PD)		0.1662									

Table 5. Yield (kg/ha)

Cultivar		Planting dates																Average yield (kg/ha)	Ranking
		PD 1 7/10/2013	Ranking	PD 2 14/10/2013	Ranking	PD 3 22/10/2013	Ranking	PD 4 28/10/2013	Ranking	PD 5 4/11/2013	Ranking	PD 6 11/11/2013	Ranking	PD 7 18/11/2013	Ranking	PD 8 25/11/2013	Ranking		
1	Delta 12 BRF	2607.7	7	4427.5	7	4536.8	2	4480.5	7	5533.1	5	4884.7	5	5287.0	7	4191.6	7	4498.6	7
2	13P3001B2RF	3553.7	5	6076.9	3	5795.7	2	5808.8	3	6168.9	3	6006.1	2	5693.8	4	4977.3	2	5512.9	2
3	DP 1240 B2RF	4610.3	2	4794.7	6	5116.7	4	5442.0	5	5856.7	4	5385.2	4	5984.2	2	4730.0	4	5243.3	4
4	Candia B2RF	3862.5	4	5176.3	5	4366.3	7	4515.9	6	5110.1	6	4659.0	7	5374.6	6	5126.4	1	4779.0	6
5	13P3005B2RF	5104.5	1	6338.8	1	6158.1	1	6126.9	1	6615.1	1	6075.3	1	6376.3	1	4726.1	5	5941.0	1
6	DP1441RF	4223.5	3	6151.0	2	4818.8	5	5525.4	4	5032.1	7	4790.3	6	5773.1	3	4666.6	6	5126.4	5
7	DP210BRF	3406.1	6	5237.5	4	5667.6	3	6062.0	2	6381.7	2	5905.0	3	5692.5	5	4843.1	3	5402.6	3
Average		3909.8		5457.5		5208.6		5423.1		5814.0		5386.5		5740.2		4751.6			
Ranking		8		3		6		4		1		5		2		7			
CV %		0.018																	
LSD_t(0.05)(PD x Cult)		427.9																	
LSD_t(0.05)(Cult x PD)		347.02																	
LSD_t(0.05)(Cult x PD)		347.02																	

Table 6. Fibre percentage (%)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	37.4	37.5	41.4	38.8	38.0	38.8	40.0	38.3	38.8	7
2	13P3001B2RF	41.0	43.1	40.5	43.3	44.1	41.3	45.4	43.4	42.7	3
3	DP 1240 B2RF	39.8	38.6	40.0	40.4	39.6	40.2	41.4	40.0	40.0	6
4	Candia B2RF	43.2	42.7	42.8	43.4	43.4	41.6	45.6	43.7	43.3	2
5	13P3005B2RF	41.4	42.0	40.8	43.1	42.5	42.5	44.1	44.1	42.6	4
6	DP1441RF	42.7	42.8	42.0	44.4	43.3	44.6	45.6	44.1	43.7	1
7	DP210BRF	40.1	39.6	42.9	41.5	40.5	41.1	42.0	40.7	41.0	5
Average		40.8	40.9	41.5	42.1	41.6	41.7	43.5	42.1		
Ranking		8	7	6	2	5	4	1	3		
CV%		3.17									
LSD_t(0.05)(PD x Cult)		0.66									
LSD_t(0.05)(Cult x PD)		0.7									

Table 7. Fibre length (mm)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2014	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	30.5	30.2	30.4	29.3	29.2	27.9	28.7	29.5	29.4	6
2	13P3001B2RF	30.3	30.5	30.6	30.9	29.6	30.5	30.1	32.1	30.6	4
3	DP 1240 B2RF	30.2	30.9	30.5	30.4	31.2	30.0	30.5	31.0	30.6	3
4	Candia B2RF	31.1	31.5	31.0	30.7	31.2	30.6	31.2	32.0	31.2	1
5	13P3005B2RF	30.1	29.8	29.8	30.1	31.1	31.1	30.3	30.1	30.3	5
6	DP1441RF	29.3	29.3	28.8	29.3	29.6	29.1	28.2	30.0	29.2	7
7	DP210BRF	31.1	31.4	31.6	31.8	31.3	30.4	30.1	31.7	31.2	2
Average		30.3	30.5	30.4	30.3	30.5	30.0	29.9	30.9		
Ranking		6	2	5	4	3	7	8	1		
CV %		3.749									
LSD_t(0.05)(PD x Cult)		0.439									
LSD_t(0.05)(Cult x PD)		0.41									

Table 8. Fibre Uniformity

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	86.1	85.3	85.9	83.8	83.8	83.1	82.4	83.1	84.2	6
2	13P3001B2RF	86.3	86.3	85.1	85.6	84.5	84.8	83.7	84.8	85.1	2
3	DP 1240 B2RF	86.7	87.0	85.9	84.9	86.3	85.0	84.5	85.0	85.6	1
4	Candia B2RF	85.0	86.7	85.4	83.5	84.0	84.2	84.1	84.2	84.6	4
5	13P3005B2RF	86.4	84.3	84.6	85.1	84.7	86.0	84.0	86.0	85.1	3
6	DP1441RF	86.4	86.2	84.6	85.2	85.0	83.9	82.3	83.9	84.7	5
7	DP210BRF	87.3	85.6	84.5	84.0	82.4	81.7	82.7	81.7	83.7	7
Average		86.3	85.9	85.1	84.6	84.4	84.1	83.4	84.1		
Ranking		1	2	3	4	5	7	8	6		
CV %		1.758									
LSD_t(0.05)(PD x Cult)		0.714									
LSD_t(0.05)(Cult x PD)		0.668									

Table 9. Fibre Strength (g/tex)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	32.6	24.5	33.6	30.6	30.2	31.3	26.4	29.4	29.8	6
2	13P3001B2RF	34.5	33.9	33.7	33.5	31.1	31.9	27.6	30.2	32.1	4
3	DP 1240 B2RF	35.2	35.2	34.8	34.8	34.5	35.6	31.1	33.1	34.3	1
4	Candia B2RF	34.0	35.1	33.1	31.1	31.2	33.8	28.4	31.1	32.2	3
5	13P3005B2RF	35.2	33.8	34.4	33.0	32.8	34.7	29.3	30.1	32.9	2
6	DP1441RF	32.1	33.6	31.3	30.5	31.4	30.5	25.7	29.2	30.5	7
7	DP210BRF	34.6	33.6	32.6	31.7	29.8	31.7	28.3	30.3	31.6	5
Average		34.0	32.8	33.4	32.2	31.6	32.8	28.1	30.5		
Ranking		1	2	3	5	6	4	8	7		
CV %		6.076									
LSD_t(0.05)(PD x Cult)		0.741									
LSD_t(0.05)(Cult x PD)		1.977									

Table 10. Micronaire (µgram)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/11/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	4.7	4.4	4.5	4.6	4.0	3.8	3.6	3.8	4.2	5
2	13P3001B2RF	4.7	4.9	4.5	4.4	4.3	4.0	4.5	3.9	4.4	3
3	DP 1240 B2RF	5.1	4.9	5.0	4.6	4.6	4.5	4.8	4.7	4.8	1
4	Candia B2RF	4.5	3.8	3.9	3.9	3.1	3.4	3.8	3.8	3.8	7
5	13P3005B2RF	4.9	4.7	5.1	4.8	4.4	4.2	4.7	4.7	4.7	2
6	DP1441RF	4.8	4.1	4.5	4.2	4.2	4.1	3.8	4.3	4.3	4
7	DP210BRF	4.6	4.4	4.6	4.0	3.8	3.7	4.1	3.7	4.1	6
Average		4.8	4.5	4.6	4.4	4.1	3.9	4.2	4.1		
Ranking		1	3	2	4	7	8	5	6		
CV %		10.754									
LSD_t(0.05)(PD x Cult)		0.161									
LSD_t(0.05)(Cult x PD)		0.151									

Table 11. Degree of reflectance (Rd ≥ 75)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/11/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	76.9	78.6	77.8	79.6	80.0	80.1	80.4	82.8	79.5	4
2	13P3001B2RF	75.9	79.7	79.4	79.5	80.3	81.1	81.1	82.2	79.9	1
3	DP 1240 B2RF	74.6	75.7	75.7	76.1	77.3	78.2	79.0	81.9	77.3	7
4	Candia B2RF	76.2	80.4	79.0	79.5	81.0	81.3	80.0	82.4	80.0	2
5	13P3005B2RF	75.0	77.7	76.9	77.9	78.8	79.4	79.9	82.3	78.5	6
6	DP1441RF	76.9	78.9	77.6	79.0	80.0	79.9	80.2	81.5	79.2	5
7	DP210BRF	78.0	79.0	79.3	78.7	80.9	81.3	80.2	81.6	79.9	3
Average		76.2	78.6	77.9	78.6	79.7	80.2	80.1	82.1		
Ranking		8	6	7	5	4	2	3	1		
CV %		2.123									
LSD_t(0.05)(PD x Cult)		0.637									
LSD_t(0.05)(Cult x PD)		0.596									

Table 12. Yellowness (+b < 9)

Cultivar		Planting dates								Average Plant height (cm)	Ranking
		PD 1 7/10/2013	PD 2 14/10/2013	PD 3 22/10/2013	PD 4 28/10/2013	PD 5 4/11/2013	PD 6 11/11/2013	PD 7 18/11/2013	PD 8 25/11/2013		
1	Delta 12 BRF	8.8	8.3	8.0	7.3	7.3	7.0	7.2	7.4	7.6	7
2	13P3001B2RF	8.7	7.9	7.7	7.6	7.3	7.0	7.5	7.4	7.6	6
3	DP 1240 B2RF	9.7	9.1	9.2	8.7	8.6	8.5	8.1	7.8	8.7	1
4	Candia B2RF	8.6	7.9	7.7	7.8	7.8	7.1	7.9	7.8	7.8	4
5	13P3005B2RF	9.2	8.6	8.7	8.0	8.5	7.9	7.9	7.8	8.3	2
6	DP1441RF	9.0	8.4	8.5	7.9	8.2	7.6	7.8	7.9	8.2	3
7	DP210BRF	8.7	8.3	8.0	7.2	7.2	7.0	7.8	7.9	7.7	5
Average		8.9	8.3	8.3	7.8	7.8	7.4	7.7	7.7		
Ranking		1	2	3	5	4	8	7	6		
CV %		7.816									
LSD_t(0.05)(PD x Cult)		0.242									
LSD_t(0.05)(Cult x PD)		0.227									