

EVALUATION OF SOME EGYPTIAN COTTON GENOTYPES OVER TWO STAGES

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ABSTRACT

The present investigation deals with the variation among some Egyptian cotton (*Gossypium barbadense* L.) genotypes. They were evaluated within Giza 80 zone, Minya and Beni Souf (Upper Egypt) through two programs (breeding and regional) during 2009 and 2010 seasons. A randomized complete block design was used in the two programs to estimate the variance among the genotypes. The first analysis used one observation per experimental unit to evaluate the genotypes in the first stage (individual generations or locations). The second analysis used more than one observation per experimental unit to evaluate genotypes in the second stage (two generations or locations). The results of the breeding program exhibited significant variation due to genotypes and hybrids vs. G80 were observed for total yields (seed and lint) and earliness. Hybrids significantly surpassed G80 with respect to total yields (seed and lint) and earliness except G90 x Pima S 62 (24240), (G83 x Pima S 6) x Dandara, (G83 x (G75 x 5844)) x G85 and G91 x G80 for earliness in the two generations. The results of the analysis of two generations gave information with respect to variance between generations to be used in the breeding program. The results of the regional program showed that (G83 x (G75 x 5844)) x G80 gave the lowest values of variance between locations for boll weight and dry weight per boll in the first season, harvest index in the second season and number of seeds per boll in the two seasons. G90 x Australian gave similar results for seed cotton yield and boll weight in 2009 season. Thus hybrids were more stable than G80. Results exhibited showed that G80 was more stable than hybrids for lint cotton yield in the two seasons due to its lowest variance between locations. The present study was very important in the two programs, it selects the surpassed varieties in the breeding program, replace new varieties to cultivars in the regional program and enter the statistical measure to evaluate the genotypes.

Key words: *cotton, genotypes, locations, randomized complete block design.*

INTRODUCTION

One of the objectives of the research stations is to develop high yielding cultivars and make them available to the growers. The productivity of cultivars, results to a large extent from how well it benefits from the environmental conditions. The attempt to adapt elements of production system used in Egypt brought about plant breeding efforts to develop cottons suited to wider range of environments in the Egyptian cotton belt. The Cotton Research Institute is the major player in cotton production policy in Egypt. It conducts fundamental and applied research on and undertakes development programs in a wide variety of areas as discussed below. Commercial cotton varieties are maintained through continuous release of new pure seed stock. Breeding materials for fiber properties are tested to select for high

quality and best characteristics in cotton. Allocation of cotton varieties to different locations throughout the country is decided according to regional field trial results.

Sing and Narayanan (2000) mentioned the benefits of applying randomized complete block design in plant breeding. The randomized complete block experiment is quite flexible. Since the variability between replications can be removed from the experimental error, it is unnecessary for the replications to be contiguous. An entire variable or replication may be omitted from the analysis when, for some reason, it is either lost or not comparable with the others.

Mohamed *et al.* (2003) evaluated twenty-four cotton genotypes in Upper Egypt using the randomized complete block design. The results showed that the cross ((G83 x G80) x G89) was a

promising cross due to its performance for yield components and fiber quality. Idris (2005) studied five Egyptian cotton genotypes in two locations using two steps of analysis of randomized complete block design. Such steps considered each location as one replicate. Results showed no difference between the two methods of analysis with respect to location effects. Rahoumah *et al.* (2008) evaluated twenty-four cotton genotypes in five locations using randomized complete block design. They found that the mean squares for genotypes x locations was significant for yield (seed and lint) and boll weight.

Researchers need a statistical measure to evaluate genotypes from different generations and locations (breeding and regional programs). Thus, the objective of the present study was to evaluate some Egyptian cotton genotypes over two stages of analysis (breeding and regional programs) of randomized complete block design to estimate the variatice between genotypes and locations variance.

2. MATERIALS AND METHODS

Some Egyptian cotton (*Gossypium barbadense* L.) genotypes were evaluated within G80 zone (control) Minya and Beni Souf Governorates (Upper Egypt) through two programs of Cotton Research Institute (breeding and regional sections) during 2009 and 2010 seasons (Table 1). Planting was during the last week of March. All agricultural practices were done as usual.

2.1. Breeding program

One field experiment was carried out in Minya Governorate during 2009 and 2010 seasons. A randomized complete block design with six replications was used. Plot size was 7.2 m² (3 rows x 4 m long x 0.60 m apart). The first experiment evaluated the eleven genotypes with G80 for seed cotton yield, lint cotton yield, weight of (50 bolls) and earliness (expressed as yield percent of first pick relative to total seed cotton yield). One sample was obtained from each generation to estimate fiber properties, viz. fiber length, micronaire reading and yarn strength. The lint cotton samples were tested in the Cotton Research Laboratories, Cotton Research Institute.

2.2. Regional program

Two field experiments were carried out in two different locations (Minya and Beni Souf) during 2009 and 2010 seasons. A randomized complete block design with four replications was used. Plot size was 52 m² (20 rows x 4 m long x 0.65 m apart) and 62.4 m² (24 rows x 4 m long x 0.65 m

apart) in the first and second seasons, respectively. The last three genotypes were evaluated for seed and lint cotton yield. One sample (50 bolls) was obtained from each plot to estimate boll components, viz. boll weight, dry weight per boll and the number of seeds per boll. In addition, harvest index per boll (seed cotton per boll / dry weight per boll) was measured. One sample was obtained from each location to estimate fiber properties, viz. fiber length, micronaire reading and yarn strength. The lint cotton samples were tested in the Cotton Research Laboratories, Cotton Research Institute.

2.3 Statistical analysis

Two analyses of randomized complete block design were used (Table 2). The first analysis was done using one observation per experimental unit to evaluate the genotypes in the first stage (individual generations or locations). The second analysis was using more than one observation per experimental unit to evaluate the genotypes in the second stage (two generations or locations). Analysis of fiber properties in the two generations or locations using one observation per experimental unit due to test one replicate in each generation or location.

Statistical analyses were straightforward according to Cochran and Cox (1950), Federer (1955), Little and Hills (1978), Gomez and Gomez (1984), Bailey (1994), Roger (1994) and Mcpherson (2001). The different genotype means were compared by L.S.D. test as given by Steel and Torrie (1980). All comparisons were done at 0.05 level of significance.

3. RESULTS AND DISCUSSION

3.1. Breeding program

The objective of the cotton breeding program is to develop long staple varieties for Upper Egypt to meet the domestic spinning industry needs for low count yarn, introduce early maturity to help produce short – season cotton varieties and enable farmers to grow a winter crop (especially wheat) before cotton.

3.1.1. Analysis of individual generations (first stage)

The first stage of analysis was carried out with the data of individual generations to estimate genotype variance (Table 2). The analysis of variance of individual generations, with respect to total yields (seed and lint), weight of 50 bolls and earliness revealed the presence of significant difference among genotypes and hybrids vs. G80 (Table 3). In both seasons, significant variation due to genotypes and hybrids vs. G80 were

Table (1): Pedigree of the Egyptian cotton genotypes.

No	Origin	2009 season Families	2010 season Families
1	G90 x Pima S 62 (24240)	F ₅ 83 / 2007	F ₆ 146 / 2008
2	(G83 x Pima S 6) x Karashinky	F ₅ 102 / 2007	F ₆ 172 / 2008
3	(G83 x Pima S 6) x Dandara	F ₅ 111 / 2007	F ₆ 178 / 2008
4	G91 x Pima S 62 (24202)	F ₅ 116 / 2007	F ₆ 182 / 2008
5	(G83 x (G75 x 5844)) x G85	F ₆ 126 / 2007	F ₇ 194 / 2008
6	(G83 x (G75 x 5844)) x G91	F ₆ 139 / 2007	F ₇ 206 / 2008
7	G 91 x G80	F ₆ 145 / 2007	F ₇ 212 / 2008
8	(G83 x (G75 x 5844)) x G90	F ₆ 159 / 2007	F ₇ 215 / 2008
9	(G83 x (G72 x Dandara)) x G91	F ₇ 173 / 2007	F ₈ 235 / 2008
10	(G83 x (G72 x Dandara)) x G85	F ₇ 184 / 2007	F ₈ 240 / 2008
11	(G83 x (G75 x 5844)) x (G83 x (G72 x Dandara))	F ₈ 208 / 2007	F ₉ 260 / 2008
12	(G83 x (G75 x 5844)) x G80	Bulk families	
13	G90 x Australian	Bulk families	
14	G 66 x G73	G80	

Table (2): Two analyses of randomized complete block design.

First stage (Individual generations or locations)		Second stage (Two generations or locations)	
Source of variation	df	Source of variation	df
Replications (r)	(r-1)	Replications (r)	(r-1)
Genotypes (g)	(g-1)	Genotypes (g)	(g-1)
Experimental error	(g-1) (r-1)	Experimental error	(g-1) (r-1)
		Sampling (k) error	r g (k-1)
Total	r g - 1	Total	r g k - 1

observed for total yields (seed and lint), bolls weight and earliness except bolls weight for hybrids vs. G80. This method of analysis gave detail for genotypes and hybrids vs. G80 variances to be used in the breeding program.

The hybrids significantly exceeded G80 with respect to total yields (seed and lint) for the two seasons except G90 x Pima S 62 (24240), (G83 x Pima S 6) x Dandara and G91 x G80 in the first season. The hybrid G90 x Pima S 62 (24240) was the best genotype for boll weight, significantly surpassing G80 in 2010 season. On the contrary, G80 significantly surpassed (G83 x Pima S 6) x Dandara and G91 x Pima S 62 (24202) for boll weight in the first season and (G83 x Pima S 6) x Karashinky in the second season. Selection of heavy boll weight genotypes could help the cotton breeder to improve yield since it is one of the main components of high seed cotton yield.

The hybrids significantly exceeded G80 with respect to earliness in the two seasons except G90 x Pima S 62 (24240), (G83 x Pima S 6) x Dandara and G91 x Pima S 62 (24202) in 2009 season, (G83 x (G75 x 5844)) x G85, (G83 x (G72 x Dandara)) x G85 and (G83 x (G75 x 5844)) x (G83 x (G72 x Dandara)) in 2010 season and G 91 x G80 in the two seasons. Earliness is a very

important character for the cotton breeder to produce early varieties, which can escape bollworm infection and can be harvested early enough before sowing winter crops (Table 4).

Total yields (seed and lint) in the two picks (Table 3) were partitioned. In both seasons, significant variation due to the genotypes and the hybrids vs. G80 were recorded for yields (seed and lint) in the first pick. The hybrids significantly exceeded G80 with respect to (seed and lint) yields except G90 x Pima S 62 (24240), (G83 x Pima S 6) x Dandara and G 91 x G80 in the 2009 season.

The results of analysis of the two picks showed that (G83 x (G72 x Dandara)) x G91, (G83 x (G72 x Dandara)) x G85 and (G83 x (G75 x 5844)) x (G83 x (G72 x Dandara)) gave the highest values of variance between picks for seed and lint yields in the 2009 season. Also, hybrids G91 x Pima S 62 (24202), (G83 x (G75 x 5844)) x G91 and (G83 x (G72 x Dandara)) x G91 gave the same results in the second season. This shows that these hybrids were earlier maturing than the other genotypes due to the presence of G83, G91 and Dandara in their pedigree. This analysis gave information for the behavior of genotypes needed for the breeding program.

Table (3): Mean squares of traits for individual generations.

Breeding program							
2009 Season							
Traits		S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		50 Bolls	Earliness
Source of variation	df	F. Pick	S. Pick	F. Pick	S. Pick	(g)	%
Replications	5	35.90**	0.55	51.84**	0.90	67.00	50.82**
Genotypes	11	7.80**	0.29	11.70**	0.46	290.79*	55.93**
Hybrids vs. G80	1	31.71**	0.13	43.16**	0.16	295.74	122.33**
Residual	10	5.41*	0.31	8.55*	0.49	290.30*	49.28**
Experimental error	55	2.19	0.36	3.17	0.49	108.10	14.66
Total	71						
2010 Season							
Replications	5	8.37**	1.13**	13.19**	1.83**	152.20*	34.13**
Genotypes	11	6.46**	0.26	10.76**	0.48	175.46**	21.84*
Hybrids vs. G80	1	57.75**	0.12	87.51**	0.22	1.63	89.80**
Residual	10	1.33	0.28	3.09	0.50	192.84**	15.04
Experimental error	55	1.82	0.17	2.90	0.28	51.15	9.36
Total	71						
Traits		Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)			
Source of variation	df	2009	2010	2009	2010		
Replications	5	36.87**	14.24**	53.17**	22.58**		
Genotypes	11	7.66**	5.90**	11.64**	10.48**		
Hybrids vs. G80	1	35.92**	52.57**	48.14**	78.95**		
Residual	10	4.84**	1.24	7.99*	3.64		
Experimental error	55	2.30	1.94	3.35	3.08		
Total	71						
Traits		S. C. Y. (k/fed.) Picks		L. C. Y. (k/fed.) Picks			
Source of variation	df	2009	2010	2009	2010		
Replications	5	18.42**	7.12**	26.34**	11.30**		
Genotypes	11	3.83**	2.95**	5.69**	5.24**		
Hybrids vs. G80	1	17.95**	26.30**	24.28**	39.46**		
Residual	10	2.42*	0.62	3.83*	1.82		
Experimental error	55	1.15	0.97	1.65	1.54		
Between picks	72	24.00	55.96	34.63	89.26		
1	6	12.59	58.70	19.08	97.23		
2	6	26.36	54.16	36.38	79.83		
3	6	16.03	61.24	21.07	91.72		
4	6	25.37	66.31	34.84	100.23		
5	6	27.85	48.49	39.89	79.65		
6	6	26.10	66.99	38.20	111.99		
7	6	17.68	52.77	25.58	84.99		
8	6	26.06	56.29	37.56	87.28		
9	6	32.30	66.83	46.53	107.65		
10	6	33.25	55.33	50.15	92.35		
11	6	32.62	57.01	48.93	93.78		
G80	6	11.76	27.37	17.31	44.43		
Total	143						

*, ** Significant at 0.05 and 0.01 levels, respectively.

S. C. Y. = Seed cotton yield L. C. Y. = Lint cotton yield k/fed = kentar / feddan

F. Pick = First pick

S. Pick = Second pick

Table (4): Means of traits for individual generations.

Breeding program						
2009 Season						
Traits	S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		50 Bolls (g)	Earliness %
Genotypes	F. Pick	S. Pick	F. Pick	S. Pick		
1	7.66	3.05	9.43	3.76	153	71.06
2	9.80 ✓	2.91	11.52 ✓	3.43	155	76.67 ✓
3	8.18	2.79	9.56	3.43	138 x	74.08
4	9.48 ✓	2.80	11.11 ✓	3.28	139 x	76.35
5	9.62 ✓	2.72	11.52 ✓	3.26	155	77.05 ✓
6	9.44 ✓	2.35	11.42 ✓	2.84	148	79.89 ✓
7	8.31	2.77	10.00	3.34	158	74.00
8	9.57 ✓	2.48	11.49 ✓	2.98	150	79.21 ✓
9	10.23 ✓	2.48	12.28 ✓	2.98	154	79.98 ✓
10	10.65 ✓	2.98	13.08 ✓	3.66	157	77.42 ✓
11	10.31 ✓	2.54	12.62 ✓	3.11	155	79.61 ✓
Hybrids	9.39 ✓	2.72	11.28 ✓	3.28	151	76.85 ✓
G80	6.99	2.56	8.48	3.11	158	72.13
L.S.D.	1.73	--	2.08	--	12	4.47
2010 Season						
1	12.00 ✓	1.22	15.44 ✓	1.57	152 ✓	91.09 ✓
2	11.29 ✓	0.90	13.71 ✓	1.09	130 x	92.74 ✓
3	12.08 ✓	1.17	14.79 ✓	1.44	138	91.33 ✓
4	12.43 ✓	0.97	15.28 ✓	1.20	139	92.65 ✓
5	11.30 ✓	1.49	14.48 ✓	1.91	137	88.44
6	12.48 ✓	0.98	16.13 ✓	1.27	144	92.64 ✓
7	11.45 ✓	1.35	14.54 ✓	1.72	140	89.53
8	11.33 ✓	0.88	14.11 ✓	1.09	141	92.72 ✓
9	12.37 ✓	0.87	15.69 ✓	1.11	136	93.40 ✓
10	11.56 ✓	1.19	14.94 ✓	1.53	142	90.68
11	11.96 ✓	1.34	15.34 ✓	1.72	133	90.14
Hybrids	11.84 ✓	1.12	14.95 ✓	1.42	139	91.40 ✓
G80	8.60	1.27	10.96	1.62	139	87.36
L.S.D.	1.57	--	1.99	--	8	3.57
Traits	Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)			
Genotypes	2009	2010	2009	2010		
1	10.71	13.22 ✓	13.19	17.01 ✓		
2	12.71 ✓	12.19 ✓	14.95 ✓	14.80 ✓		
3	10.97	13.25 ✓	12.99	16.23 ✓		
4	12.28 ✓	13.40 ✓	14.39 ✓	16.48 ✓		
5	12.34 ✓	12.79 ✓	14.78 ✓	16.39 ✓		
6	11.79 ✓	13.46 ✓	14.26 ✓	17.40 ✓		
7	11.08	12.80 ✓	13.34	16.26 ✓		
8	12.05 ✓	12.21 ✓	14.47 ✓	15.20 ✓		
9	12.71 ✓	13.24 ✓	15.26 ✓	16.80 ✓		
10	13.63 ✓	12.75 ✓	16.74 ✓	16.47 ✓		
11	12.85 ✓	13.30 ✓	15.73 ✓	17.06 ✓		
Hybrids	12.10 ✓	12.96 ✓	14.55 ✓	16.37 ✓		
G80	9.55	9.87	11.59	12.58		
L.S.D.	1.77	1.62	2.14	2.05		

✓, Hybrids significantly surpassed G80 (control).
 x, G80 (control) significantly surpassed hybrids.

--: Not significant at 0.05 level.

information for the behavior of genotypes needed for the breeding program.

3.1.2. Analysis of generations (Second stage)

In this proposal the data of the two generations were used together. Each cell contained two readings (k) one for each generation (Table 2). The analysis of variance in the two generations with respect to yields (seed and lint), weight of 50 bolls and earliness revealed significant differences among genotypes and between hybrids vs. G80 (Table 5). Significant variations due to genotypes and hybrids vs. G80 were also observed for total yields (seed and lint) and earliness. Hybrids significantly surpassed G80 with respect to total yields (seed and lint) and earliness, except G90 x Pima S 62 (24240), (G83 x Pima S 6) x Dandara, (G83 x (G75 x 5844)) x G85 and G 91 x G80 for earliness, (Table 6). Partitioning total seed and lint yields in the first and second picks was made (Table 5). Significant variations due to genotypes and hybrids vs. G80 were detected in the first pick. Hybrids significantly exceeded G80 with respect to seed and lint yields in the first pick (Table 6). This method of analysis of randomized complete block design gave information with respect to variation between generations and partitioning to individual genotypes to be used in the breeding program. In the fiber properties, the analysis considered each generation as one replicate due to test one sample (Table 5). Results of analysis showed that significance due to replications was observed for both fiber length and yarn strength. This method of analysis was very important in breeding program to estimate variation between generations when only one replication was tested.

3.2.Regional program

To establish the cotton varietal policy on sound scientific basis, promising and commercially – grown varieties are evaluated regionally to specify the most appropriate agroclimatic areas for each variety. This is also linked to the actual needs of each variety at the domestic and international markets.

3.2.1. Analysis of individual locations

The analysis of variance for individual locations during the two seasons, with respect to seed and lint yield, boll weight, dry weight per boll, harvest index and number of seeds / boll revealed the presence of significant differences among genotypes and hybrids vs. G80, (Table 7).

3.2.1.1.Minya

In 2009 season, significant variations due to

genotypes and hybrids vs. G80 were observed for yields (seed and lint), boll weight, dry weight per boll, harvest index and number of seeds / boll in the two picks except for harvest index and number of seeds/ boll in the second pick. (G83 x (G75 x 5844)) x G80 gave the highest values for yields (seed and lint) in the first pick, it significantly surpassed G80. The hybrids significantly exceeded G80 with respect to harvest index in the first pick. In contrast, G80 significantly surpassed both hybrids for bolls weight and dry weight per boll in the two picks, and one hybrid (G83 x (G75 x 5844)) x G80 for number of seeds / boll in the first pick (Table 8).

In 2010 season, significant variations due to both genotypes and hybrids vs. G80 were recorded for seed cotton yield and dry weight per boll in the two picks, lint cotton yield, harvest index and number of seeds / boll in the first pick. Significant variation due to genotypes was observed for boll weight in the first pick. Hybrids significantly exceeded G80 with respect to yields (seed and lint) in the first pick. (G83 x (G75 x 5844)) x G80 had the highest values for boll weight and number of seeds / boll, significantly surpassed G80. On the contrary, G80 significantly surpassed both hybrids for dry weight per boll and seed cotton yield in the first and second picks, respectively and G90 x Australian for boll weight and dry weight per boll in the first and second picks, respectively.

In both seasons of the study, significant variation due to genotypes was detected for total yields (seed and lint) except for total seed cotton yield in the 2010 season. Significant variation due to hybrids vs. G80 was recorded for total lint cotton yield in 2010 season. (G83 x (G75 x 5844)) x G80 was the best genotype for seed and lint yield in the first season, significantly surpassing G80. Two hybrids significantly exceeded G80 with respect to total lint cotton yield in the second season. In contrast, G80 significantly surpassed G90 x Australian for seed cotton yield in the 2009 season (Table 8).

The results of analysis of two picks showed that the hybrids gave the highest values of variance between picks compared to G80 for (seed and lint yields) in both seasons. This is due to the faster maturity of these hybrids compared to G80.

3.2.1.2.Beni Souf

Significant variation due to genotypes was observed for dry weight per boll, harvest index and the number of seeds / boll in both seasons,

Table (5): Mean squares of traits for two generations.

Breeding program							
Traits		S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		50 Bolls	Earliness
Source of variation	df	F. Pick	S. Pick	F. Pick	S. Pick	(g)	%
Replications	5	23.11**	1.48**	33.92**	2.46**	70.89	55.73**
Genotypes	11	10.85**	0.343	17.19**	0.609	210.07	56.63**
Hybrids vs. G80	1	87.52**	0.005	126.80**	0.003	126.72	210.71**
Residual	10	3.19	0.380	6.23*	0.670*	218.40*	41.22**
Experimental error	55	1.97	0.218	2.96	0.321	103.51	9.33
Between generations	72	6.39	1.51	11.72	2.07	169.44	123.19
1	6	12.57	1.84	23.01	2.64	46.33	206.45
2	6	3.26	2.39	5.40	3.24	339.83	143.39
3	6	12.86	1.61	21.20	2.15	66.42	150.53
4	6	6.15	1.81	11.15	2.37	69.58	136.73
5	6	5.09	1.25	9.78	1.65	234.17	106.17
6	6	5.47	1.09	12.42	1.49	46.67	95.54
7	6	6.02	1.17	11.98	1.56	214.17	131.90
8	6	4.62	1.33	8.08	1.84	58.08	99.74
9	6	4.16	1.39	8.61	1.89	271.00	102.61
10	6	7.46	2.09	12.68	3.03	215.50	117.10
11	6	5.86	0.910	10.61	1.28	255.08	65.56
G80	6	3.11	1.24	5.78	1.72	216.50	122.63
Total	143						
Traits		T. S.C.Y.	T. L.C.Y.	Traits		Fiber length (mm)	
Source of variation	df	(k/fed.)	(k/fed.)	Source of variation	df		
Replications	5	28.86**	42.89**	Rep. (generations)	1		6.61*
Genotypes	11	10.19**	16.67**	Genotypes	11		0.665
Hybrids vs. G80	1	87.70**	125.19**	Hybrids vs. G80	1		0.970
Residual	10	2.43	5.82	Residual	10		0.634
Experimental error	55	2.02	3.06	Experimental error	11		0.744
Between generations	72	4.09	7.24				
1	6	7.57	14.28				
2	6	1.79	2.31				
3	6	10.13	16.61				
4	6	2.89	5.24				
5	6	3.36	6.11				
6	6	1.72	5.45				
7	6	2.80	6.37				
8	6	2.66	4.30				
9	6	1.97	3.91				
10	6	6.15	8.97				
11	6	4.86	8.21				
G80	6	3.16	5.18				
Total	143						
				Traits		Micronaire reading	
				Rep. (generations)	1		0.135
				Genotypes	11		0.014
				Hybrids vs. G80	1		0.002
				Residual	10		0.015
				Experimental error	11		0.029
				Traits		Yarn strength	
				Rep. (generations)	1		44632*
				Genotypes	11		2681
				Hybrids vs. G80	1		1678
				Residual	10		2781
				Experimental error	11		7196
				Total	23		

* , ** Significant at 0.05 and 0.01 levels, respectively.

Table (6): Means of traits of cotton genotypes for two generations.

Breeding program						
Traits	S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		50 Bolls	Earliness
Genotypes	F. Pick	S. Pick	F. Pick	S. Pick	(g)	%
1	9.83 ✓	2.14	12.44 ✓	2.67	153	81.08
2	10.55 ✓	1.91	12.62 ✓	2.26	143	84.71 ✓
3	10.13 ✓	1.98	12.18 ✓	2.44	138	82.71
4	10.96 ✓	1.89	13.20 ✓	2.24	139	84.50 ✓
5	10.46 ✓	2.11	13.00 ✓	2.59	146	82.75
6	10.96 ✓	1.67	13.78 ✓	2.06	146	86.27 ✓
7	9.88 ✓	2.06	12.27 ✓	2.53	149	81.77
8	10.45 ✓	1.68	12.80 ✓	2.04	146	85.97 ✓
9	11.30 ✓	1.68	13.99 ✓	2.05	145	86.69 ✓
10	11.11 ✓	2.09	14.01 ✓	2.60	150	84.05 ✓
11	11.14 ✓	1.94	13.98 ✓	2.42	144	84.88 ✓
Hybrids	10.61 ✓	1.92	13.11 ✓	2.35	145	84.12 ✓
G80	7.80	1.92	9.72	2.37	149	79.75
L.S.D.	1.64	--	2.01	--	--	3.56
Genotypes	T. S.C.Y. (k/fed.)	T. L.C.Y (k/fed.)	Fiber length mm	Micronaire reading	Yarn strength	
1	11.97 ✓	15.10 ✓	29.90	4.2	2318	
2	12.45 ✓	14.88 ✓	30.75	4.1	2328	
3	12.11 ✓	14.61 ✓	29.70	4.2	2328	
4	12.84 ✓	15.44 ✓	29.60	4.4	2305	
5	12.57 ✓	15.59 ✓	31.30	4.2	2343	
6	12.63 ✓	15.83 ✓	30.05	4.2	2290	
7	11.94 ✓	14.80 ✓	31.00	4.2	2355	
8	12.13 ✓	14.84 ✓	30.50	4.1	2265	
9	12.98 ✓	16.03 ✓	30.40	4.3	2357	
10	13.19 ✓	16.61 ✓	29.75	4.3	2275	
11	13.08 ✓	16.40 ✓	30.05	4.3	2245	
Hybrids	12.53 ✓	15.46 ✓	30.27	4.2	2310	
G80	9.71	12.09	31.00	4.2	2340	
L.S.D.	1.66	2.04	--	--	--	

✓, Hybrids significantly surpassed G80 (control). --: Not significant at 0.05 level.

Table (7): Mean squares of traits for individual locations.

Regional program							
Minya 2009 Season							
Traits		S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		Boll weight (g)	
Source of variation	df	F. Pick	S. Pick	F. Pick	S. Pick	F. Pick	S. Pick
Replications	3	3.76**	0.034	6.21**	0.073	0.008*	0.057**
Genotypes	2	5.62**	0.783*	7.80**	1.17*	0.122**	0.208**
Hybrids vs. G80	1	3.08*	1.57**	5.78**	2.33*	0.218**	0.224**
Residual	1	8.16**	0.011	9.81**	0.005	0.025**	0.192**
Experimental error	6	0.310	0.113	0.309	0.185	0.002	0.005
Source of variation	df	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
Replications	3	0.003	0.004	0.013	0.087	0.476	2.05*
Genotypes	2	0.069**	0.033**	0.122*	0.053	4.22**	1.05
Hybrids vs. G80	1	0.131**	0.058**	0.236*	0.029	0.377	0.160
Residual	1	0.007	0.007	0.008	0.076	8.06**	1.94*
Experimental error	6	0.003	0.001	0.019	0.022	0.215	0.211
2010 Season							
Traits		S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		Boll weight (g)	
Source of variation	df	F. Pick	S. Pick	F. Pick	S. Pick	F. Pick	S. Pick
Replications	3	2.72**	0.552**	7.05**	0.864**	0.018**	0.104**
Genotypes	2	1.80**	0.111**	3.78**	0.153	0.056**	0.038
Hybrids vs. G80	1	3.57**	0.167**	7.44**	0.265	0.001	0.043
Residual	1	0.038	0.054*	0.115	0.042	0.110**	0.033
Experimental error	6	0.082	0.007	0.114	0.081	0.001	0.014
Source of variation	df	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
Replications	3	0.019	0.003	0.097	0.141	2.11	2.17
Genotypes	2	0.078*	0.070*	0.267*	0.160	6.96*	6.85
Hybrids vs. G80	1	0.132**	0.099*	0.519**	0.236	12.46*	0.567
Residual	1	0.024	0.042	0.015	0.084	1.45	13.13*
Experimental error	6	0.010	0.010	0.036	0.099	1.05	1.58
Total	11						
Traits		Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)			
Source of variation	df	2009	2010	2009	2010		
Replications	3	3.16**	3.72	5.38**	10.29**		
Genotypes	2	4.20**	1.19	5.08**	2.46*		
Hybrids vs. G80	1	0.254	2.19	0.767	4.90**		
Residual	1	8.14**	0.183	9.40**	0.018		
Experimental error	5	0.162	0.450	0.158	0.338		
Total	11						
Two picks							
Traits		S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		Boll weight (g)	
Source of variation	df	2009	2010	2009	2010	2009	2010
Replications	3	1.89**	2.77**	3.10**	5.76**	0.051**	0.102**
Genotypes	2	2.10**	0.593**	2.54**	1.23*	0.311**	0.080**
Hybrids vs. G80	1	0.127	1.10**	0.387*	2.45**	0.443**	0.029
Residual	1	4.07	0.091	4.70*	0.009	0.178**	0.131**
Experimental error	6	0.105	0.033	0.046	0.122	0.004	0.006
Between picks	12	27.69	44.70	43.19	76.28	0.282	0.320
12	4	39.85	49.18	61.07	86.68	0.211	0.408
13	4	23.86	48.81	38.73	81.87	0.353	0.296
G80	4	19.35	36.10	29.78	60.30	0.281	0.258

Table (7): Cont.

Traits		Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
Source of variation	df	2009	2010	2009	2010	2009	2010
Replications	3	0.006	0.014	0.067	0.033	1.84*	1.86
Genotypes	2	0.098**	0.147**	0.116	0.407	0.780	10.41*
Hybrids vs. G80	1	0.181**	0.230**	0.216*	0.728*	0.515	9.17
Residual	1	0.014	0.065*	0.017	0.086	1.05	11.66
Experimental error	6	0.002	0.007	0.033	0.105	0.294	2.03
Between picks	12	0.025	0.028	0.037	0.124	6.05	3.62
12	4	0.019	0.020	0.012	0.210	1.55	2.92
13	4	0.020	0.034	0.086	0.112	11.17	6.98
G80	4	0.037	0.030	0.013	0.051	5.43	0.958
Total	23						
Beni Souf (one pick)							
Traits		Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)		Boll weight (g)	
Source of variation	df	2009	2010	2009	2010	2009	2010
Replications	3	1.04**	4.57**	1.52**	7.64**	0.087**	0.127*
Genotypes	2	0.408*	0.270	0.684*	0.237	0.033	0.124*
Hybrids vs. G80	1	0.177	0.473	0.510	0.470	0.040	0.037
Residual	1	0.638*	0.067	0.858*	0.003	0.026	0.211*
Experimental error	6	0.074	0.258	0.112	0.537	0.009	0.016
Source of variation	df	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
Replications	3	0.010	0.004	0.057	0.119	3.39	1.86
Genotypes	2	0.037*	0.081*	0.115*	0.281*	24.37**	17.21**
Hybrids vs. G80	1	0.074**	0.158**	0.198**	0.468**	14.25**	0.760
Residual	1	0.006	0.003	0.031	0.095	34.49**	33.66**
Experimental error	6	0.004	0.008	0.013	0.029	0.871	1.11
Total	11						

*, ** Significant at 0.05 and 0.01 levels, respectively

seed and lint yields in the first season and bollhybrids vs. G80 was recorded for dry weight per boll and harvest index in both seasons and the number of seeds / boll in the first season, (Table 7).

The hybrids significantly surpassed G80 in respect to harvest index in both seasons. G90 x Australian gave the highest value for number of seeds / boll, significantly exceeding G80 in both seasons. On the contrary G80 significantly surpassed both hybrids for dry weight per boll in both seasons, G90 x Australian for (seed and lint) yields in 2009 season and (G83 x (G75 x 5844)) x G80 for boll weight in 2010 season (Table 8).

3.2.2 Analysis over locations (Second stage)

The analysis of variance over the two locations (within G80 zone) in respect to seed and lint yields, boll weight, dry weight per boll, harvest index, number of seeds / boll and fiber properties revealed the presence of significant differences between genotypes and hybrids vs. G80 (Table 9).

Significant variation due to the genotypes was detected for seed and lint yields in the first season. Significant variation due to both genotypes and hybrids vs. G80 was observed for boll weight in

the first season, dry weight per boll, harvest index and number of seeds / boll in both seasons. Hybrids significantly surpassed G80 with respect to harvest index in both seasons. (G83 x (G75 x 5844)) x G80 was the best genotypes for yields (seed and lint), it significantly exceeded G80 in 2009 season.

G90 x Australian gave the highest value for number of seeds / boll in both seasons, it significantly exceeded G80. On the contrary, G80 significantly surpassed two hybrids for dry weight per boll in both seasons, G90 x Australian for yields (seed and lint) and boll weight in the 2009 season (Table 10).

Results of analysis of variance over locations showed that (G83 x (G75 x 5844)) x G80 gave the lowest values of variance between locations for boll weight and dry weight per boll in the first season, harvest index in the second season, and number of seeds / boll in both seasons. G90 x Australian gave similar results for seed cotton yield and boll weight in the 2009 season. This explains that these hybrids were more stable than stable than the hybrids for lint cotton yield in both . G80. The results indicat that G 80 was more

Table (8): Means of traits for individual locations.

Regional program						
Minya 2009 Season						
Traits	S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		Boll weight (g)	
Genotypes	F. Pick	S. Pick	F. Pick	S. Pick	F. Pick	S. Pick
12	10.13 ✓	1.24 x	12.54 ✓	1.54 x	2.90 x	2.25 x
13	8.09	1.25 x	10.32	1.59 x	2.78 x	1.94 x
Hybrids	9.11 ✓	1.25 x	11.43 ✓	1.57 x	2.84 x	2.10 x
G80	8.04	2.01	9.96	2.50	3.13	2.39
L.S.D.	0.96	0.58	0.96	0.74	0.07	0.13
Genotypes	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
12	1.00 x	0.81 x	2.90 ✓	2.78	16.11 x	14.47
13	0.94 x	0.75 x	2.95 ✓	2.58	18.12	13.49
Hybrids	0.97 x	0.78 x	2.93 ✓	2.68	17.12	13.98
G80	1.20	0.93	2.61	2.58	17.49	14.23
L.S.D.	0.09	0.06	0.24	--	0.80	--
2010 Season						
Genotypes	S. C. Y. (k/fed.)		L. C. Y. (k/fed.)		Boll weight (g)	
12	11.50 ✓	1.60 x	15.25 ✓	2.13	2.87 ✓	1.99
13	11.64 ✓	1.77 x	15.01 ✓	2.28	2.63 x	1.86
Hybrids	11.57 ✓	1.69 x	15.13 ✓	2.21	2.75	1.93
G80	10.41	1.93	13.46	2.52	2.77	2.05
L.S.D.	0.50	0.14	0.58	--	0.05	--
Genotypes	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
12	1.12 x	0.96	2.54 ✓	2.10	18.92 ✓	17.13
13	1.02 x	0.82 x	2.62 ✓	2.30	18.07	14.57
Hybrids	1.07 x	0.89 x	2.58 ✓	2.20	18.50 ✓	15.85
G80	1.30	1.08	2.14	1.90	16.33	15.39
L.S.D.	0.17	0.18	0.33	--	1.77	--
Traits	Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)			
Genotypes	2009	2010	2009	2010		
12	11.37 ✓	13.10	14.08 ✓	17.38 ✓		
13	9.34 x	13.41	11.91	17.29 ✓		
Hybrids	10.36	13.26	13.00	17.34 ✓		
G80	10.05	12.34	12.46	15.98		
L.S.D.	0.70	--	0.69	1.01		
Beni Souf (one pick)						
Traits	Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)		Boll weight (g)	
Genotypes	2009	2010	2009	2010	2009	2010
12	7.04	9.21	9.16	12.01	2.47	2.57 x
13	6.47 x	9.39	8.51 x	11.97	2.58	2.89
Hybrids	6.76	9.30	8.84	11.99	2.53	2.73
G80	7.01	8.88	9.27	11.57	2.65	2.85
L.S.D.	0.47	--	0.58	--	--	0.22
Genotypes	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
12	0.97 x	0.99 x	2.55 ✓	2.59 ✓	16.38	16.79
13	0.97 x	1.03 x	2.68 ✓	2.81 ✓	20.53 ✓	20.90 ✓
Hybrids	0.97 x	1.01 x	2.62 ✓	2.70 ✓	18.46 ✓	18.85
G80	1.13	1.26	2.34	2.28	16.15	18.31
L.S.D.	0.11	0.15	0.20	0.30	1.61	1.82

✓, Hybrids significantly surpassed the control (G80).--: Not significant at 0.05 level.
x, G80 (control) significantly surpassed hybrids.

Table (9) : Mean squares of traits for two locations.

Regional program							
Traits		Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)		Boll weight (g)	
Source of variation	df	2009	2010	2009	2010	2009	2010
Replications	3	3.87**	6.76**	6.27**	14.27**	0.074**	0.117**
Genotypes	2	3.34**	1.29	3.99**	2.11	0.111**	0.017
Hybrids vs. G80	1	0.004	2.35	0.013	4.20	0.223**	0.025
Residual	1	6.67**	0.235	7.97**	0.018	0.006	0.008
Experimental error	6	0.089	0.615	0.066	1.12	0.004	0.008
Between locations	12	6.20	7.63	7.90	13.55	0.084	0.038
12	4	9.44	7.88	12.14	15.38	0.112	0.048
13	4	4.27	8.58	6.08	15.04	0.021	0.035
G80	4	4.88	6.45	5.48	10.22	0.118	0.032
Total	23						
Source of variation	df	Dry weight per boll (g)		Harvest index (%)		Number of seeds / boll	
Replications	3	0.009	0.018	0.020	0.029	4.27**	3.18*
Genotypes	2	0.102**	0.148**	0.235**	0.540**	21.47**	10.12**
Hybrids vs. G80	1	0.200**	0.290**	0.433**	0.986**	4.99**	9.68**
Residual	1	0.003	0.005	0.036*	0.093	37.95**	10.56**
Experimental error	6	0.002	0.012	0.006	0.042	0.236	0.505
Between locations	12	0.005	0.008	0.070	0.068	1.61	3.76
12	4	0.003	0.012	0.060	0.032	0.279	3.03
13	4	0.006	0.008	0.100	0.125	3.38	4.83
G80	4	0.005	0.003	0.049	0.047	1.17	3.44
Total	23						
Rep. (locations)		Fiber length (mm)		Micronaire reading		Yarn strength	
Rep. (locations)	1	0.202	0.042	0.027	0.002	12604	10004
Genotypes	2	1.20	1.42	0.072*	0.052	44663	27630
Hybrids vs. G80	1	1.76	2.80	0.053*	0.013	24303	40252
Residual	1	0.640	0.040	0.090*	0.090	65024	15008
Experimental error	2	0.352	0.412	0.002	0.012	9653	3179
Total	5						

*, ** Significant at 0.05 and 0.01 levels, respectively.

Table (10) : Means of traits of cotton genotypes for two locations.

Regional program						
Traits	Total S. C. Y. (k/fed.)		Total L. C. Y. (k/fed.)		Boll weight (g)	
Genotypes	2009	2010	2009	2010	2009	2010
12	9.21 v	11.16	11.62 v	14.70	2.69 x	2.72
13	7.91 x	11.40	10.21 x	14.63	2.68 x	2.76
Hybrids	8.56	11.28	10.92	14.67	2.69 x	2.74
G80	8.53	10.61	10.87	13.78	2.89	2.81
L.S.D.	0.52	--	0.44	--	0.11	--
Genotypes	Dry weight per boll g		Harvest index (%)		Number of seeds / boll	
12	0.99 x	1.06 x	2.72 v	2.57 v	16.25	17.86
13	0.96 x	1.03 x	2.82 v	2.72 v	19.33 v	19.49 v
Hybrids	0.98 x	1.05 x	2.77 v	2.65 v	17.79 v	18.68 v
G80	1.17	1.28	2.48	2.21	16.82	17.32
L.S.D.	0.07	0.19	0.13	0.35	0.84	1.23
Genotypes	Fiber length (mm)		Micronaire reading		Yarn strength	
12	30.60	29.90	4.2	3.9	2325	2243
13	29.80	30.10	4.5 v	4.2	2070	2120
Hybrids	30.20	30.00	4.4 v	4.1	2198	2182
G80	31.35	31.45	4.1	4.0	2333	2355
L.S.D.	--	--	0.2	--	--	--

v, Hybrids significantly surpassed G80 (control). - : Not significant at 0.05 level. - x, G80 (control) significantly surpassed hybrids.

In respect to fiber properties, the analysis considered each location as one replicate due to test one sample (Table 9). Results of analysis fiber properties showed that no significant differences due to replications for fiber properties in indicating that these traits were more stable in different locations. This way of analysis was very important in regional program to estimate variation between locations when test one replicate. Significant variation due to both genotypes and hybrids vs. G80 were detected for micronair reading in the first season. G90 x Australian gave the highest value for micronaire reading, and significantly exceeded G80. Also, this way of analysis could be calculated genotypes variance under different locations when test one replicate

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تقييم بعض التراكيب الوراثية من القطن المصري على مرحلتين

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ملخص

تم تقييم المحصول ومكوناته (صفات اللوزة) والصفات التكنولوجية لثلاثة عشر تركيب وراثي من القطن المصري داخل المنطقة المخصصة لزراعة الصنف التجاري جيزة ٨٠ (المنيا - بنى سويف) موسمي ٢٠٠٩، ٢٠١٠ طبقاً للقرار الوزاري بتحديد مناطق زراعة أصناف القطن من خلال برنامجي التربية والتقييم الإقليمي بمعهد بحوث القطن بهدف التعاون والربط بين القسمين في تقييم التراكيب الوراثية الجديدة من القطن المصري. تم استخدام تصميم القطاعات الكاملة العشوائية.

أولاً : قسم بحوث التربية

تم تقييم ١١ تركيب وراثي (هجن مبشرة في أجيال مختلفة) مع الصنف جيزة ٨٠ في ٦ مكررات (مساحة القطعة التجريبية ٧.٢ م^٢) بالمنيا بهدف تحديد التراكيب الوراثية المتفوقة على الصنف المنزرع في منطقة زراعة الصنف لاستمرارها في البرنامج واستبعاد التراكيب الوراثية غير المتفوقة. تم إجراء تحليل إحصائي في المرحلة الأولى بتقييم كل جيل على حده (مشاهدة واحدة في الخلية) لتقدير تباين التراكيب الوراثية مع تقدير الاختلاف بين الهجن والصنف جيزة ٨٠. ثم إجراء تحليل إحصائي في المرحلة الثانية بتقييم للجيلين (أكثر من مشاهدة في الخلية) لتقدير التباين بين الجيلين لكل تركيب وراثي على حده للاستفادة به في برنامج التربية. و أظهرت النتائج تفوق الهجن معنوياً على الصنف جيزة ٨٠

في المحصول الزهر والشعر والتكبير ماعدا جـ ٩٠ x بيما من ٦٢ (٢٤٢٤٠) ، (جـ ٨٣ x بيما من ٦) x نسدرة ، (جـ ٨٣ x (جـ ٧٥ x ٥٨٤٤)) x جـ ٨٥ ، جـ ٩١ x جـ ٨٠ بالنسبة للتكبير.

ثانيا : قسم التقييم الإقليمي

تم تقييم (٢) تركيب وراثي في المراحل النهائية من برنامج التربية (مخلوط عائلات) مع الصنف جيزة ٨٠ في ٤ مكررات (مساحة القطعة التجريبية كبيرة ٥٢ م^٢ ، ٦٢.٤ م^٢ في الموسم الأول و الثاني على التوالي) بالمنيا وبنى سويف بهدف تحديد التركيب الوراثي المتفوق على الصنف المنزرع ومدى نجاحه في التفاعل في منطقة زراعة الصنف تمهيدا لزراعته بدلا منه. تم إجراء تحليل إحصائي في المرحلة الأولى لكل موقع على حده (مشاهدة واحدة في الخلية) لتقدير تفاعل التركيب الوراثية في الموقع لتحديد المتفوق منها. ثم تحليل إحصائي في المرحلة الثانية للموقعين (أكثر من مشاهدة في الخلية) لتقدير التباين بين المواقع لكل تركيب وراثي على حده لتحديد المتفوق منها في منطقة زراعة الصنف. وأوضحت النتائج أن (جـ ٨٣ x (جـ ٧٥ x ٥٨٤٤)) x جـ ٨٠ أظهر تباينا بين المواقع من حيث أقل من الصنف جيزة جـ ٨٠ بالنسبة إلى وزن اللوزة ، الوزن الجاف للوزة في الموسم الأول ، دليل الحصاد في الموسم الثاني ، عدد البذور باللوزة في الموسمين. وكذلك أظهر جـ ٩٠ x أسترالي نفس النتائج بالنسبة إلى المحصول الزهر ، وزن اللوزة في الموسم الأول ، بينما أظهر الصنف جـ ٨٠ تباين بين المواقع أقل من الهجن بالنسبة إلى محصول القطن الشعر في الموسمين.

ويستفاد من هذه الدراسة في برامج قسمي التربية والتقييم الآتي:

١ - تحديد التراكيب الوراثية المباشرة التي تتفوق على الأصناف المنزرعة.

٢ - تقدير التباين بين جيلين أو موقعين لكل تركيب وراثي على حده .

٣- إدخال طرق تحليل إحصائي في برامج التربية و التقييم لتقدير التباين بين التراكيب الوراثية.

المجلة العلمية تكلية الزراعة - جامعة القاهرة - المجلد (٦٢) العدد الرابع (أكتوبر ٢٠١١): ٣٩٥-٤٠٨ .