COMPARATIVE PERFORMANCE OF PIMA AND EGYPTIAN COTTON CULTIVARS: I. COTTON YIELD AND ITS COMPONENTS, EARLINESS IN MATURITY AND FIBER PROPERTIES

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Abstract

Four Pima genotypes (Earlipima, PS-4, PS-6 and PS-7) and four long staple Egyptian cotton varieties (G.80, G.83, G.85 and G.86) were sampled to conduct a comparison of growth and development. Significant variation due to genotypes was found for cotton yield and for only two of its components viz. lint percent and seed index in the combined data across environments and in some instances for individual environments. Also significant variation was observed for genotype x environment interaction for only cotton yield. Contrasting the Egyptian group vs. Pima in their yielding potentials exhibited no significant differences in seed cotton and lint cotton yields and all yield contributing variables studied except lint percentage which exhibited significant differences of about 1 % in favour of the Egyptian group.Contrasting Pima vs. Egyptian group exhibited significant mean squares for combined data across environments for the two maturity indices, i.e. mean maturity date (MMD) and earliness index (EI) in favour of Pima cotton with about one day in MMD and 7 % for E1. Results of combined analysis indicated that, G.86 cultivar is characterized with good fiber prop-

INTRODUCTION

The short season (150-165 days maturity) concept in Egyptian cotton production is an integration of cultural and pest management practices and shortening the growing season by practising late planting system. The need for change in cotton production practices in Egypt has been caused by inflated production costs, declining profits and static yields. In this connections Namken and Heilman (1973) mentioned that shortening the growing season by the use of early-maturing cultivars and management systems that also induce earliness probably offers the greatest potential for reducing production costs. Production efficiencies may be increased by reducing insect control, irrigation, and harvest costs.

Egyptian cotton, *G. barbadense* L., is a perennial plant of tropical origin with indeterminate fruiting behavior grown as an annual crop in Egypt. Development of types that will produce an acceptable yield in a short period of time has

attracted the interest of many cotton growing regions of the world (Bilbro and Quisenberry, 1973 and Gipson and Ray, 1975). This may be achieved via developing early-maturing determinate cultivars in which the bloom rate increases much more rapidly and remains higher during peak bloom than that of the standard in-determinate cultivars. This type of thinking is also in the back memory of Pima cotton breeders. In this respect, Silvertooth (1994) stated that within the germplasm of American Pima cotton (G. barbadense L.) and with the recent release of Pima S-7 in 1991, the breeder now have a Pima variety that is even more determinate (earlier in nature), with improved heat tolerance, and improved yield capacity, and still maintains excellent fiber quality characteristics

Extra-long staple cotton became established in the southwestern United States shortly after the turn of the twentieth century. It was known originally as American-Egyptian cotton because the germplasm was derived from Egyptian introductions. Three Egyptian cultivars served as parental material in the development of American-Egyptian cotton in the U.S., those being Mit Afifi, Sakel and Giza 7. The name Pima may be in reference to the Gila River Pima Indian reservation at Sacaton, Arizona where the research station was located (Smith et al., 1999). The letter S of the s-series America Pima cotton varieties designated synthetic. Smith et al. (1999) mentioned that the initial commercial release of Pima S-1 was a heterogeneous mixture of genotypes. As they began a program in 1952 to evaluate the different component lines of the original synthetic. A total of 160 strains were selected, increased, and tested in the field, and by 1957 Pima S-1 was composed of nine component lines that were increased separately and then bulked to form the final Pima S-1 cultivar.

The first variety out of Mit Afifi was Yuma. Then Pima was developed out of Yuma. In 1918 several crosses were made between Pima and Sakel .The variety developed out of one of the crosses was designated as Sakel (S) _ Pima (P). Following S_P was the Earlipima variety resulting from a backcross of S_ P stock to Pima.

It is a well known fact that efficiency of selection depends upon the availability of genetic variability in the reference population used for selection. Therefore, enriching the genetic variability within Egyptian cotton gene pool is of prime importance for efficient selection for short season genotypes. Incorporation of the Pima cotton germplasm in the Egyptian breeding program may be a possible way. Accordingly, four Pima genotypes (Earlipima, PS-4, PS-6 and PS-7) and four long staple Egyptian cottons (G.80, G.83, G.85 and G.86) were sampled to conduct a comparison of growth and development on the basis that they had similar full-season growth characteristics and they have more or less the same ancestors. Our objective was to quantify and compare the general cotton

yields potentials and lint properties of these two groups of cotton under fully irrigated conditions as a first step in identifying the possible causes in yield differences if existed between them before being incorporated in a breeding program of Egyptian cotton. This is quite importante to meet the growing interest among the Egyptian cotton breeders for breeding varieties for special needs like short season cotton, such as high seed quality traits (high oil and protein and low gossypol content).

MATERIALS AND METHODS

The present study was conducted to compare the relative performance of four Pima and four long-staple Egyptian cotton genotypes under local environmental conditions.

This study was carried out in three environments viz.: E_1, conventional planting (CN), on 1st of April 1998 at Giza Agricultural Experimental Station, ARC; E_2, CN planting, on 25th of March 1999 and E_3: late planting (LP), on 1st of May, 1999. The second and third experiments were conducted at Sids Agricultural Experimental Station; Beni-Suef governorate. Designations, pedigree of main fiber characteristics of the genotypes used are presented in Table 1.

The genotypes were sown in a randomised complete block design with four replications. Each Plot consisted of 7 rows, 4 meters long, 60 cm apart. Plants were sown in hills spaced 20 cm within the row. Thinning to two plants per hill was done 30 days after sowing.

All the cultural practices such as irrigation, weed control, fertilization, insect control,....etc were applied in the same manner as usually done in the ordinary cotton fields to obtain maximum yield.

Soon after complete emergence each plot was divided into two sections. One section of 3 rows was used for determining seed cotton yield and yield contributing variables, and the other section of 4 rows was used for sampling of cotton plants for growth analysis.

Earliness criteria:

A representative random sample of ten competitive plants from each half plot devoted for yield determinations was used for recording the following earliness criteria:

1- Date of the first flower (DFF): number of days from sowing to appearance of the first flower.

2- Date of first open boll (DFOB): number of days from sowing to opening of the first boll.

3- Node of first sympodium: expressed as number of nodes from the two cotyledonary nodes up to the node of first sumpodium.

4- yield related measures of earliness: the seed cotton weight obtained from the three periodic harvests were used in calculating the following earliness in maturity indices:

- Earliness index (EI, %): expressed as percent of seed cotton yield of the first pick to the total yield.

- Mean Maturity Date (MMD, days): the procedure used by Bilbro and Quisenberry (I1973) as follows was used:

$$MMD = \Sigma Wi\ Hi / \Sigma Wi$$

Where:
W = weight of seed cotton.
H = number of days from planting to harvest and
i = 1,2..n = consecutive periodic harvest number.

- Production Rate Index (PRI, g/m2/day): was calculated according to (Bilbro and Quisenberry, 1973)

PRI = Total plot weight / MMD

Yield and yield contributing variables:

A representative sample of 50 bolls picked from the three rows of each plot devoted for yield determination at first harvesting time was used for determining seed cotton yield components. Seed cotton from the 50-boll samples was cleaned, weighed, ginned, and the lint was weighed to determine lint percentage. Seed cotton yield per unit area was determined from the yield of the three rows.

The variables studied were:

1- Boll weight: Average weight in grams of fifty sound open bolls.
2- Lint percentage: Percentage of the weight of lint to seed cotton.
3- Seed index: Weight of 100 seeds in grams.
4- Lint index: Weight of lint in grams born on 100 seeds. It was calculated from the following expression according to (Meredith and Bridge, 1973).

Lint index = (Lint percentage x seed index) / (100 - lint percentage)

5- Seed cotton yield / unit area: was determined from the summation of seed cotton yield of the three harvests of each half plot and then were converted to Kentar/ feddan.

6- Lint cotton yield: was obtained by multiplying seed cotton yield by lint percentage.

Fiber characteristics:

The following fiber properties were tested at Cotton Technology Department, Cotton Inst., Agric., Res., centre under fixed temperature and humidity.

1- Fiber length: using the digital Fiberograph, model 530 expressed as 2.5 and 50 % span length.

2.5 % span length (2.5% SL) = length (millimetres) at which 2.5 % of the fibers are ≥ this length (May and Bridges, 1995).

50 % span length (50% SL) = length (millimetres) at which 50 % of the fibers are ≥ this length (May and Bridges, 1995).

2-Uniformity Ratio (UR): The ratio between two span lengths expressed as a percentage of the longer span length (ASTM, 1998).

Uniformity Ratio = 50 % SL x 100 / 2.5% SL

3- Fineness (Fineness / maturity in combination) of the fiber: measured by micronaire reading (MR) and expressed in standard micronaire units.

4- Fiber strength (Pressley index): calculated as the force-to-break in pounds divided by the bundle weight in mg.

Data from each macro-environment; CN and LP planting dates and combined over environments were subjected to analysis of variance using plot means according to Snedecor and Cochran (1967). Moreover, means were compared by Duncan,s multiple range test (1955).

Table 1. Designation, pedigree, year released, zone of cultivation and fiber main characteristics of genotypes.

Genotype	Pedigree	Year released	Cultivation area	Fiber characteristics*			
				Length		Fineness	Strength
				2.5% (mm)	50% (mm)	Micronaire reading	Pressley index (g/tex)
1.Egyptian genotype							
1.1 Giza 80	Giza 66 _ Giza 73	1981	Beni-Suef, El-Menia.	30.9	15.4	4.1	28.3
1.2 Giza 83	Giza 72 _ Giza 67	1992	Assiut, Sohag.	30.3	15.4	3.6	27.6
1 3 Giza 85	Giza 67 C.B 58	1993	Kalubyia, Ismailia, Domiat	30	15.2	3.6	30.3
1.4 Giza 86	Giza 75 _ Giza 81	1994	Dakahlia, Kafir EL-Shikh.	32.8	16.5	3.9	31.8
2.Pima genotype							
2.1 Earlipima	(Sakel _ Pima) _ Pima	Experimental line					
2.2 Pima S-4	(P32 S1 10-8) _ Pima S-2	1966	Obsolete cultivar				
2.3 Pima S-6	(5934-23-2-6) _ (5903-98-4-4)	1983	High elevations (above 750 m), partially in New Mexico and Texas	33.8	14.2	4.2	31.3
2 4 Pima S-7	(6614-91-9-3) _ (6907-513-509-501)	1991	Low (< 450 m) and intermediate (450-750 m) elevations	34	14	4.1	31 4

* Spinning test report on the Egyptian cotton crop of 2000, Cotton Research Institute, ARC, Egypt.

2.1 Crops Research Division, ARS, U.S.Dept.Agr.April 1962.

2.2 Crop Sci. vol 16, 1976 p. 604.

2.3 Crop Sci. vol 24, 1984 p. 382.

2.4 Crop Sci. vol 32, 1992 p.1291.

RESULTS AND DISCUSSION

G. barbadense cotton, for which Egyptian and Pima groups are members, is an extra-long stable cotton, being limited to regions capable of accommodating very long growing seasons (> 200 day) due to its indeterminate (full-season) habit (Unruh and Silvertooth, 1996). Pima cotton is originated from Egyptian cotton variety "Mit Afifi". It is expected to be different in many respects from its progenitor i.e. Egyptian cotton, especially when evaluation is done under Egyptian environmental conditions. *G. barbadense* cotton has a stronger tendency to develop excessive vegetative growth. Pima cotton characteristically is much more sensitive to delays in planting date. Pima cotton is also much more sensitive to any excesses in N fertility levels, commonly resulting in greater vegetative growth and delays in maturity (Silvertooth *et al.*, 1995).

There is a disti nct need to develop an understand ing of Pima growth and development in a more definitive sense. Studies of pima cotton would be most useful if confucted with compaeisons to Eguptian cotton under the Egyptian eveironment.

Yield and its contributing variables:

The analysis of variance combined across environments indicated the existence of highly significant variations due to environments for cotton yields (seed cotton and lint cotton) and its contributing variables, ball weight, lint percentage and seed and lint indices Table 2.

Significant variation due to genotypes was also detected for cotton yields and for only two of its components viz. lint percent and seed index, for the combined data across environments and in some instances for individual environments. Also significant variation was observed for genotype _ environment interaction for only cotton yield character.

Further analysis of splitting the tested genotypes into two groups for contrasting Pima group vs. Egyptian one, revealed insignificant variation across environments within Pima genotypes for cotton yield. However, significant variations were observed for three yield components viz. lint percent, seed index and lint index out of the four components studied. However, significant variation among Egyptian genotypes were detected on y for seed cotton, lint yield and two of its components viz. lint percentage and seed index. However, when contrasting Egyptian genotypes vs. Pima genotypes. there were no significant differences except for lint percentage in favour of Egyptian group with about one- percent. Such trend for the significance of variations for yield and its components within or between the two groups studied (Egyptian and Pima) were also reported in in-

dividual environments Table 3.

Within the Egyptian group the two genotypes G.83 and G.85 ranked first and G.80 ranked last and G.86 occupied intermediate position in yield potentials expressed as seed cotton or lint yield (Table 3). These results were comparable with those reported by Abdalla *et al.* (1999) who emphasized the superiority of yield potential of Giza 83 cultivar compared to 12 Egyptian cultivars and 5 Pima ones.

It was evident from data presented in Table 3, that the high yielding of lint cotton for Giza 83 was primary due to it highest lint percentage.

In spite of the insignificant differences in yielding ability within Pima cultivars, it was observed that the three newly released cultivars PS-4, PS-6 and PS-7 were more lint yielders than the experimental line Earlipima, This was mainly attributed to their superiority compared to Earlipima with more than 2 % in lint percentage.

Earliness in maturity:

Genotype x environment interaction was significant for earliness criteria except date of first open boll, however the genotypes mean squares were of much larger magnitude for all the six studied earliness traits Table 4. Contrasting Pima vs. Egyptian group exhibited significant mean squares for the combined data across environments for the two maturity indices, MMD and EI in favour of Pima cotton with about one day in MMD and 7% for E1. However from the practical point of view it may be stated that there was no actual differences between the two groups in earliness in maturity under the conditions of this study.

Within groups it may be stated that G.83 and PS-7 were the earliest genotypes for Egyptian and Pima groups, respectively. However, the magnitude of this superiority is of no practical importance. Intra-group comparisons among cultivars revealed that G.83 and G.85 out of the Egyptian cultivars and Pima S-7 out of the Pima cultivars ranked first in earliness in maturity. However, the magnitude of their superiority in earliness was of low and of no practical importance, where ranges in maturity indices within each group was so small (MMD =151.47-154.40 day, EI = 43.66 -28.74% within Egyptian group; MMD = 150.45 - 153.16 day, EI = 50.93 -28.74 % within Pima group) Table5).

However, close inspection of earliness data Table 5 revealed that Pima S-7 significantly surpassed G.83 in earliness index (7.27 %). whereas, when judging with PRI (on the basis of seed cotton yield) G.83 surpassed Pima S-7 (0.34 g/m^2/ day). This may be attributed to the highyielding of seed cotton in G.83 (1.43 k/

fed.) relative to that of Pima S-7 Table 3. Genotypes rating for seed cotton yield and PRI G.83, PS-6 and PS-7 ranked first among 17 genotypes and were insignificantly different in this respect (Abdalla *et al.*, 1999).

In the present study, although there was significant variation among tested genotypes in earlliness (Table 3), the range of variation in the mean node level of first sympodium was narrow in both Egyptian (8.50 for G.80 to 7.33 for G.85) and Pima (8.09 for Earlipima to 7.72 for Pima S-4) groups.

Fiber Characteristics:

Mean squares of fiber characteristics are summarized in Table 6. These are 2.5 % span length ,50 % span length ,uniformity ratio, micronaire reading and Pressley index.

The longest fibers (2.5 % SL) were produced by G.86 and all Pima genotypes of the Egyptian group with 34.09, 34.42, 33.70, 34.01 and 34.36 mm for Earlipima, PS-4, PS-6, PS-7 and G.86, respectively (Table 7).

In individual environments and averaged over all environments the fiber quality Pima cultivars were significantly higher of about 2 mm in 2.5 % SL compared to the Egyptian cotton. The estimated values of the combined data were 34.06 and 32.45 mm for Pima and Egyptian cotton, respectively. Also Pima cotton exhibited more fineness of about 0.5 micronaire units compared with the Egyptian group, in individual environments and when combined across environments micronaire units were 3.46 and 4.10 for Pima and Egyptian cotton, respectively.

The uniformity ratio of the Egyptian cultivars tended to be significantly higher in uniformity ratio were 2 units compared to Pima. Averaged over environments uniformity ratio were 53.44 and 51.55 for Egyptian and Pima cotton, respectively. However, the individual environment variations among the two cotton groups in the two traits 50 % SL and Pressley index recorded only slight differences. Fiber length from all Egyptian and Pima genotypes evaluated was within the average of the long staple cotton.

The pooled analysis for variations among environments indicated significant genotypes x environment interaction for 50 % SL, uniformity ratio and Pressley index, indicating that cultivars did not respond consistently over environments for these three fiber traits. However, the insignificant G x E interaction for 2.5 % SL and micronaire reading. indicated that cultivars behaved consistently over environments for these two traits Table 6.

Table 2. Mean squares of individual and combined analysis of variance across 3 environments for 8 G. barbadense genotypes for seed cotton yield and it's contributing variables

Source of variance	E1	E2	E3	Com.	E1	E2	E3	Com.	E1	E2	E3	Com.
	Seed Cotton Yield (k/f)				Lint Cotton Yield (k/f)				Boll Weight (g)			
Environments (E)				170.8**				329.01**				3.57**
Genotypes (G)	15.76*	1.35	1.01	7.94**	24.71**	2.75	1.60*	13.97**	0.04	0.08	0.05	0.06
Pima	0.99	1.58	0.64	0.09	1.14	4.53	0.43	1 32	0.01	0.13	0.01	0.03
Egyptian	35.16**	1.55	1.23	14.02**	56.37**	1.86	3 23**	26.27**	0.06	0.03	0 12	0 1
Pima vs. Egyptian	1.86	0.03	1 19	0.22	0 42	0 04	0.24	2.54	0 08	0.03	0.01	0.01
G F				5 09**				7 63*				0 06
Pooled error	1 71	1 17	0 43	1.1	2 2	0 51	0 58	1 62	0 02	0 05	0 04	0 44
	Seed Index (g)				Lint Percentage (%)				Lint Index (g)			
Environments (E)			.	43.21**				48 70**				32.00**
Genotypes (G)	1.22**	0.94*	0.38	1.33**	10 16**	6.05	9.13**	16.76*	0 74*	0.82	0.46	0 84
Pima	1 37*	1.13*	0.07	1.64*	11.11**	5.84	4.83*	18.04**	0.4	1.01	0.43	1 36*
Egyptian	1.09*	0.25	0 7	1.32*	8.86**	8.31	10 41*	14.02**	0 7	0.6	0.41	0 41
Pima vs. Egyptian	1.16	2.46*	0.37	0.42	11.23*	0.1	18.20*	21.16**	1 84*	0.91	0.7	0.64
G_E				0.6				4.3				0.59
Pooled error	0.3	0.34	0.53	0.51	1.67	4.08	3.12	2.96	0.27	0.56	0.44	0.42

* ($p < 0.05$)

** ($p < 0.01$)

Table 3. Means for 8 *G. barbadense* genotypes for seed cotton yield and its contributing variables evaluated at three environments (E1, CN, 1998;E_2 CN, 1999; E_3, 1999) and across environments for yield and yield components.

Genotypes	E1	E2	E3	Com.	E1	E2	E3	Com.
	Seed cotton yield (k/f)				Lint cotton yield (k/f)			
Egyptian								
G.80	2.73 d	10 72	6.36	6.60 c	3.09 c	13.59	7.42 ab	8.03 c
G.83	9.77 a	10 64	7.12	9.18 a	11.89 a	13.57	8.71 a	11.39 a
G.85	6.03 bc	10.39	6.43	7.62 b	6.89 bc	12.36	7.38 bc	8.88 bc
G.86	4.72 c	9 37	5.77	6.62 c	5.23 c	11.78	6.70 c	7.90 c
x	5.81	10.28	6.42	7.5	6.78	12.83	7.55	9.05
Pima								
Earlipima	6.65 bc	9 56	7.39	7.87 b	6.91 bc	11.5	8.04 ab	8.82 bc
Pima S-4	6.76 bc	10.13	6.43	7.77 b	7.68 bc	12.41	7.50 bc	9.19 b
Pima S-6	6.06 bc	10.93	6.81	7.93 b	7.03 bc	13.57	8.00 ab	9.53 b
Pima S-7	5.70 bc	10.77	6.78	7.77 b	6.38 bc	13.58	7.69 ab	9.22 b
x	6.29	10 35	6.85	7.83	7	12.77	7.81	9.19
	Boll weight (g)				Lint percentage (%)			
Egyptian								
G.80	2.18	2.89	2.52	2.53	35.98 b	40 25 ab	37.02 ab	37.75 b
G.83	2.38	2.82	2.86	2.69	38.63 a	40.48 a	38.84 a	39.32 a
G.85	2 64	3 04	2 67	2.72	36.27 b	37.76 d	36.42 bc	36.82 b
G.86	2.37	2.9	2.89	2.72	35.18 b	39 92 ab	36.85 ab	37.32 b
x	2.39	2 91	2.74	3.67	36.52+	39.6	37.28+	37.80+
Pima								
Earlipima	2.3	2.72	2.82	2.61	32.99 c	38.19 cd	34.54 c	35.24 c
Pima S-4	2 3	3 09	2 8	2 73	36.07 b	38 89 bcd	37.04 ab	37.33 b
Pima S-6	2.19	3.02	2.73	2.65	36.83 ab	39 43 abc	37.30 ab	37.85 b
Pima S-7	2.19	3 09	2.74	2.67	35.53 b	40 03 ab	36.00 bc	37.18 b
x	2 25	2 98	2.77	2.67	35.36	39.14	36.22	36.9
	Seed index (g)				Lint index (g)			
Egyptian								
G.80	8.68 bc	10.83 c	10.9	10.15 b	4.88 bc	7.31	6.48	6.22 abc
G.83	9.38 ab	10 82 c	10.5	10.22 ab	5.90 a	7.36	6.43	6.63 a
G.85	9.60 a	1.35 ab	11 4	10 79 a	5.46 ab	6.89	6.54	6.30 abc
G.86	9.90 a	11.08 bc	11.2	10 73 a	5.37 abc	7 36	6.54	6.43 bc
x	9.39	11 02	11	10 47	5.4	7.23	6.5	6.4
Pima								
Earlipima	9.60 a	1.49 ab	11.3	10.80 a	4.73 bc	7.09	5.97	5.93 c
Pima S-4	8.20 c	10 86 c	10 1	9.71 b	4.63 c	6.93	6.5	6.02 bc
Pima S-6	9.13 ab	12 05 a	11.1	10.77 a	5 37 abc	7 84	6.61	6.60 a
Pima S-7	9.10 ab	11 90 ab	11 3	10 78 a	5 02 bc	7 95	6.38	6 45 a
x	9.01	11.58+	11	10.52	4.94	7.45	6.37	6.25

Table 4. Mean squares of individual and combined analysis of variance across 3 environments for 8 G. barbadense genotypes for earliness indices.

Source of variance	E1	E2	E3	Com.	E1	E2	E3	Com.	E1	E2	E3	Com.
	Date of first flower (day)				Date of first open boll (day)				Node of first sympodium (node)			
Environments (E)				1164.00*				1702*				26.3**
Genotypes (G)	7.50**	1.79*	2.71**	5.17**	3.9	14.8**	7.85**	19.9**	0.67**	1.23*	0.35*	1.50**
Pima	2.08*	1.67*	0.56	1.47*	0.2	1.17	2.06	1.25	0.11	0.69	0.18	0.24
Egyptian	12.75**	1	2.75**	10.00**	8.9	20.56**	16.17**	41.17**	1.41**	2.15**	0.63**	3.25**
Pima vs. Egyptian	8.00**	4.50**	9.03**	1.76	0.2	38.28**	0.28	12.04	0.14	0.07	0.01	0.27
G_E				3.42**				3.33				0.38*
Pooled error	0.54	0.54	0.32	0.46	5.4	1.48	0.72	2.53	0.09	0.39	0.11	0.2
	Earliness index (%)				Mean maturity date (day)				Production rate index (g/m2/day)			
Environments (E)				21.16				4407.98**				7.07**
Genotypes (G)	28.0**	364.0**	119.0**	536.48**	5.7	22.00**	4.14*	18.30**	0.94*	0.1	0.08*	0.53**
Pima	163.87	79.72	122.53*	298.8**	9.1	4.94*	4.07*	15.01**	0.05	0.09	0.05	0.01
Egyptian	316.95*	648.5**	9.51	505.5**	3.6	39.82**	0.57	17.39**	2.10**	0.14	0.09	0.95
Pima vs. Egyptian	549.1**	66.03	7.03	1344**	1.8	20.21**	15.04**	30.80**	0.12	0.01	0.15*	0.01
G_E				176.00**				6.77**				0.30*
Pooled error	76.07	41.6	31.64	49.77	3.1	1.43	1.23	1.62	0.1	0.06	0.03	0.06

* ($p < 0.05$)

** ($p < 0.01$)

Table 5. Means for 8 G. barbadense genotypes evaluated at three environments and across environments for earliness measurements.

Genotypes	E1	E2	E3	Com.	E1	E2	E3	Com.
	Date of first flower (day)				Date of first open boll (day)			
Egyptian								
G.80	75.75 a	79.75 ab	68.00 b	74.50 ab	118	130.00 b	116.50 bc	121.5
G.83	72.75 c	79.75 ab	68.00 b	73.50 def	117.5	128.75 bc	114.50 d	120.25
G.85	72.00 c	79.75 ab	67.25 bc	73.00 f	117.5	129.25 bc	113.25 e	120.08
G.86	75.00 ab	80.75 a	69.25 a	75.00 a	120.5	133.75 a	117.75 a	124
x	73.88	80.00+	68.13+	74	118.38	130.44+	115.5	121.44
Pima								
Earlipima	75.00 ab	79.00 bc	67.25 bc	73.75 cde	118.25	128.75 bc	115.25 d	120.75
Pima S-4	75.75 a	80 00 b	66.50 c	74.08 bc	118.5	128.00 c	116.75 ab	121.08
Pima S-6	74.00 b	78 50 c	67.25 bc	73.25 ef	118	127.75 c	115.25 d	120.33
Pima S-7	74.75 ab	79.50 bc	67.25 bc	73 83 cd	118	129.00 bc	115.50 cd	120.83
x	74.88+	79 25	67.06	73.73	118.19	128.38	115.69	120.75
	Node of first sympodium				Earliness index (%)			
Egyptian								
G.80	7.25 ab	9.16 a	9.10 a	8.50 a	29.48 c	42.33 ab	38.09 b	36.63 d
G.83	7.33 a	8 08 b	8 80 ab	8.07 bc	43.99 ab	47.29 a	39.72 b	43 66 bc
G.85	6.08 c	7.75 b	8.15 c	7 33 d	44.99 ab	38.94 ab	35.98 b	39.97 bcd
G.86	7.20 ab	9.16 a	8.65 ab	8.34 ab	28.73 c	18.33 c	38.30 b	28.74 c
x	6.97	8 54	8.86	8 06	36.8	39.22	38.02	37.25
Pima								
Earlipima	7.20 ab	8.33 ab	8.75 ab	8.09 bc	45.91 ab	45.50 ab	43.13 b	44.84 b
Pima S-4	7.05 ab	8.30 ab	8.40 bc	7.72 c	36.77 bc	36.89 b	42.57 b	38.74 cd
Pima S-6	6.88 b	9.05 a	8.85 ab	8.26 ab	45.28 ab	44.81 ab	42.30 b	44.13 bc
Pima S-7	7.25 ab	8.10 b	8.85 ab	8.07 bc	52.37 a	46.72 a	53.71 a	50.93 a
x								
	Mean maturity date (day)				Production rate index (g/m2/day)			
Egyptian								
G.80	156 57	161.28 bc	140.11 a	152 57 ab	0.65 d	2.5	1.71 bc	1.62 c
G.83	154 68	160 20 c	139.53 a	151 47 de	2.37 a	2.5	1.91 ab	2.26 a
G.85	154 71	163 01 b	140.41 a	152 71 bc	1.46 bc	2.39	1.72 bc	1.86 b
G.86	156 02	167 35 a	139.83 a	154.40 a	1.13 c	2.1	1.55 c	1.59 c
x	156 01	162.96	139.97	152 79-	1.4	2.37	1.72	1.83
Pima								
Earlipima	154.66	160 76 c	139.00 a	151.47 de	1.61 b	2.23	2.00 a	1.95 b
Pima S-4	157.12	163.02 b	139.35 a	153 16 b	1.61 b	2.33	1.73 bc	1.89 b
Pima S-6	155.05	160.90 c	138.94 a	151 63 cd	1.47 bc	2.55	1.84 ab	1.95 b
Pima S-7	153.49	160.75 c	137.11 b	150 45 e	1.39 bc	2.51	1.85 ab	1.92 b
x	155.08	161 36	138.6	151 68	1.52	2.41	1.86+	1.93

Means designated with the same letters are not significantly different at 0.05 level of probability by Duncan, s multiple range test.

+ Significant mean of Egyptian-vs-Pima group.

Table 6. Mean squares of individual and combined analysis of variance across 3 environments for 8 G. barbadense genotypes for the main fiber characteristcs.

Source of variance	E1	E2	E3	Com.	E1	E2	E3	Com.	E1	E2	E3	Com.
	2.5 % SL.(mm)				50 % SL.(mm))				Uniformity ratio (%)			
Environments (E)				6.81**				39 69**				26.3**
Genotypes (G)	7.36**	5.56**	6.43**	17.90**	2.32**	1.55	7.54**	7.09**	0.51*	13.81	0.35*	1.50**
Pima	1.54**	0.33	0.94	1.02	0.74**	0.64	0.82	0.95	0.61	6.02	0.18	0.24
Egyptian	6.52**	4.88*	9.84**	20.07**	1.86**	2.92	15.82**	15.29**	0.31	13.95	0.63**	3.25**
Pima vs. Egyptian	27.38**	23.26**	12.71**	61.84**	8.41**	0.19	2.88	0.9	0.78	36.77*	0.01	0.27
G _ E				0.74				2 16**				0 38*
Pooled error	0.2	1.06	1.18	0.81	0.14	1.26	0.88	0.76	0.34	7.08	0.11	0.2
	Pressley index (lb/mg)				Micronaire reading (unit)							
Environments (E)				1.03				1 99**				
Genotypes (G)	1.70**	1.68**	1.25	2.86**	0.55**	0.31**	0.59**	1.33**				
Pima	1.44*	1.2	0.96	1.53**	0.2	0.05	0.06	0.25*				
Egyptian	2.21*	2.11**	1.78*	4.91**	0.12	0.19	0.32**	0.50**				
Pima vs. Egyptian	0.95	1.83	0.5	0.72	2.88**	1.40**	3.00**	7.10**				
G _ E				0.88*				0.06				
Pooled error	0.43	0.42	0.51	0.45	0.07	0.08	0.06	0.07				

* ($p < 0.05$)

** ($p < 0.01$)

Table 7. Means for 8 G. barbadense genotypes evaluated at three environments and across environments for some fiber properties.

Genotypes	E1	E2	E3	Com.	E1	E2	E3	Com.
	2.5 % S.L. (mm)				50 % S.L. (mm)			
Egyptian								
G.80	31.08 d	31.93 b	31.65 c	31.55 b	15.40 d	16.26	16.13 d	15.93 c
G.83	31.68 d	31.75 b	32.83 bc	32.08 b	15.65 d	17.26	19.27 b	17.40 b
G.85	31.10 d	31.66 b	32.65 bc	31.80 b	15.53 d	17.5	19.34 b	17.45 b
G.86	33.78 bc	33.98 a	35.34 a	34.36 a	16.88 abc	18.33	20.87 a	18.69 a
x	31.91	32.33	33.12	32.45	15.87	17.34	18.9	17.37
Pima								
Earlipima	34.48 a	34.02 a	33.77 ab	34.09 a	17.40 a	18.04	18.17 bc	17.87 b
Pima S-4	34.08 ab	34.32 a	34.85 a	34.42 a	17.08 ab	17.13	18.89 bc	17.70 b
Pima S-6	33.25 c	33.65 a	34.22 ab	33.70 a	16.63 bc	17.26	17.81 c	17.23 b
Pima S-7	33.23 c	34.15 a	34.67 a	34.01 a	16.45 c	17.54	18.34 bc	17.44 b
x	33.76+	34.04+	34.38+	34.06+	16.89+	17.49	18.3	17.56
	Uniformity ratio (%)				Pressley index (lb/mg)			
Egyptian								
G.80	49.55	50.92	50.96 b	50.48 c	9.58 d	9.60 bcd	9.66	9.62 c
G.83	49.4	54.36	58.70 a	54.15 a	10.35 bcd	8.90 d	9.1	9.45 c
G.85	49.94	55.27	59.23 a	54.81 a	10.63 abc	9.75 abcd	10.38	10.25 b
G.86	49.97	53.94	59.05 a	54.32 a	11.38 a	10.68 a	10.55	10.87 a
x	49.72	53.62	56.99	53.44+	10.49	9.73	9.92	10.05
Pima								
Earlipima	50.46	53.03	53.81 b	52.43 b	10.90 ab	10.63 a	9.85	10.46 ab
Pima S-4	50.12	49.91	54.20 b	51.41 bc	9.53 d	10.45 ab	10.8	10.26 b
Pima S-6	50.02	51.29	52.05 b	51.12 bc	9.83 cd	9.40 cd	9.73	9.65 c
Pima S-7	49.5	51.36	52.90 b	51.25 bc	10.30 bcd	10.33 abc	10.33	10.32 b
x	50.03	51.4	52.24	51.55	10.14	10.2	10.18	10.17
	Mean maturity date (day)				Production rate index (g/m2/day)			
Egyptian								
G.80	3.36 ab	3.83 bcd	4.15 ab	3.87 b				
G.83	3.93 a	4.35 a	4.40 a	4.23 a				
G.85	3.58 ab	4.03 abc	3.80 bc	3.80 bc				
G.86	3.85 a	4.13 ab	4.40 a	4.13 a				
x	3.75+	4.09+	4.19+	4.10+				
Pima								
Earlipima	3.38 b	3.30 c	3.75 c	3.61 cd				
Pima S-4	2.95 c	3.63 cde	3.48 c	3.35 ef				
Pima S-6	3.30 bc	3.80 bcd	3.58 c	3.56 de				
Pima S-7	2.95 c	3.53 de	3.50 c	3.33 f				
x	3.15	3.57	3.58	3.46				

Means designated with the same letters are not significantly different at 0.05 level of probability by Duncan, s multiple range test.

+ Significant mean of Egyptian-vs-Pima group.

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دراسة مقارنة لسلوك أقطان البيما والأقطان المصرية
١- المحصول ومكوناته ، مكونات التبكير ، صفات التيلة

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من المعروف إن كفاءة الانتخاب تعتمد على تعظيم التباينات الوراثية فى العشائر التى سيمارس فيها الانتخاب ولذلك فان زيادة التباين داخل عشائر القطن المصرية التى سيمارس فيها الانتخاب يعتبر من الأهمية بمكان وذلك لانتخاب تراكيب وراثية ذات موسم نمو قصير. وفى هذا المجال فان ادخال اقطان البيما فى برنامج تربية القطن المصرى ممكن ان يكون أحد هذه الوسائل . ولهذا فانه تم التفكير لمقارنة اربعة تراكيب وراثية من البيما (بيما مبكر-بيما س٤ -بيما س٦-بيما س٧) مع أربع أصناف من الأقطان المصرية الطويلة التيلة (جـ٨٠-جـ٨٣-جـ٨٥-جـ٨٦) وذلك كخطوة اولى للتعرف على الأسباب الكاملة لاختلاف المحصول اذا وجد بين المجموعتين وذلك قبل ادخالها فى برامج تربية القطن المصرى .

ولمقارنة المحصول والتبكير وصفات التيلة لهاتين المجموعتين تحت الظروف المحلية .اجريت هذه الدراسة فى ٣ بيئات وهى الأولى : زراعة فى اول ابريل ١٩٩٨ فى محطة بحوث الجيزة بينما الثانية والثالثة فى ميعادى زراعة الأول فى ٢٥ مارس والثانى فى اول مايو عام ١٩٩٩ فى محطة بحوث سدس(بنى سويف). تم زراعة هذه الأصناف فى تصميم القطاعات الكاملة العشوائية باستخدام ٤ مكررات. ويمكن تلخيص اهم النتائج المتحصل عليها من هذه الدراسة .

١- المحصول ومكوناته: بمقارنة اصناف البيما والأصناف المصرية ظهر عدم وجود اختلافات معنوية بالنسبة للمحصول الزهر والشعر وجميع الصفات المكونة له فيما عدا صفة تصافى الحليج حيث ان الأقطان المصرية كانت متفوقه فى هذ الصفة عن مجموعة البيما بحوالى ١٪.

٢- التبكير ومكوناته: اظهرت دلائل التبكير ان هناك اختلافات معنوية بين المجموعتين لصالح اصناف البيما لصفات معامل التبكير (EI)بـ ٧، وصفة متوسط تاريخ النضج (MMD) بحوالى ١ يوم .

٣- صفات التيلة: تشير النتائج الى تفوق الصنف المصرى جـ٨٦ مقارنة بالأصناف السبعة الأخرى فى طول التيلة عند ٥٠٪ وايضا فى معامل البريسلى غير انه يتصف بارتفاع قيمة الميكرونير(اكثر خشونة)عن جميع الأصناف فيما عدا الصنف جـ٨٣ و بمقارنة اصناف البيما والأصناف المصرية ظهر اختلافات معنوية بين المجموعتين لصالح اصناف البيما لصفات الطول عند ٢,٥٪ والنعومة .