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Improving earliness index and lint yield by pedigree selection in two populations of Egyptian cotton under late planting

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Abstract:

Two cycles of pedigree selection for earliness index and lint yield/plant were achieved in two populations of Egyptian cotton (*G. barbadense* L.) under late planting condition. The genetic materials were the F6, F7 and F8-generations of (Giza 80 x Pima 56)/Giza 91 (pop. I) and Dandara/Giza 80 (pop. II). The genotypic coefficients of variation (gcv) in the F6-genreation were 13.35 and 14.69% for earliness index, and 23.70 and 27.60% for lint yield/plant for pop. I and pop. II; respectively. The remained gcv after two cycles of pedigree selection were 8.12 and 10.60% for earliness index, and 22.59 and 21.50% for lint yield/plant for pop. I and pop. II; respectively. The respective realized heritability was 0.4550 and 0.2731 for earliness index, and 0.4128 and 0.3970 for lint yield/plant. The average direct observed gain was significant and accounted for 5.59 and 3.80% for earliness index, and 6.68 and 5.45% (ns) for lint yield/plant from the bulk sample for pop. I and II; respectively. Two promising superior families were isolated from each population in both of earliness index and yield. For example, concerning earliness index, the best superior family No. 175 showed significant ($P<0.01$) observed gains from the better parent of 26.81, 49.99, 18.17, 9.87, 43.19 and 13.78% for seed cotton yield/plant, lint yield/plant, lint percentage, seed index, lint index and earliness index; respectively.

Key words: Egyptian cotton, late planting, pedigree selection, observed gain, realized heritability, parent-offspring regression.

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Introduction:

Cotton production in Egypt faces a serious constraint, notably delaying sowing date by the farmers to gain complete early winter crop before cotton. Therefore, cotton breeders in Egypt have to develop new cultivars adapted to late planting after early winter crops and early wheat cultivars. **Narayanan *et al.* (1987)** curtailed the days to first boll opening up to 25 days by disruptive mating and selection for earliness. **Abdalla (1990)** found that first sympodial node and earliness index were the best criteria for selecting early high yielding lines. **Abo El-Zahab and Amein (1996a and b)** reported that Egyptian cotton genotypes do differ in their response to the stress of late planting. **Mahdy *et al.* (2001a and b)** found that two cycles of pedigree selection for earliness depleted the genetic variability of earliness and pedigree selection improved seed cotton yield and earliness in late planting. **Mahdy *et al.* (2006, 2007, 2009 a and b)** obtained superior families out yielded the better parent in seed cotton yield/plant, number of bolls/plant, seed index, lint index and earliness index by pedigree selection in Egyptian cotton populations in late planting. The present work aimed to isolate superior promising early and high yielding families in late planting.

Materials and Methods:

Two cycles of pedigree selection for earliness index and lint yield/plant were achieved in two segregating populations of Egyptian cotton (*G. barbadense* L.) under late planting condition at Assiut Univ. Exper. Farm during 2009 to 2011 summer seasons. The basic materials were two F6-populations. Population I (pop. I) were 40 families stemmed from the cross [(Giza 8 x Pima 56) x Giza 91)], and 38 families from population II (pop. II) stemmed from the cross (Giza 80 x Dandara). In season 2009, the families of pop. I and pop. II along with the two parents and the unselected bulk sample were sown on May, 5^{th} in two experiments. A randomized complete block design of three replications was used in the three seasons. In the three seasons; the plot size was one row, 4 m long, 60 cm apart and 40 cm between hills within a row, after full emergence, seedlings were thinned to one plant per hill. In the three seasons the recommended cultural practices for cotton production were adopted through out the growing season, except for nitrogen fertilization. Only half of the recommended dose of nitrogen for cotton production was added after thinning and before the first irrigation. At the end of the growing season, two picks were done. The recorded traits in the three seasons were; seed cotton yield/plant; g.(SCY/P,g.), lint yield/plant; g.(LY/P,g.), lint percentage(LP), number of bolls/plant(NB/P), boll weight, g.(BW,g.); (average weight of 25 sound open bolls from each family before the first pick), seed index; g.(SI,g), lint index; g.(LI,g), earliness index(EI); (weight of the first pick/weight of the two picks), and days to first flower(DFF). The best plant from each of the best 20 families in lint yield/plant, and in earliness index was saved from each population. In season 2010, F7-genreation; sowing date was on May, 1st. At the end of the season, the best plant from each of the best 10 families in lint yield/plant, and in earliness index from each population was selected for evaluation in season 2011. In season 2011, F8-generation; the 10 selected families for lint yield/plant, and the 10 families for earliness index from the two populations were evaluated in separate experiments, one for each population. Data were subjected to proper statistical analysis according to **Steel and Torrie (1980).** Genotypes means were compared using Revised Least Significant Differences test (RLSD) according to **El-Rawi and Khalafalla (1980).** The phenotypic (σ^2p), genotypic (σ^2g) variances, the phenotypic (pcv %) and genotypic (gcv %) coefficients of variability and heritability in broad sense (H) were calculated according to **Walker (1960).** Realized heritability (h^2) was calculated as; $h^2 = R / S$ **(Falconer, 1989);** where R = response to selection and S = selection differential. Narrow sense heritability was calculated as parent-offspring regression according to **Smith and Kinman (1965).**

Results and Discussions:

1- Description of the base populations in the F6-generation:

1.1- Means and variances:

The analysis of variance of the studied traits in the two populations, pcv, gcv and heritability in broad sense are shown in Table 1. Mean squares of the families of the two populations were significant for all traits indicating the presence of variability in the criteria of selection.

The family means (Table 2) showed wide range in all traits. In pop.I,seed cotton yield/plant ranged from 25.48 to 63.66 with an average of 39.35 g., lint yield/plant ranged from 9.74 to 25.15 with an average of 14.98 g., number of bolls/plant ranged from 9.93 to 23.25 with an average of 15.74, and earliness index ranged from 0.51 to 0.97 with an average of 0.82. Similar ranges were observed in pop. II. Such wide ranges reflected in high estimates of pcv and gcv. High estimates of gcv were observed in seed cotton yield/plant (23.61 and 26.59%),lint yield/plant (23.70 and 27.60%) and number of bolls/plant (21.61 and 29.78%) in pop. I and II; respectively. Boll weight, earliness index and seed and lint indices showed moderate variability. However,lint percentage and days to flowering showed narrow estimates of genetic variability.The close estimates of gcv and pcv resulted in very high unreliable estimates of broad sense heritability, which reached in lint yield to 93.78 and 94.88%, and in earliness index to 98.35 and 98.11% for pop. I and II; respectively. This could be due to two main causes; firstly, evaluation of the families at one site for one season inflated the family's mean squares by the confounding effects of the interactions among families, years and locations. Secondly, the preponderance of dominance and over-dominance in early segregating generations.

2- Pedigree selection for earliness index:

2.1- Variability and heritability estimates:

Mean squares of the selected families for earliness index and the other traits was significant (P<0.01) after two cycles of selection in the two populations (not included). The pcv and gcv of earliness index in pop. I decreased from 13.46 and 13.35% in the base population(Table1) to 8.28 and 8.12% after two cycles of selection (Table 3). Similar decrease in variability was also observed in pop. II. The close estimates of pcv and gcv resulted in very high and unreliable estimates of broad sense heritability in the two populations for all traits except for boll weight and days to first flower in pop. I. Otherwise, the realized heritability of earliness index was 0.4550 in pop. I and 0.2731 in pop. II (Tables 3 and 5). Parent-offspring regression was very low for the criterion of selection; earliness index and was 0.1127 in pop. I and 0.1311 in pop. II (Table 5). The wide differences between broad sense heritability as estimated from the expected mean squares, realized heritability and parent-offspring regression could be due to the two main causes mentioned before, in addition to that the realized heritability and parent-offspring regression depend only upon the additive variance transmitted from generation to generation. The only criticism of realized heritability estimates in this research was the calculation of the selection differential in a season and genetic gain in another season, in which the genotype by environment interaction could affect these estimates. Heritability estimates from parent-offspring regression could be also affected by genotype-environment interaction, in which the parents and offspring were grown in two different seasons. Generally, it could be concluded that the realized heritability and parent-offspring regression estimates were more reliable than the broad sense heritability in the two populations. **Singh *et al.* (1995)** found significant genotypic differences for all traits in the F3 and F4-generations. **Lloyd and Bridges (1995)** practiced selection at conventional and late plantings and found significant genotypic variation for all traits. **Mahdy *et al.* (2006)** found that the gcv after two cycles of selection for earliness index ranged from16.06 to 19.16%. **Mahdy *et al.* (2009b)** noted that the gcv after two cycles of selection for earliness index was 13.65 and 17.30% in two populations, and the realized heritability was 0.4598 and 0.4099.**Hassaballa *et al.*(2012)**came to the same conclusion and found realized heritability of 0.4214 and 0.3649 in two populations at late planting.

2.2- Means and observed gain in population I:

Mean earliness index (Table 3) ranged from 0.77 to 0.96 with an average of 0.89. Most of the ten selected families for earliness index which showed high earliness index (Family No. 8, No. 11, No. 97, No. 136 and No. 144) were low in yielding ability. However, two promising families; No. 2 and No. 175 showed significant (P<0.01) observed gains (Table 4) from both of the bulk sample and the better parent in earliness index and yield. The direct observed gain in earliness index accounted for 12.78 and 9.72% from the bulk sample, and for 16.95 and 13.78% from the better parent for families No. 2 and No. 175; respectively. Family No. 175 showed significant (P<0.01) correlated gains of 26.81, 49.99, 18.17, 9.87 and 43.19% from the better parent for seed cotton yield/plant, lint yield/plant, lint percentage, seed index and lint index; respectively.

2.3- Means and observed gain in population II:

Mean earliness index of the selected families ranged from 0.62 to 0.94 with an average of 0.82 compared to 0.79 for the bulk sample and 0.83 for the better parent Dandara (Table 5). The response to selection in pop. II was better than in pop. I. The average of the ten selected families (Table 4) showed significant (P<0.01) direct gain in earliness index of 3.80% from the bulk sample and insignificant (-1.20%) from the better parent accompanied with significant (P<0.05 - <0.01) correlated gain of 7.89% for seed cotton yield/plant, 12.90% for lint yield/plant, 5.34% for lint percentage, 8.82% for boll weight, 2.36% for seed index and 14.59% from the better parent. Furthermore, two superior promising families; No.11 and No. 151 were obtained. The two superior families characterized by significant (P<0.01) gain from the bulk sample and the better parent for earliness index, seed cotton yield/plant, lint yield/plant and most of the other traits. These results are in general agreement with those obtained by **Narayanan *et al.* (1987), Abdalla (1990), Mahdy *et al.* (2001b), Mahdy *et al.* (2006) and Hassaballa *et al.* (2012).**

3. Pedigree selection for lint yield/plant:

3.1- Variability and heritability estimates:

The families mean squares of the selection criterion, lint yield/plant and the other traits were significant (P<0.01) in both populations (not included). The pcv and gcv % (Tables 6 and 8) were high for lint yield/plant, seed cotton yield/plant and number of bolls/plant, and moderate for the other traits except days to first flower, which were low in the two populations. The gcv of lint yield/plant was 22.59 in pop. I and 21.50% in pop. II indicating sufficient genetic variability for further cycles of selection. The close estimates of pcv and gcv % resulted in very high and unreliable estimates of broad sense heritability. However, the realized heritability for the criterion of selection was low in pop. I (0.4128) and in pop. II (0.3970). Furthermore, parent-offspring regression was very low after two cycles of selection and accounted for 0.1528 in pop. I and 0.1459 in pop. II. The wide differences between broad sense, realized heritability estimates and parent-offspring regression were interpreted before, and reflect the effects of dominance and over-dominance in the F8-genreation in these materials. **Lloyd and Bridges (1995)** found significant genotypic variation for all traits at conventional and late plantings of cotton. **Okasha (1998)** noted high to moderate broad sense heritability estimates for all traits in a study of direct selection for yield and yield components. **Mahdy *et al.* (2001a and b) and Mahdy *et al.* (2012)** are in line with these results.

3.2- Means and observed gain in pop. I:

Mean lint yield/plant (Table 6) ranged from 7.78 for family No. 82 to 20.77 for family No. 184 with an average of 15.48 g. Six families (No. 95, No. 128, No. 140, No. 184 and No. 189) significant ($P<0.01$) out yielded the better parent in lint yield/plant and seed cotton yield/plant, four of them (family No. 95, No. 128, No. 147 and No. 184) gave significant earliness index from the better parent Giza 91 (Table 6). The average direct observed gain was significant ($P<0.05$) and accounted for 6.68 and 7.87% from the bulk sample and the better parent; respectively. Two selected families could be considering promising families; No. 128 and no. 184. These two families show significant ($P<0.01$) direct gain in lint yield/plant and significant correlated gains in most of the studied traits, especially earliness index (Table 7).

3.3- Means and observed gain in pop. II:

Mean lint yield/plant ranged from 11.89 to 22.63 with an average of 16.07 g. Four families (No. 16, No. 73, No. 151 and No. 160) out yielded the bulk sample with a range from 11.29 to 36.09% (Table 8). The four families showed significant correlated response in seed cotton yield/plant, number of bolls/plant and days to first flower, three of them showed significant correlated response in earliness index. Five families (No. 16, No. 73, No. 151, No. 160 and No. 182) showed significant ($P<0.01$) direct response form the better parent ranged from 9.49 to 54.47% (Table 8). The over all mean of the ten selected families showed significant ($P<0.01$) direct response of 9.69% from the better parent (Table 7). Selection for lint yield/plant in pop. II, resulted in two superior promising families; No. 151 and No. 160, Family No. 160 showed significant ($P<0.01$) direct gain in lint yield/plant of 14.77% from the bulk sample and 19.39% from the better parent accompanied with significant correlated gain in earliness index of 7.37 and 2.41% from the bulk sample and the better parent; respectively. These results are in agreement with those reported by **Mahdy *et al.* (2001a), El-Okkiah *et al.* (2008), Mahdy *et al.* (2009b), Hassaballa *et al.* (2012) and Mahdy *et al.* (2012).**

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Table 1. Analysis of variance, heritability in broad sense (H_b%), phenotypic (p c v%) and genotypic coefficients of variability (g c v%) for the studied traits in the two populations in the F_6-generation (season 2009).

Population	S.O.V	D.F	SCY/P	LY/P	LP	BW	NB/P	SI	LI	EI	DFF
OP.I	Reps	2	3.671	0.971	2.874	0.020	2.416	1.664	0.755	0.002	6.691
	Families♦	42	264.226**	38.634**	6.996**	0.193**	35.598**	3.135**	1.581**	0.036**	19.277**
	Error	84	5.346	0.836	0.728	0.001	0.885	0.054	0.080	0.0002	1.739
	P.C.V %		24.33	24.47	4.41	10.19	22.42	10.13	12.04	13.46	4.77
	G.C.V %		23.61	23.70	3.79	10.11	21.61	9.87	11.18	13.35	4.19
	H_b%		94.17	93.78	74.16	98.46	92.89	95.00	86.21	98.35	77.07
OP.II	Reps	2	6.712	0.220	5.317	0.019	1.389	0.352	0.062	0.002	8.884
	Families♦	40	359.727**	59.318**	8.119**	0.303**	62.840**	2.021**	1.290**	0.047**	13.812**
	Error	80	4.553	1.048	1.190	0.001	0.729	0.141	0.128	0.0003	1.044
	P.C.V %		27.10	28.33	4.80	11.72	30.30	9.36	12.00	14.83	3.61
	G.C.V %		26.59	27.60	3.90	11.66	29.78	8.45	10.41	14.69	3.24
	H_b%		96.30	94.88	66.00	99.02	96.60	81.63	75.16	98.11	80.30

♦Families + the parents and the unselected bulk sample **; significant at 0.01 level of probability.

Table. 2 Means and range of the studied traits in the base populations I and II (F_6-generation); season 2009.

Item	SCY/P, g.	LY/P,g	LP	BW,g	NB/P	SI,g	LI,g	EI	DFF
	Population I								
Mean ± SE	**39.35± 1.33**	**14.98 ± 0.53**	**38.10 ± 0.49**	**2.50 ± 0.02**	**15.74 ± 0.54**	**10.27 ± 0.13**	**6.33 ± 0.16**	**0.82 ± 0.01**	**57.70±0.76**
Range	25.48-63.66	9.74 - 25.15	32.96 - 40.54	2.07 - 3.16	9.93-23.25	8.83-12.34	4.93 - 7.84	0.51 - 0.97	51.04-61.44
Bulk	33.79	12.78	37.84	2.52	13.39	9.02	5.49	0.81	57.40
G.80 x PS6	31.50	11.95	37.95	2.29	13.77	9.95	6.09	0.74	58.06
G.91	35.54	13.74	38.66	2.79	12.77	9.88	6.23	0.84	57.59
	population II								
Mean ± SE	**40.92± 1.23**	**15.97 ± 0.59**	**38.94 ± 0.63**	**2.72 ± 0.02**	**15.28 ± 0.49**	**9.36 ± 0.22**	**5.98 ± 0.21**	**0.85 ± 0.01**	**63.75±0.59**
Range	17.80-60.78	7.17-24.75	34.51 - 41.00	2.15 - 3.51	6.34-27.81	7.58-10.98	4.78 - 7.59	0.47 - 0.99	60.00-68.10
Bulk	29.85	11.52	38.62	2.57	11.63	9.90	6.24	0.83	65.61
Dandara	44.57	15.05	33.75	2.63	16.97	9.42	4.80	0.87	64.00
G.80	31.47	12.15	38.73	3.01	10.45	8.99	5.69	0.85	63.07

Table 3. Means, pcv%, gcv% and heritability estimates of the studied traits of the selected families for earliness index from pop. I; season 2011.

Fam. No.	SCY/P,g	LY/P,g	LP	BW,g	NB/P	SI,g	LI,g	EI	DFF
2	68.59	21.82	31.84	3.21	21.37	9.73	4.54	0.95	57.22
8	31.57	11.53	36.34	3.34	9.43	9.48	5.42	0.95	60.93
11	40.22	13.43	33.41	3.25	12.50	9.90	4.97	0.96	62.08
97	40.67	14.72	36.18	2.74	14.83	9.25	5.24	0.90	58.00
136	26.05	10.41	39.99	2.53	10.29	7.73	5.15	0.90	60.14
139	31.78	10.25	32.21	2.80	11.36	9.77	4.64	0.83	60.11
140	43.25	16.86	38.92	2.92	15.03	8.95	5.71	0.77	58.74
144	38.25	13.99	36.54	2.93	13.19	10.98	6.33	0.93	58.01
145	45.18	13.68	30.29	2.89	15.66	9.55	4.15	0.83	60.02
175	53.85	21.52	39.95	2.86	18.96	9.91	6.60	0.92	62.73
means	**41.94**	**14.82**	**35.57**	**2.95**	**14.26**	**9.52**	**5.27**	**0.89**	**59.80**
Bulk	40.25	14.51	36.05	2.57	15.67	8.85	5.39	0.84	61.43
G.80 x PS6	33.84	11.40	33.69	2.44	13.89	8.55	4.35	0.74	60.76
G.91	42.46	14.35	33.81	2.59	16.63	9.02	4.61	0.81	63.25
Rev.$LSD_{0.05}$	3.05	1.27	1.31	0.48	2.38	0.61	0.48	0.02	2.10
Rev. $SD_{0.01}$	4.06	1.69	1.74	0.67	3.17	0.82	0.64	0.03	2.82
PCV %	26.37	25.80	8.99	12.06	25.95	8.93	14.73	**8.28**	3.59
GCV %	25.90	25.13	8.63	8.27	23.65	7.92	13.53	**8.12**	2.88
H_B	96.43	94.86	92.13	46.97	83.03	78.70	84.43	**96.34**	64.21
Real.$h^{2cycle2}$								**0.4550**	
$b_{op\ cycle2}$								**0.1127**	

b_{op} = parent – offspring regression.

Table 4. Observed direct and correlated responses after the second cycle of pedigree selection of the promising selected families for earliness index measured in percentage of the unselected bulk and the better parent in pop I and II; season 2011.

Fam.No.	SCY/P	LY/P	LP	BW	NB/P	SI	LI	EI	DFF
Observed response in percentage from the bulk sample (PI)									
2	70.41**	50.40**	-11.69	24.98**	36.35**	9.89**	-8.96	12.78**	-6.86**
175	33.78**	48.34**	10.83**	11.28	20.98**	11.98**	32.28**	9.72**	2.12
Average	4.20	2.14	-1.34	14.78	-8.99	7.58*	-2.22	5.59**	-2.66
Observed response in percentage from the better parent (PI)									
2	61.54**	52.08**	-5.84	24.02*	28.48**	7.82*	-1.45	16.95**	-5.83**
175	26.81**	49.99**	18.17**	10.42	13.99	9.87**	43.19**	13.78**	3.24
Average	-1.22	3.28	5.21**	13.89	-14.25	5.54	14.32**	9.88**	-1.58**
Observed response in percentage from the bulk sample (PII)									
11	57.73**	32.33**	-16.07	-3.62	64.14**	7.62**	-17.79	10.05**	-3.01**
151	32.31**	36.07**	2.89	29.70**	2.28	5.24	10.45**	16.05**	-5.28**
Average	15.94**	8.53**	-5.67	15.18*	2.21	2.92	-6.06	3.80**	-6.01**
Observed response in percentage from the better parent (PII)									
11	46.77**	37.66**	-6.26	-8.93	52.28**	7.04**	0.28	4.75**	9.71
151	23.12**	41.55**	14.91**	22.55**	-5.11	4.68	34.74**	10.45**	7.15
Average	7.89*	12.90**	5.34**	8.82	-5.18	2.36	14.59**	-1.20	6.31

*** and ** significant at 0.05 and 0.01 levels of probability, respectively.**

Table 5. Means, pcv%, gcv% and heritability estimates of the studied traits of the selected families from pop.II for earliness index; season 2011.

Fam. No.	SCY/P,g	LY/P,g	LP	BW,g	NB/P	SI,g	LI,g	EI	DFF
11	62.54	20.17	32.26	2.48	25.28	9.96	4.74	0.87	67.81
27	44.67	13.18	29.49	3.12	14.32	10.79	4.51	0.81	67.81
124	40.58	15.75	38.79	3.23	12.64	10.47	6.64	0.80	65.26
128	54.29	19.46	35.86	3.41	15.93	9.13	5.11	0.62	66.14
138	49.56	18.25	36.83	2.87	17.29	9.62	5.61	0.83	64.76
151	52.46	20.74	39.55	3.33	15.75	9.74	6.37	0.92	66.23
153	39.63	15.31	38.66	3.23	12.27	9.14	5.76	0.85	66.60
169	43.07	12.96	30.12	2.70	16.08	9.82	4.23	0.71	67.96
183	34.98	14.04	40.13	2.54	13.93	8.75	5.86	0.94	59.67
185	37.98	15.53	40.89	2.74	13.95	7.77	5.37	0.88	64.89
means	**45.97**	**16.54**	**36.26**	**2.96**	**15.74**	**9.52**	**5.42**	**0.82**	**65.71**
Bulk	39.65	15.24	38.44	2.57	15.40	9.25	5.77	0.79	69.92
Dandara	37.69	12.01	31.89	2.72	13.86	9.30	4.36	0.83	61.81
G.80	42.61	14.65	34.42	2.58	16.60	9.01	4.73	0.76	68.95
Rev. $LSD_{0.05}$	3.09	0.93	1.29	0.31	2.17	0.46	0.35	0.02	1.27
Rev. $LSD_{0.01}$	4.10	1.23	1.72	0.42	2.90	0.60	0.46	0.02	1.68
Pcv%	17.42	17.48	10.85	12.46	22.06	8.50	14.53	**10.68**	4.43
gcv%	16.80	17.06	10.57	10.47	20.21	7.88	13.86	**10.60**	4.23
H_B	93.05	95.19	94.96	70.66	83.95	85.94	90.97	**98.58**	91.16
Real.h^2Cycle$_2$								**0.2731**	
b_{op}cycle$_2$								**0.1311**	

Table 6. Means , pcv%, gcv% and heritability estimates of the studied traits of the selected families for lint yield/plant from pop. I; season 2011.

Fam. No.	SCY/P,g	LY/P,g	LP	BW,g.	NB/P	SI,g	LI,g.	EI	DFF
82	23.00	7.78	33.86	2.97	7.73	9.87	5.05	0.91	62.80
95	46.32	17.89	38.62	2.23	20.90	9.62	6.05	0.82	57.99
97	40.67	14.72	36.18	2.74	14.83	9.25	5.24	0.90	58.00
108	30.64	10.72	34.93	3.37	9.20	10.47	5.62	0.90	59.92
128	57.65	18.72	32.49	2.70	21.68	9.18	4.42	0.89	61.98
140	43.25	16.86	38.92	2.92	15.03	8.95	5.71	0.77	58.74
147	43.68	17.35	39.69	2.44	17.92	8.96	5.89	0.90	62.06
176	34.62	12.88	37.19	2.52	13.74	8.37	4.96	0.79	60.31
184	51.83	20.77	40.10	2.64	19.99	9.21	6.17	0.91	59.21
189	56.27	17.06	30.32	3.23	17.66	9.60	4.17	0.81	59.40
means	**42.79**	**15.48**	**36.23**	**2.77**	**15.87**	**9.35**	**5.33**	**0.86**	**60.04**
Bulk	40.25	14.51	36.05	2.57	15.67	8.85	4.99	0.84	61.43
G.80 x PS6	33.84	11.40	33.69	2.44	13.89	8.55	4.35	0.74	60.76
G.91	42.46	14.35	33.81	2.59	16.63	9.02	4.61	0.81	63.25
Rev. $LSD_{0.05}$	2.24	0.88	1.15	0.45	3.10	0.61	0.47	0.01	2.15
Rev. $LSD_{0.01}$	2.98	1.17	1.53	0.62	4.14	0.81	0.62	0.02	2.89
pcv%	22.68	**22.91**	8.74	13.65	23.97	8.01	12.57	7.75	3.94
gcv%	22.40	**22.59**	8.47	9.84	20.46	6.78	11.22	7.67	3.27
H_B	97.57	**97.23**	93.90	52.00	72.90	71.76	79.66	97.73	68.62
Real.$h^2$$Cycle_2$		**0.4128**							
$b_{op}$$Cycle_2$		**0.1528**							

Table 7. Observed direct and correlated responses after the second cycle of pedigree selection of the promising selected families for lint yield/plant measured in percentage of the unselected bulk and the better parent in pop I and II, season 2011.

Fam. No.	SCY/P	LY/P	LP	BW	NB/P	SI	LI	EI	DFF
Observed response in percentage from the bulk sample (popI)									
128	43.23**	29.03**	-9.87	4.86	38.37**	3.67	-11.46	6.52**	0.90
184	28.77**	43.17**	11.24**	2.68	27.56*	4.07	23.65**	7.92**	-3.61*
Average	6.31*	6.68*	0.50	7.78	1.27	5.64	6.81	2.38**	-2.26
Observed response in percentage from the better parent (popI)									
128	35.77**	30.47**	-3.90	4.05	30.38**	1.72	-4.16	10.46**	2.01
184	22.07**	44.76**	18.61**	1.89	20.19*	2.11	33.84**	11.92**	-2.55
Average	0.78	7.87*	7.51**	6.94	-4.57	3.66	15.62**	6.17**	-1.18
Observed response in percentage from the bulk sample (popII)									
151	32.31**	36.07**	2.89	29.70**	2.28	5.24*	10.45**	16.05**	-5.28**
160	18.90**	14.77**	-3.44	14.86*	3.71	1.14	-4.28	7.37**	-3.92**
Average	19.37**	5.45	-10.82	23.46**	-1.72	8.54**	-9.18	4.00**	-5.82**
Observed response in percentage from the better parent (popII)									
151	23.12**	41.55**	14.91**	22.55**	-5.11	4.68	34.74**	10.45**	7.15
160	10.65**	19.39**	7.84**	8.46	-3.80	0.65	16.70**	2.41**	8.69
Average	11.08**	9.69**	-0.41	16.18*	-8.80	7.96**	10.78*	-1.20	6.54

- and ** significant at 0.05 and 0.01 levels of probability, respectively.

Table 8. Means, pcv%, gcv% and heritability estimates of the studied traits of the selected families for lint yield/plant from pop. II; season 2011.

Fam. No.	SCY/P,g.	LY/P,g	LP	BW,g	NB/P	SI,g	LI,g	EI	DFF
16	54.24	16.96	31.30	2.98	18.34	10.70	4.87	0.74	65.87
27	44.67	13.18	29.49	3.12	14.32	10.79	4.51	0.81	67.81
52	47.47	14.44	30.40	3.47	13.69	10.98	4.80	0.85	64.96
73	74.02	22.63	30.59	3.31	22.42	9.77	4.31	0.82	60.81
78	31.92	11.89	37.29	3.27	9.79	9.51	5.66	0.87	64.89
123	36.44	11.99	32.94	3.38	10.77	10.31	5.06	0.66	66.69
151	52.46	20.74	39.55	3.33	15.75	9.74	6.37	0.92	66.23
153	39.63	15.31	38.66	3.23	12.27	9.14	5.76	0.85	66.60
160	47.15	17.49	37.12	2.95	15.97	9.36	5.52	0.85	67.18
182	45.35	16.04	35.43	2.52	18.03	10.15	5.57	0.84	67.43
means	47.33	16.07	34.28	3.16	15.14	10.04	5.24	0.82	65.85
Bulk	39.65	15.24	38.44	2.57	15.40	9.25	5.77	0.79	69.92
Dandara	37.69	12.01	31.89	2.72	13.86	9.30	4.36	0.83	61.81
G.80	42.61	14.65	34.42	2.58	16.60	9.01	4.73	0.76	68.95
Rev. $LSD_{0.05}$	2.82	0.90	1.48	0.38	2.46	0.47	0.44	0.01	1.55
Rev. $LSD_{0.01}$	3.75	1.19	1.97	0.52	3.28	0.63	0.59	0.02	2.06
pcv%	23.61	21.81	10.61	13.17	21.92	7.80	16.21	8.22	4.99
gcv%	23.27	21.50	10.21	10.69	19.59	7.19	15.29	8.13	4.72
H_B	97.15	97.18	92.56	65.84	79.88	85.15	88.98	97.89	89.69
Real.h^2Cycle$_2$		0.3970							
bop Cycle$_2$		0.1459							

تحسين معامل التبكير ومحصول القطن الشعر بالانتخاب المنسب في عشيرتين من القطن المصري في الزراعة المتأخرة

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أجريت دورتين من الانتخاب المنسب لمعامل التبكير ومحصول القطن الشعر / نبات في عشيرتين من القطن المصري تحت ظروف الزراعة المتأخرة. كانت مواد البحث هى الجيل السادس والسابع والثامن من كل عشيره. العشيرة الأولي ناتجة من التهجين بين (جيزه 80 × بيماس 6) (جيزه 91). والعشيرة الثانية من الهجين (دندرة × جيزه 80) . كان معامل الاختلاف الوراثي في الجيل السادس 13.35 ، 14.69% لمعامل التبكير ، 23.70 ، 27.60% لمحصول الشعر / نبات في العشيرة الأولي والثانية علي الترتيب. أصبح معامل الاختلاف الوراثي بعد دورتين انتخابيتين 8.12 ، 10.60% لمعامل التبكير ، 22.59 ، 21.50% لمحصول الشعر / نبات للعشيرة الأولي والثانية علي الترتيب. وبنفس الترتيب كان معامل التوريث المحقق 0.4550 ، 0.2731 لمعامل التبكير ، 0.4128 ، 0.3970 لمحصول الشعر / نبات. وكان التحسين الوراثي المباشر لمعامل التبكير معنوياً ووصل إلي 5.59 ، 3.80% من العينة العشوائية ، 6.68 ، 5.45% لمحصول الشعر / نبات للعشيرة الأولي والثانية علي الترتيب. وقدأمكن عزل سلالتين مبشرتين ومتفوقتين من كل عشيرة لكل صفة انتخابية. علي سبيل المثال ، بخصوص معامل التبكير أظهرت العائلة رقم 175 تحسين وراثي فعلي يتفوق معنوياً عن أبكر الآباء بنسبة مئوية 26.81 في محصول القطن الزهر ، 49.99 في محصول القطن الشعر ، 18.17 في نسبة الشعر ، 9.87 في دليل البذرة ، 43.19 في دليل الشعر ، 13.78 في معامل التبكير.