

GIZA 90, A NEW LONG STAPLE EGYPTIAN COTTON VARIETY FOR MIDDLE AND UPPER EGYPT

AWAD H.Y., M.M AWAAD, S.A.S. MOHAMED, H.H. EL-ADLY, T.M. EL-AMEEN, A.A. MOHAMED and A.E.M. Eissa

Cotton Research Institute, Agricultural Research Centre, Giza, Egypt.

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Abstract

The new variety Giza 90 is a new long staple variety of Egyptian cotton. It has been introduced by the Cotton Breeding Research Section through artificial hybridization between the two parents Giza 83 and Dendera followed by a pedigree method of selection.

The variety Giza 90 is characterized by about 5% higher seed cotton yield and lint yield the commercial variety Giza 83. It slightly surpassed Giza 83 for boll weight and gave the same range of lint percentage of Giza 83 variety. Fiber quality for the new variety Giza 90 was nearly the same for the long staple cotton category in Middle and Upper Egypt.

INTRODUCTION

Egyptian cotton, as it is well known, is of about two centuries old. Therefore, the Ashmouni variety appeared in about 1860 is considered as the origin of most of the Egyptian cotton varieties and currently cultivated from 1860, until 1977. In 1906 Sakel variety first appeared winning a high reputation over all the other Egyptian cotton varieties.

Cotton Research Board was established in 1919 (Cotton Research Institute now). During that time, Sakel variety covered the cotton areas in Delta, while Ashmouni variety covered the area in Middle and Upper Egypt. Therefore, it is evident that the two varieties, Sakel and Ashmouni are sources of great importance from which most Egyptian cotton varieties had been obtained later.

Many varieties had been produced by individual selection, in this respect Giza 7 and Sakel 4 varieties are good examples.

The varietal hybridization was first employed in 1921 between Ashmouni and Sakel varieties where, the first hybrid was produced under the name of Giza12 (Wafeer), that surpassed the variety Giza7 in yield and earliness but its fiber was less in quality. Most of Egyptian commercial varieties were produced directly by hybridization except Dendera which that was one of few selected varieties by using individual plant selection.

Egyptian cotton varieties have been introduced by Cotton Breeding Section such as Giza77 (El-Moghaze *et al.*, 1984), Giza81 (Megahed *et al.*, 1986) and Giza86 (Haikal *et al.*, 1996").

Recently the two long staple varieties Giza 80 and Giza 83 (Sallam *et al.*, 1992) had been introduced by the Cotton Breeding Research Section, for Middle and Upper Egypt. In this investigation, breeding , production and evaluation of the new variety Giza 90 will be discussed.

MATERIAL AND METHODS

The Cotton Breeding Research Section at Giza is still fully depending on hybridization followed by the pedigree method for breeding and production of the alternative varieties. The new cotton variety Giza 90 was derived from a cross between the two long staple varieties, Giza 83 and Dendera, Giza 83 is characterized by high yielding ability, high lint percentage (39%) and early maturing. It was released for commercial cultivation in 1988 for Middle Egypt. Dandera is characterized by early maturity and heat tolerance. It was selected from Giza 3 and developed in Upper Egypt.

The two parents were crossed in 1985 at Giza Experimental Station. The F_1 hybrid seeds were sown in the second season. Beginning with the F_2 till F_{10} generations, selection had been practiced at Sids Experimental Station. From F_5 generation, the hybrid was evaluated through Trial A at Sids and Trial B at different locations. i.e. Sids, El-Fayoum, El-Menia, Assiut, Sohag and El-Mataana along Middle and Upper Egypt to select the promising families that exceeded the existing commercial varieties .

The promising families in the later generations that were selected from the breeding nursery field had been grown in an isolated field in 1996 season at Sids Experimental station in Bani-souaif Governorate. In 1997 season it was planted in the same location to maintain the selected strains of the new variety Giza90. In 1998 season the isolated field was grown in the Agricultural Extension field in Maghagha, El-Menia Governorate. The new strains and the breeding nucleus of the new variety Giza 90 were evaluated in yield trial in 1999 season and planted at Shandaweel Experimental Station in Sohag Governorate.

A randomized complete block design with six replicates was used in each location with five rows in each plot. The rows were four meters long, 60 cm apart from each other and 20 cm between hills. The plants were thinned to two plants per hill. The yield was obtained from the three middle rows of each plot.

In this investigation the following characters were considered:

1. Seed cotton yield (S.C.Y. C/F): estimated as the weight of seed cotton yield in Kantars per feddan.
2. Lint cotton yield (L.C.Y. C/F): Estimated as the weight of lint in metric Kantars per feddan.
3. Boll weight (B.W): the average weight, in grams, of 50 sound opened bolls, picked at random from the first and fifth row of each plot.
4. Lint percentage (L%): the amount of lint in seed sample expressed in percentage.
5. Earliness index (E.I): expressed as yield percent of first pick relative to total seed cotton yield.
6. Fiber fineness and maturity as expressed by Micronaire reading (MIC). (A.S.T.M)
7. 2.5% Span Length (2.5% S.L): in mm, measured by the digital Fibrograph. (A.S.T.M)
8. Hair Weight (H.W): in terms of millitex .
9. Yarn Strength (Y.St): is the product of „lea strength x yarn count,, (60 s carded and 3.6 twist multiplier).

The lint cotton samples were tested in the Cotton Research Laboratories, Cotton Research Institute.

The analysis of variance was calculated using the appropriate method mentioned by Snedecor (1956) and Le-Clerg *et al.*, (1962).

RESULTS AND DISCUSSION

Giza 90 variety has been induced by artificial hybridization between the two parents, Giza 83 which characterized by early maturity, high yielding ability and high ginning out-turn and Dendera with its characteristics of early maturity and heat tolerance, in order to combine the excellent characteristics of the two parents.

In 1985 hybridization was carried out between the two parents at Giza Agricultural Experimental Station to obtain the F₁ seeds. In the second season, F₁ seeds were planted at Sids Experimental Station. The selection practices through pedigree method had been applied starting from F₂ generation in the breeding field at Sids Agricultural Experimental Station. From F₅ generation, the selected promising strains were evaluated through trials A and B. From the outcome results of the preliminary trial A and the advanced trial B for yield evaluation at Sids and different locations of Middle and Upper Egypt it was noticed that the three mother families F₁₀ 268\95, F₁₀270/95 and F₁₀272/95 had excelled other cultivated varieties.

Table (1) shows that the means of most characters of the three mother families of Giza 90 were equal to or higher than means of Giza 83, Giza 80 and Dendera varieties. With regard to lint yield, the three families of Giza 90 yielded 0.94 to 2.73 Kantars per feddan more than the other cultivated varieties. With respect to boll weight and lint percentage, the two families F₁₀ 268\95 and F₁₀ 270\95 were equal to or higher than the two parents Giza 83 and Dendera. The fiber quality for the three families F₁₀ 268\95, F₁₀ 270\95 and F₁₀ 272\95 falls within the range of long staple cotton varieties characteristics.

Table 1. Mean performance of yield characters and fiber quality of three maternal families of Giza 90 variety and their parents in 1996 season.

Families or Varieties	Parents	S.C.Y	L.C.Y	B.W	L%	MIC	H.W	2.5%S.L (mm)	Y.St
F ₁₀ 268\95	F ₉ 251\94	10.87	13.15	151	39.1	4.0	157	30.0	1925
F ₁₀ 270\95	F ₉ 256\94	10.75	12.99	146	38.4	3.8	129	30.0	1995
F ₁₀ 272\95	F ₉ 263\94	10.81	13.33	142	38.6	3.9	152	30.0	1960
Giza 83		10.12	12.39	146	38.9	4.0	152	30.0	2015
Giza 80		9.46	11.92	148	40.0	3.9	159	30.8	2005
Dendera		9.15	10.60	149	36.9	3.8	158	30.3	1855

Due to the results of the three maternal families (F₉251 \ 94, F₉256 \ 94 and F₉263 \ 94) which were obtained from preliminary trial A and the advanced trial B at Sids Experimental Station and different locations in Middle and Upper Egypt, the two mother families, progeny F₁₀ 268 \ 95 and F₁₀ 272 \ 95 had been isolated and the selfed seed propagation began in 1997 in the isolated field at Sids Experimental Station. Similarly, Megahed *et al*, (1986) reported that the families selected and isolated for the promising hybrid Giza67x line 867\63 (a line selected from the hybrid Giza44 x Giza58A) exceeded the parents for seed cotton yield and lint yield.

Table (2) revealed that the mother families progeny F₁₀ 268\ 95 and F₁₀ 272\ 95 exceeded the commercial varieties Giza 83 and Giza 80 for seed and lint cotton yield, on the other hand the other traits were in the same trend of long staple cotton varieties.

Table 2. Mean performance of yield characters and fiber quality of two maternal families of Giza 90 variety and commercial varieties in 1997 season.

Families or Varieties	Parents	S.C.Y	L.C.Y	B.W	L%	MIC	H.W	2.5%S.L (mm)	Y.St
F ₁₀ 268\95	F ₉ 251\94	9.27	11.27	158	38.26	3.9	154	29.1	1945
F ₁₀ 272\95	F ₉ 263\94	9.47	11.56	156	38.54	3.8	149	29.5	1920
Giza 83		8.91	10.93	160	38.70	3.9	159	30.3	1990
Giza 80		8.94	11.04	158	38.95	3.8	151	29.2	1910

In 1997, season, 47 plants were selected and cultivated at Sids experimental Station in isolated field (distances 500 m far from other cotton fields in all directions in order to avoid cross pollination). Selfed seed for every-selected plants was grown

individually on wide spaces (7 m row length and 70 cm between hills). In the same field, natural seeds of every plant from the isolated field were also individually grown (4 m per row and 20 cm length between hills). These plants represent the two mother families of Giza90, beside these families, 46 selfed and natural nucleoli were cultivated.

In 1998 season, selected 16 nuclei from the progeny of the maternal families F_{10} 268 \ 95 and F_{10} 272 \ 95 of the variety Giza 90 were planted. These nuclei had been tested in a yield trial to compare their yield with that of the previous foundation seed of the strain Giza90\98. A randomized complete block design with four replications was used in a yield trial with five rows in each plot. Each row was four meters long, 20 cm between hills. The hills were thinned to two plants. The yield was obtained from the three middle rows of each plot. Six nuclei were selected according to the superiority of their yield traits and fiber quality. The nuclei seeds were mixed to form the breeder seed of the strain Giza 90\98. On the other hand 50 superbly plants were selected from 1997 season, their selfed seed for every plant were gown individually while natural seeds were selected bulky and planted as mentioned before. Beside these families 45 selfed and natural nucleoli were cultivated in the same field. Fifteen nuclei were selected from 45 nucleoli in1998 season, representing the two maternal families (F_{10} 268\ 95 and F_{10} 272\ 95) and cultivated in a yield trial to be compared with the breeder seed of the strains Giza90\98 in 1999 season. In the same isolated field 50 plants from the progeny families of the variety Giza90 that were selected from the isolated field in 1998 season to be grown as individual plants and bulk families. Also 46 selfed and natural nucleoli were cultivated forming the nuclei\2000 of Giza 90. Seven out of fifteen nuclei were selected, forming the breeder seed of the strain Giza 90\99.

Table 3. Comparison between the selected nuclei / 99 of G.90 and breeder seeds of the strain G.90 \ 98 variety in 1999 season.

Nuclei	SCY	LCY	BW	L%	MIC	HW	2.5%SL (mm)	Y.St
1\99	6.50	7.85	153	38.4	3.8	150	29.6	1960
3\99	6.76	8.14	147	38.2	3.7	152	29.5	1860
4\99	7.36	9.22	148	38.4	3.6	184	29.2	1860
5\99	7.6	9.13	147	38.1	3.6	146	30.6	1910
6\99	7.22	8.72	151	38.3	3.6	146	30.3	1875
7\99	7.09	8.6	140	38.5	3.7	152	30.4	1945
8\99	7.67	9.21	140	38.1	3.6	142	29.0	2165
G.90\98	7.67	9.21	142	38.1	3.8	164	29.8	1885

Forty-eight superbly characterized plants of the progeny lines of the variety Giza 90 were selected in 1999 season to form the progeny in 2000 season. Their selfed seeds were planted, whereas, their natural seeds were bulkly sown. In the same time 45 plants of the progeny lines were also selected from 1999 season forming the nucleoli /2000 (45 selfed nucleoli forming nuclei /2001. Fourteen nucleoli \1999 had been selected according to their yield components and fiber quality to form the nuclei/2000. These nuclei were tested in a yield trial to be compared with the two breeder seeds (Giza90\98 and Giza90\99). Seven nuclei\2000 had been selected and their seeds were mixed to form the breeder seed of the strain Giza90\2000 (Table 4).

Table 4. Comparison between the selected nuclei / 2000 of G.90 with breeder seeds, G.90 \ 98 and G.90\99 in 2000season.

Nuclei	SCY	LCY	BW	L%	MIC	HW	2.5%SL (mm)	Y.St
2\2000	3.43	4.15	125	38.5	2.7	125	29.5	2065
5\2000	3.85	4.69	132	38.7	2.8	125	29.8	2030
6\2000	3.36	4.41	126	38.6	2.9	128	29.7	2150
8\2000	3.62	4.39	128	38.5	2.8	129	29.7	2010
10\2000	3.77	4.64	129	39.1	2.7	116	29.5	2005
11\2000	3.67	4.54	140	39.3	2.8	119	29.6	1905
12\2000	3.77	4.65	114	39.1	2.8	126	29.0	2050
G.90\99	4.02	4.86	112	38.4	2.9	126	29.5	1890
G.90\98	3.43	4.19	120	38.8	2.8	124	29.0	1970

In 2000 season, fifty plants from the progeny lines were selected. These selected plants were excellent in some yield traits and fiber quality, and were used to form the progeny in 2001 season. Their selfed seeds were widely spaced planted while natural seeds had been bulkly planted. Also another 50 plants of the variety Giza90 representing the desired qualities were selected and their selfed seeds had been planted bulkly in 2001, forming 50 selfed and natural nucleoli\2001. Seventeen nucleoli had been selected from 45 nucleoli\2000 forming nuclei\2001 that were tested in a yield trial with three breeder seed strain (G.90\98, G.90\99 and G.90\2000). Unfortunately, the isolated field of Giza90 in season 2000 exposed to bad environmental conditions such as weeds, shortage of water and severe investment by pink bollworm. Seven nuclei\2001 had been selected to be compared with the three

breeder seeds strain of Giza90. Their seeds were mixed to form the breeder seed of the variety Giza90\2001 (Table 5).

Table 5. Comparison between the selected nuclei / 2001 of G.90 with the three breeder seeds of Giza 90 variety in 2001season.

Nuclei	SCY	LCY	BW	L%	MIC	HW	2.5%SL (mm)	Y.St
2\2001	7.29	8.86	149	38.6	4.0	143	31.8	2010
5\2001	6.95	8.52	142	38.9	3.9	145	31.6	1840
72001	7.76	9.47	147	38.7	3.9	144	30.9	1830
13\2001	8.05	9.94	147	39.2	3.9	153	31.2	2315
15\2001	6.88	8.33	146	38.4	3.9	148	30.8	2185
16\2001	7.03	8.42	144	38.0	4.0	151	30.1	2070
17\2001	7.32	8.97	152	38.9	4.0	154	30.5	2140
G.90\2000	7.30	8.89	148	38.7	4.0	148	30.7	2180
G.90\99	6.13	7.46	142	38.7	3.9	148	30.5	2190
G.90\98	7.11	8.59	146	38.4	4.0	153	30.0	2230

Forty-five plants were selected from progeny lines in 2001 season. These selected plants showed favorable yield and fiber characters to serve as progeny lines in 2002 season. Their selfed seeds were planted as individual plants wide spaced, whereas the natural seeds had been bulkly planted. Also 45 selfed and natural nucleoli were cultivated. Sixteen nuclei were selected from 45 nucleoli\2001 and grown in a yield field trial field along with the previous breeder seed strains (G.90\98, G.90\99, G.90\2000 and G.90\2001), and presented in Table 6.

Table 6. Comparison between the selected nuclei / 2002 of G.90 with the four breeder seeds of Giza 90 variety in 2002 season.

Nuclei	SCY	LCY	BW	L%	MIC	HW	2.5%SL (mm)	Y.St
3\2002	5.23	5.99	167	36.35	4.4	159	29.7	1770
4\2002	4.26	4.77	172	35.53	4.1	163	30.0	1845
9\2002	5.21	5.98	156	36.44	4.2	167	30.0	1800
13\2002	6.62	7.76	162	37.18	4.2	165	29.8	1715
15\2002	5.35	6.17	152	36.58	4.1	165	30.7	1770
G90\2001	5.19	5.96	144	36.45	4.2	162	29.7	1735
G90\2000	5.69	6.32	149	35.24	4.3	160	29.7	1720
G90\99	6.15	7.13	143	36.85	3.6	162	30.1	1670
G90\98	4.35	4.97	143	36.27	4.5	161	29.1	1790

In 2003 season, Forty-five plants were selected from progeny lines in 2002, and these plants were within the range of the variety characters. The selfed seeds were individually cultivated wide- spaced and the natural seeds had been bulkly planted. Forty- five plants were also selected in order to form natural and selfed nucleoli\2003, In the same season, 17 nuclei were selected and were compared in a yield trial with the previous foundation seeds G.90\2002, G.90\2001 and G.90\2000. From results of the former experiments seven nuclei were selected as shown in Table (7).

Table 7. Comparison between seven selected nuclei / 2003 of G.90 with the three breeder seeds of Giza 90 variety in 2003 season.

Nuclei	SCY	LCY	BW	L%	MIC	HW	2.5%SL (mm)	Y.St
1\2003	9.83	11.49	155	37.1	3.9	159	29.6	1890
4\2003	8.44	10.06	154	37.8	3.9	159	29.8	1960
8\2003	8.63	10.36	156	38.1	4.1	162	29.5	1940
9\2003	9.59	11.39	157	37.7	4.0	160	29.9	1900
11\2003	9.39	11.12	152	37.6	4.1	160	30.3	1970
12\2003	9.09	10.77	152	37.6	4.0	161	31.5	1975
17\2003	8.90	10.88	153	38.8	4.1	161	28.2	1850
G90\2002	8.82	10.34	154	37.2	4.1	162	30.4	1920
G90\2001	9.57	11.30	157	37.5	4.1	161	30.2	1960
G90\2000	9.23	10.96	153	37.7	4.1	164	30.4	1960

Evaluation of the new variety

Table 8 shows the means of two varieties Giza 90 and Giza 83. Data were extracted from the advanced yield trial (B), which were grown in Assiut and Sohag Governorates during four seasons 2000,2001,2002 and 2003 where, Giza 90 is expected to the old grown varieties in the two Governorates

Table 8 indicates that Giza 90 is of higher seed cotton yield by 1.11 K\F (9.54%) and 0.18 K\F (1.85%) than Giza 83 cultivar in Assuit and Sohag governorates, respectively. Lint cotton yield for Giza 90 variety exceeded the commercial variety Giza 83 by 1.27 Km\F (9.05%) and 0.34 (1.21%) kan\F in Assuit and Sohag, respectively. With regard to boll weight, Table 8 shows that Giza 90 slightly surpassed Giza 83 for the average weight of 50 bolls in the two Governorates. As for lint percentage, the new variety Giza90 gave the same range of lint percentage compared with Giza 83 variety. Fiber quality for Giza 90 is nearly within the range of the long staple category cotton in Middle and Upper Egypt.

Awad *et al* (1996) noticed that the promising hybrid Giza 83 x Giza 80 exceeded the cultivated varieties Giza 83, Giza 80 and Dendera in seed cotton yield and lint yield, while for boll weight (50 bolls) it slightly exceeded Giza 80 and Dendera.

Table 8: comparison between Giza90 and Giza83 for yield and fiber quality at Assuit and Sohag governorates in four seasons.

Locations		Assuit					Sohag					Means
Characters	Varieties	2000	2001	2002	2003	Mean	2000	2001	2002	2003	Mean	
S.C.Y	G.90	12.82	13.56	11.24	13.34	12.74	14.22	7.47	8.74	9.20	9.91	11.32
	G.83	12.74	-----	10.57	13.51	12.27	13.35	7.82	9.11	8.64	9.73	11.0
L.C.Y	G.90	14.99	16.40	13.93	15.90	15.31	16.98	8.96	10.11	10.72	11.69	13.50
	G.83	15.72	-----	13.36	16.48	15.18	16.39	8.95	10.71	10.11	11.55	13.36
B.W	G.90	162	121	159	150	148	148	134	124	136	136	142
	G.83	158	128	147	138	143	147	133	137	119	134	139
L%	G.90	38.7	38.4	37.7	37.84	38.16	37.9	38.1	36.7	37.0	37.43	37.8
	G.83	39.1	37.1	38.7	38.70	38.40	39.0	36.5	37.3	37.1	37.48	37.9
MIC	G.90	4.4	3.9	3.8	4.6	4.2	4.0	3.6	3.4	4.2	3.8	4.0
	G.83	4.5	3.6	4.1	4.5	4.2	3.9	3.7	3.6	4.5	3.9	4.1
2.5%S.L	G.90	31.0	30.1	29.1	31.3	30.4	30.6	39.1	38.5	30.5	29.7	30.1
	G.83	31.0	29.7	28.8	30.8	30.1	30.8	29.4	29.5	30.4	30.0	30.1
Y.St	G.90	1590	-----	1700	2020	1770	1820	1720	1930	2190	1915	1845
	G.83	1575	-----	1705	1870	1715	1640	1860	1960	2000	1865	1790

CONCLUSION

From the previous results obtained in the present study it can be concluded that Giza 90 could be regarded as a new long staple cotton variety for Middle and Upper Egypt.

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جيزة ٩٠ صنف جديد من طبقة الاقطان الطويلة لوسط وجنوب مصر

حسين يحيى عوض - محمد محمود عواد - سلطان عطية سيد - حسن حسين العدلى - ثروت محمد
الامين - أبو القاسم عبد الراضى محمد - أنور عيسى مسعود عيسى

معهد بحوث القطن - مركز البحوث الزراعية - الجيزة

جيزة ٩٠ من أصناف القطن الجديدة والتي تنتمى الى طبقة الاقطان الطويلة الثقيلة والتي تزرع فى مصر الوسطى والعليا أستنبطت قسم بحوث تربية القطن بالتهجين الاصطناعى بين الصنفين طويلى الثيلة جيزة ٨٣ و دنرة .
تم عزل هذا الهجين لأول مرة عام ١٩٩٦ بمحطة البحوث الزراعية بسدس - محافظة بنى سويف ونتيجة للانتخاب المستمر للعائلات المنعزلة تم انتخاب عائلتين لتكونا اللبنة الاولى لأنتاج هذا الصنف فى موسم ١٩٩٩ .
يبلغ متوسط انتاجية الفدان من محصول القطن الزهر لجيزة ٩٠ من ٩,٩١ - ١٢,٧٤ ق ز/ف بينما يتراوح متوسط انتاجية الفدان من القطن الشعر من ١١,٩٦ - ١٥,٣٤ قنطار شعر . ايضا يتراوح وزن اللوزة من ٢,٧ - ٢,٩ جرام وتصافى الحليج من ٣٧,٤% - ٣٨,٢% .
وقد لوحظ أن صفات الثيلة من حيث الطول والتمانة والنعموة لهذا الصنف تقع داخل طبقة الاقطان الطويلة والمنزرعة فى جنوب الوادى لجمهورية مصر العربية. هذا ويعتبر الصنف الجديد جيزة ٩٠ مقاوم لمرض الذبول.
ويعتبر الصنف جيزة ٩٠ ملائم للزراعة فى محافظات مصر الوسطى والعليا .