

**BREEDING POTENTIAL OF THE PROMISING HYBRID
GIZA 84 x (GIZA 74 x GIZA 68)
OF THE EXTRA-LONG STAPLE COTTONS**

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Abstract

Breeding of the promising cross Giza 84 x (Giza 74 x Giza 68) depended upon the use of artificial hybridization followed by pedigree analysis. It has been introduced by the cotton Breeding Research Section, Cotton Research Institute. This promising cross is characterized by high yielding, abundant fruiting branches per plant, carrying large number of bolls. Moreover, it is distinctly an early maturing strain. The new cross is also distinguished by its highest yarn strength, over all extra-long staple varieties. The morphological characteristics showed early maturing medium long plants about 130 cm large deeply lobed dark green leaf abundant fruiting branches being at a relative lower node (about the 7th). The plants are highly resistant to Fusarium wilt. This promising cross is characterized by its high yarn strength of 2810, fineness of 3.4, hair weight 126 and fiber length of (33.9mm on 2.5% sl) while its agronomic characters are 3 gram for boll weight, 11.9 centar/F for seed cotton yield, 13.2 centar/F for lint cotton yield and 35.09 percent for lint per cent. It could be stated that this promising cross may be a suitable replacement to the already commercial varieties G.70 and/or G.88.

INTRODUCTION

Until 1920 the new Egyptian cotton varieties were considered as offtypes selected individually by those concerned with cotton production at that period. In 1906 Sakel variety first appeared winning a high reputation over than Egyptian cotton varieties, it has covered most of the area assigned for cotton in the Delta within 1916-1925. The area that was cultivated with it reached more than one million feddan. The main objective for selection at that time was the high yield. Cotton Research Board was established in the 1919 at that time Sakel covered the Nile Delta and Ashmouni variety was planted in Upper Egypt. It may be evident that the two varieties, Sakel and Ashmouni are considered the two main origins from which all Egyptian varieties were introduced. There were different extra long staple varieties characterized by high yielding ability,

early maturing and high fiber strength. Those varieties were introduced by Cotton Breeding Section, such as Giza 76 and Giza 77 (El - Moghazy *et al.* 1984), Giza 85 (Megahed *et al.* 1996) and Giza 86 (Haikal *et al.* 1996). Awad *et al.*, (1996) reported the breeding potentials of the new promising cross (G 83 X G 80).

MATERIAL AND METHODS

The cotton Breeding Research Section at Giza is still fully depending on production of the alternative varieties, on hybridization followed by the pedigree method whereas the parents are selected according to the breeding programme adopted. Hybridization between the two parental varieties, (Giza 84 x Giza 74) x G 68 strain had been carried out in 1984 at Giza Experimental Station. The F₁ hybrid seeds were sown in the second season. Beginning with the F₂ till F₈ generations selection had been practiced at Sakha experimental station. The selected families from the F₅ generation of the hybrid were evaluated through A and B trials at Sakha and at different locations; Gharbia, Sakha, El-Behera, Sharkia, Menoufia and Demiat Governorates at 1989 season, along lower Egypt to select the promising families that excelled the commercial. Progeny of the promising maternal families in the later generations that were selected from the breeding field were grown in an isolated field in 1996 season to maintain the selected strains of the new variety. Comparisons among the new strains and the nuclei were tested in a yield trial.

A randomized complete block design with six replications was used in each location with five rows in each plot. The row was four meters long, 60 cm apart and 20 cm between hills. The hills were thinned to two plants.

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 metric cantars* per feddan.

2. Lint cotton yield (L.C.Y. C/F) estimated as the weight of lint in metric cantars** per feddan.

* Metric cantar of seed cotton = 157.5 kg.

** Metric cantar of lint cotton = 50 kg

3. Boll weight (B.W) the average weight, in grams, of 50 sound opened bolls, picked at random from the first and fifth rows of each plot.

4. Earliness index: expressed as percent yield at first pick relative to total seed cotton.

5. Lint percent (L%) the amount of lint in seed cotton sample expressed in percentage.

6. Micronaire reading: an indication of fineness and maturity (ASTM. 1976).

7. Fiber length (2.5% and 50%) was measured by the digital fibrograph according to ASTM 1998.

8. Hair weight (H.W.) in terms of millitex (10^{-8} g/cm).

9. Yarn strength (Y.St.) is the product of "Lea strength x yarn count" (60's carded and 3.6 twist multiplier) measured by the Good Brand Tester.

The lint cotton samples were tested in the Cotton Technology Research Division of the Cotton Research Institute.

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

RESULTS AND DISCUSSION

Hybridization between the two parents, and the F_1 hybrid seed was carried out in 1984 at Giza Experimental Station.

Selection practices through pedigree method had been applied starting from the F_2 generation until F_{12} in the breeding field at Sakha. The results of the four maternal families of this promising cross, indicated that family 1369/97 exceeded the parental variety Giza 84 in lint percentage by 2.39% while the results of the other families were less than the parent Giza 84 in lint percentage.

However, family F_{12} 1369/97 showed high values in seed cotton yield over the two parents Giza 84 and Giza 74 x Giza 68 (4.98, 2.82 C/F), respectively (as shown in Table 1). Whereas. The family F_{12} 1375/97 was higher in yield by 3.90 and 1.74 C/F than the two parents respectively.

Hair weight of family F_{12} 1369/97 surpassed the parent Giza 84 & Giza 74 x Giza 68 by 3 and 4 units respectively; the other families F_{12} 1373/97 and F_{12} 1375/97 nearly equalized the two parents.

However, yarn strength results of family F_{12} 1373/97 and family F_{12} 1375/97 exceeded the two parents by 67 and 230 units over the parent Giza 84, and 230 and 355 over the second parent (Giza 74 x Giza 68 strain) respectively.

In general, the first selected family showed high values over the parents, whereas the other families either surpassed the two parental values or gave the same values of the parents.

Boll weight results showed no differences between these varieties and the cross Giza 84 x (Giza 74 x Giza 68). The family F_9 1398/94 in 1996 season had excelled the variety Giza 88, Giza 70 and Giza 77 in lint yield by 1.77 metric cantars (14.04%), 3.01 m cantars (33.71%) and 2 metric cantars (22.22%), respectively, and seed cotton yield by 1.38 metric cantars (11.44%) per/F, 3.39 metric cantars (33.37%) per feddan and 2.08 metric cantars (18.31%) per/F respectively as shown in Table 2. However, this family had been earlier longer, finer and stronger than the commercial varieties Giza 88, Giza 70 and Giza 77, whereas both families showed nearly similar values. The family F_9 1406/94 had exceeded the varieties G. 88, Giza 70 and Giza 77 in lint yield by 0.86 m cantars (8.2%), 2.40 m cantars (26.9%) and 1.56 m cantars (15.97%) respectively, seed cotton yield by 0.71 m cantars (5.9%), 2.72 m cantars (27.1%) and 7.41 m cantars (12.41%). However, this family had been earlier, longer finer and stronger than the parental varieties and both families were nearly the same concerning boll weight.

In 1997 season, the family F_{10} 1432/95 had exceeded the variety Giza 70 in lint yield by 3.1 m cantars (33.4%), 3.33 m cantars (32.2%) in seed cotton yield, 8.11% earlier and 142 unit stronger, however, Giza 70 was slightly finer and heavier in boll weight. Concerning the family F_{10} 1443/95, it had exceeded the variety Giza 70 2.28 m cantars (30.17%) in lint yield 2.10 m cantars (20.33%) in seed cotton yield, 11.59 earlier and 175 unit stronger, whereas, Giza 70 had been slightly finer, stronger and heavier in boll weight.

In 1998 season the family F_{11} 1414/96 had surpassed the variety Giza 70 in seed cotton yield by 1.71 met. cantars (23.88%), and 2.16 met. cantars (29.59%) lint cotton, finer, stronger and heavier in boll weight.

Comparative studies were held between the cross Giza 84 (Giza 74 X Giza 68) and the commercial varieties Giza 88, Giza 70 and Giza 86 for lint yield, seed cotton yield and boll weight. The data were extracted from the yield of trial B which had been grown at different locations, representing all over lower Egypt in the three seasons,

1998, 1999 and 2000. It is perceived from Table 3 that the variety Giza 70 recedes significantly in lint yield the cross Giza 84 x (Giza 74 x Giza 68) with 2.4 m. cantars per feddan (26.2 in relation to the average of the three years in all governorates).

Concerning seed cotton yield character it has been noticed that the average mean yield of the promising cross was relatively higher than the control varieties except for the long staple variety Giza 86 (Tables 3&4). The promising cross showed a significant improvement of 2.37 met. cant./f (28.6% in average) than the control variety Giza 70. Moreover, the cross also surpassed the two control varieties Giza 88, and Giza 86 with 0.53 met. cant./f (5.27%) and 0.72 met. cant./f (7.29%) respectively, for seed cotton.

The parent families were superior in fiber quality than the other commercial varieties, whereas the agronomic characters of these families were either better or nearly in the same trend. According to the results attained by the preceding parent families, progenies of both were isolated, and the selfed-seeds were propagated in an isolated field beginning in 1998 season. With the reference to Table (5), in 1999 season Giza 84 x (Giza 74 x Giza 68) exceeded Giza 70 by 1.87 C/F and 1.83 C/F for seed cotton, and lint cotton yield, respectively, while Giza 88 showed a slight increase than the promising cross. However, the promising cross showed a reliable values for fineness, yarn strength and earliness than the two commercial varieties indicating that it has finer fibers and stronger yarns and earlier yield. (as shown in tables 1 and 2).

Moreover, in 2000 season, the promising cross showed similar results indicating the excess in seed cotton yield, lint cotton yield, fineness, strength and earliness over the two commercial varieties.

The seeds of the new promising cross were tested against the Fusarium wilt in the Cotton Disease Research Section. The results obtained showed a highly resistance against Fusarium wilt.

It could be concluded (from trials A and B and tables 1 and results) that this promising cross is characterized by nearly fine, long and strong fibers. Its lint is white. The morphological characteristics showed early maturing medium long plants about 130 cm, large deeply lobed dark green leaves abundant fruiting branches per plant, carrying large number of bolls and its fruiting branches begin at somewhat lower node (about the 7). Therefore, this promising cross was considered an extra long staple strain and may be a suitable alternative of the already commercial varieties Giza 70 and Giza 88. Comparing this promising cross G. 84 X (G. 74 X G. 68) through trial Ballover Delta for several seasons showed that it surpassed the commercial extra long staple varieties in high yielding ability and early maturing.

Table 1. Mean performance of the agronomic and spinning characteristics of four maternal families of the promising cross Giza 84 x (Giza 74 x Giza 68) and their parental varieties in 1997 season.

Family and variety	Parent	Yield C/F.		B.W. (gm.)	Lint%	Mic.	H.W. millitex	Fiber length (mm)		Y.S.
		S.C.Y.	L.C.Y.					2.5%	50%	
F ₁₂ 1369/97	F ₁₁ 1414/96-25	17.17	19.95	3.0	36.89	3.0	122	31.5	15.6	2780
F ₁₂ 1373/97	F ₁₁ 1417/96-28	11.98	14	2.7	37.09	3.1	118	32.5	16.5	2995
F ₁₂ 1375/97	F ₁₁ 1417/96-33	16.09	17.85	2.6	35.21	2.9	115	32.2	16.5	3020
F ₁₂ 1377/97	F ₁₁ 1425/96-11	13.26	14.81	2.6	35.47	2.7	109	32.5	16.3	2860
Mean		14.63	16.65	2.7	36.17	2.9	116	32.2	16.2	2914
Giza 84		12.19	13.24	2.7	34.5	3.0	119	32.0	16.2	2928
G. 74 x G. 68		14.35	17.01	2.7	37.58	3.0	118	31.5	15.9	2765

Table 2. Comparison between the maternal families of promising cross Giza 84 x (Giza 74 x Giza 68) and the commercial varieties Giza 88, Giza 70 and Giza 77 for 3 seasons 1996, 1997 and 1998.

Family or variety	parent	S.C.Y.	L.C.Y.	L%	B.W.	Mic	Length			F.	S.	E%
							2.5% (mm)	50% (mm)				
F ₉ 1398/94	F ₈ 1374/93-15	11.94	13.44	35.67	143	3.3	34.1	17.0	133	2846	72.51	
F ₉ 1406/94	F ₈ 1380/93-32	11.33	12.77	35.57	137	3.2	34	17.0	133	2896	75.68	
G.88		10.47	12.06	36.4	145	3.5	34.8	17.4	137	2714	65.67	
G.70		8.93	10.05	35.73	143	3.5	35.2	17.7	138	2628	64.39	
G.77		9.77	11.36	36.67	142	3.4	34.2	17.1	135	2739	61.58	
F ₁₀ 1432/95	F ₉ 1398/94	12.29	13.66	35.25	143	3.4	34.2	17.1	132	2841	66.19	
F ₁₀ 1443/95	F ₉ 1406/94	11.56	12.43	34.13	138	3.4	34.4	17.2	134	2884	69.67	
G.88		11.6	13.36	36.51	150	3.7	34.7	17.4	143	2786	63.51	
G.70		9.28	10.33	35.3	145	3.6	35.1	17.6	140	2709	58.08	
G.77		10.05	11.75	37.08	143	3.6	34.3	17.1	141	2696	58.04	
F ₁₁ 1414/96	F ₁₀ 1432/95-4	8.87	9.46	33.82	131	3.3	33.2	16.8	128	2908	74.03	
F ₁₁ 1417/96	F ₁₀ 1432/95-18	8.56	9.08	33.78	129	3.4	33.3	16.9	124	2963	76.89	
F ₁₁ 1425/96	F ₁₀ 1443/95-5	8.22	8.64	33.43	119	3.2	33.6	16.6	123	2988	77.13	
G.88		8.88	9.42	33.76	132	3.5	34.5	17.7	131	2940	67.31	
G.70		7.16	7.3	32.34	126	3.4	34.6	17.7	126	2855	63.25	
G.77		7.29	7.77	33.76	126	3.6	33.9	17.3	129	2905	65.18	

Table 3. Comparison between the cross Giza 84 x (Giza 74x Giza 68) and the commercial varieties Giza 88, Giza70 and Giza 86 concerning lint yield, seed cotton yield and the mean weight of 50 bolls in grams in the lower Egypt governorates in 1998, 1999 and 2000 seasons.

Varieties	Characters	1998										1999										2000						Grand mean
		Location					Location					Location					Location											
		1	2	3	4	5	M	1	2	3	4	5	M	1	2	3	4	5	6	M								
G.84x(G.74xG.68)	L.C.Y.C/f	10.94	9.75	7.32	6.39	12.88	9.46	8.64	9.87	8.12	12.55	16.74	11.20	12.60	12.68	13.43	15.72	17.62	12.08	14.02	11.59							
G.88		11.17	8.64	9.03	7.03	11.21	9.42	9.28	10.04	7.96	16.09	17.67	12.21	12.41	11.79	10.36	15.03	14.81	9.35	12.29	11.31							
G.70		8.55	6.76	5.83	6.27	9.07	7.30	6.12	9.12	5.99	12.11	13.51	9.37	10.69	10.52	8.32	13.20	11.22	10.82	10.80	9.16							
G.86		10.34	9.31	7.87	7.63	11.90	9.41	5.79	13.96	7.04	12.40	20.49	11.94	16.43	13.89	10.70	15.63	16.54	12.48	14.30	11.88							
S.E.		0.33																				0.37	0.38					
L.S.D. 0.05		0.65																				0.72	0.72					
0.01		0.86																				0.95	0.97					
G.84x(G.74xG.68)	S.C.Y.C/f	9.98	8.83	7.19	6.03	12.31	8.87	8.21	9.70	7.47	10.55	14.40	10.07	11.45	11.41	12.43	14.39	16.07	11.24	12.83	10.59							
G.88		9.88	7.76	8.51	6.86	11.41	8.88	8.36	9.90	7.01	13.57	14.39	10.66	10.65	10.21	9.19	12.56	12.81	8.47	10.65	10.06							
G.70		7.83	6.28	6.07	6.33	9.31	7.16	5.61	8.82	5.47	9.82	11.30	8.20	9.37	8.97	7.58	11.28	9.86	9.85	9.49	8.28							
G.86		8.72	7.91	6.89	6.83	10.11	8.03	4.94	11.70	5.67	9.82	15.87	9.60	13.24	12.87	9.07	12.85	13.56	10.37	11.98	9.87							
S.E.		0.66																				0.41	0.41					
L.S.D. 0.05		1.29																				0.80	0.80					
0.01		1.70																				1.06	1.06					
G.84x(G.74xG.68)	B.W. (50)	155	138	119	125	118	131	145	114	145	151	147	140	152	150	145	157	151	147	150	140							
G.88		150	132	131	117	128	132	133	122	144	149	145	139	151	151	146	155	153	147	150	140							
G.70		151	133	119	106	121	126	131	124	143	149	147	139	150	154	149	150	148	140	149	139							
G.86		155	149	118	122	117	132	139	129	141	152	155	143	151	149	148	149	146	149	150	142							
S.E.		2.18																				1.82	1.19					
L.S.D. 0.05		4.27																				3.56	2.34					
0.01		5.64																				4.71	3.09					

Table 4. Comparative data of Giza 84 x (Giza 74 x Giza 68) cross and the commercial varieties Giza 88, Giza 70 and Giza 86 concerning lint yield, seed cotton yield c/f and the mean weight of 50 bolls in grams in 5 locations in seasons 1998, 1999 at 6 locations in season 2000.

Varieties	Characters	1998					1999					2000						Means diff.	mean
		Loc.1	2	3	4	5	Loc.1	2	3	4	5	6	2	3	4	5	6		
		G.84x(G.74xG.68)		10.94	9.75	7.32	6.39	12.88	8.64	9.97	8.12	12.55	16.74	12.6	12.88	13.43	15.72		
G.88	L.C.Y.C/f	+0.23	-1.11	+1.71	+0.64	-1.67	+0.64	+0.07	-0.16	+3.54	+0.93	-0.19	-0.89	-3.07	-0.89	-2.81	-2.71	-0.25	11.31
G.70		-2.39	-2.99	-1.49	-0.12	-3.81	-2.52	-0.85	-2.13	-0.44	-3.23	-1.91	-2.16	-5.11	-2.52	-6.4	-1.24	-2.4	9.16
G.86		-0.6	-0.44	+0.55	+1.24	-0.88	-2.85	+3.99	-1.06	-0.15	+3.75	+3.83	+1.31	-2.73	-0.09	-1.08	+0.42	+0.32	11.88
G.84x(G.74xG.68)		9.88	8.83	7.19	6.03	12.31	8.21	9.7	7.47	10.55	14.4	11.45	11.41	12.43	14.39	16.07	11.24	10.59	
G.88	S.C.Y.C/f	-0.13	-1.07	+1.32	+0.83	-0.9	+0.15	+0.2	-0.46	+3.02	-0.01	-0.8	-1.2	-3.24	-1.83	-3.28	-2.77	-0.53	10.06
G.70		-2.16	-1.07	+1.32	+0.3	-3	-2.6	-0.88	-2	-0.73	-3.1	-2.08	-2.44	-4.85	-3.11	-6.21	-1.39	-2.31	8.28
G.86		-1.27	-2.55	-1.12	+0.5	-2.2	-3.27	+2.00	-1.8	-0.73	+1.67	+1.79	+1.46	-3.36	-1.54	-2.51	-0.87	-0.72	9.87
G.84x(G.74xG.68)		155	138	119	125	118	145	114	145	151	147	162	150	145	157	151	147	140	
G.88	B.W. (50)	-5	-6	+12	-8	+10	-12	+8	-1	-2	-2	-1	+1	+1	+2	+2	-	-	140
G.70		-4	-5	-	-19	+3	-14	+10	-2	-2	-	-2	+4	+4	-5	-7	-7	-1	139
G.86		-	+11	-1	-3	-1	-6	+15	-4	+1	+8	-1	-1	3	-6	-7	+2	+2	142

Table 5. Comparisons between the promising cross Giza 84 x (Giza 74 x Giza 68) and the commercial varieties Giza 88 and Giza 70 for two seasons 1999 and 2000.

Season	Family or variety	S.C.Y	L.C.Y	L%	B.W	Mic	Length		F.	S.	E%
							2.5% (mm)	50% (mm)			
1999	G.84x(G.74xG.68)	10.07	11.20	35.05	140	2.9	33.6	16.6	123	2750	77.71
	G.88	10.66	12.21	35.94	139	3.2	33.8	17.1	129	2654	72.29
	G.70	8.20	9.37	35.88	139	3.1	33.8	16.8	128	2436	67.86
2000	G.84x(G.74xG.68)	12.83	14.02	34.69	150	3.4	34.1	17.0	130	2885	70.53
	G.88	10.65	12.29	36.56	150	3.8	35.9	17.8	145	2825	61.22
	G.70	9.49	10.8	36.08	149	3.8	35.4	17.5	142	2590	57.59

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إستنباط الهجين المباشر جيزة ٨٤ × (جيزة ٧٤ × جيزة ٦٨)

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معهد بحوث القطن - مركز البحوث الزراعية - الجيزة

يعتمد قسم بحوث تربية القطن في إستنباط الأصناف الجديدة أساساً على طريقة التهجين الإصطناعي مع الإنتخاب بطريقة النسب . والهجين جيزة ٨٤ × (جيزة ٧٤ × جيزة ٦٨) قد إستنبط بنفس الطريقة . ويتميز هذا الهجين بالحصول العالي والأفرع الثمرية الغزيرة وعدد اللوز المحمول على النبات كبيراً ، كما يتفوق على بقية أصناف القطن التابعة لطبقة الأقطان فائقة الطول بالتكبير في النضج ومثانة الغزل .

وهذا الهجين يمتاز بطول نباتاته (حوالي ١٣٠سم) وأوراقه خضراء داكنة عميقة التفصيص وتقارب سلامياته وإنخفاض العقدة الثمرية (السابعة في المتوسط) كما يتميز بمثانة الغزل العالية (٢٨١٠ وحدة) ونعومة (٣,٤ ميكرونير) ووزن الشعرة ١٢٦ وحدة وطول شعره ٣٣,٩ ملم على مستوى ٢,٥٪ (بالفيبروجراف) هذا وتبلغ وزن اللوزة ٣ جرام في المتوسط وإنتاجيته ١١,٥ قنطار / فدان زهر والقطن الشعير ١٣,٢ قنطار / فدان ، وتصافي الطليج ٢٥,٥٩٪ وتتميز نباتاته بالمقاومة لمرض الذبول الفيوزاريومي . ويمكن إعتبار هذا الهجين بديلاً مناسباً للصنفين التجاريين جيزة ٧٠ و جيزة ٨٨ لتفوقه عليهما.