EVALUATION STUDIES OF SOME EGYPTIAN OKRA LEAF COTTON GENOTYPES FOR YIELD, YIELD COMPONENTS, FIBER QUALITY, CHEMICAL TRAITS AND INSECT RESISTANCE

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(Manuscript received 25 October 2005)

Abstract

Field experiments were conducted during 2003 and 2004 seasons in El-Giza Experimental Station, A.R.C. to evaluate five cotton genotypes, namely Giza 80 okra, Giza 83 okra, Giza 85 okra, Giza 88 okra and (Giza 80 x Giza 83) okra, which descended from discontinuous backcrossing between the Egyptian cotton genotypes, Giza 80, Giza 83, Giza 85, Giza 88, Giza 80 x Giza 83 and the upland okra leaf line MAR GN-8, compared with three Egyptian varieties Giza 80, Giza 83 and Giza 85. The results indicated that insignificant differences were found between all okra genotypes and the recurrent parents for number of bolls/plant, boll weight, seed cotton yield, lint yield and fiber strength.

The okra leaf shape tended to significant increase in leaves content of chlorophyll, carotenoids, total aminonitrogen, indoles gossypol and phenols. This increase of some chemicals content such as polyphenols and gossypol was associated with the resistance to insects such as jasside, whitefly and cotton leaf warm. The breeder can use these lines as a good material for insect resistance in cotton breeding program.

INTRODUCTION

Cotton is grown for its fiber mainly to use in textile industry; yield has the top priority in any cotton-breeding program. In the last decades losses due to pests and diseases in cotton cause significant reductions in yield and quality of lint, seeds and increase production costs.

Therefore, the breeding of improved cotton cultivars with some levels of heritable resistance to pests while having desirable yield and fiber quality is essential. Some morphological traits, physiological and biochemical responses with insect resistance have been identified in cotton as well as okra leaf shape. The okra leaf trait

is characterized by deeply and narrowly lobed leaves with less surface area per leaf than normal leaf cotton.

Okra leaf provides some resistance to many insects such as cotton leaf hopper, Jasside, whitefly, pink bollworm and cotton leaf warm. The association of several morphological traits with resistance to insects and diseases have been reviewed (Maxwell, 1980; Wilson and George, 1982; El-Zik and Thaxton, 1989; Thaxton and El-Zik, 1994 b and Meredith *et al.*, 1996).

The aim of this study is to evaluate 5 promising lines descended from discontinuous backcrossing between the American cotton line (MAR GN-8) of *Gosypium. hirsutum* which characterized by okra leaf shaped to the Egyptian cotton genotypes [Giza 80, Giza 83, Giza 85, Giza 88 and (Giza 80 x 83)] as compared with the three long staple cotton varieties Giza 80, Giza 83 and Giza 85 to estimate yield and its components, fiber quality, physiological characters, chemical components and relationship among traits for insect resistance.

MATERIALS AND METHODS

The materials used in this study consisted of 5 lines descended from 5 inter-specific crosses between *G. babadence* X *G. hirsutum*. After hybridization between the Egyptian cotton verities Giza 80, Giza 83, Giza 85, Giza 88, promising cross (Giza 80 x Giza 83) and the upland line MAR GN-8 of *G. hirsutum* which had okra leaf shape. Four discontinuous backcrossed to the Egyptian cotton genotypes were done.

These lines were as follows:

- Giza 80 ok descended from the discontinuous backcrosses Giza 80 X MAR GN-8.
- Giza 83 ok descended from the discontinuous backcrosses Giza 83 X MAR GN-8.
- Giza 85 ok descended from the discontinuous backcrosses Giza 85 X MAR GN-8.
- Giza 88 ok descended from the discontinuous backcrosses Giza 88 X MAR GN-8.
- Giza 80 X Giza 83 ok were descended from the discontinuous backcrosses (Giza 80 X Giza 83) X MAR GN-8.

To evaluate the promising five lines a randomized complete block trial with three replicates were carried out at Giza Experimental Station in 2003 and 2004 seasons. The three Egyptian cotton varieties Giza 80, Giza 83 and Giza 85 were also included in the experiment as control varieties. Each plot had four rows 4 meters long and 60 cm apart. Hills were spaced 20 cm apart and thinned to two plants per hill. All

cultural practices were applied as usual field. The following plant characters were studied:

A. Yield and yield component: these included: number of open bolls per plant, average of boll weight, seed cotton yield per feddan in kantars, lint yield per feddan, lint percentage, seed index and lint index.
B. Fiber properties: such as micronaire reading and Pressley index, fiber strength (2.5% S. L) and fiber strength (F. st.).
C. Chemical constituents: the determination were done in leaves in which leaf samples were collected from the upper fourth leaf from the apex at the start of flowering, to determine the following chemical constituents: chlorophyll a and b were determined as described by Arnon (1949), carotenoides was determined as described by the method of Rolbelen (1957), total phenols were determined according to Simons and Ross (1971), total amino nitrogen was determined according to Rosen (1957), gossypol were determined according to the method described by Smith (1958), total soluble sugars (Cerning, 1975), and reducing sugars (A.O.A.C., 1965).

Insect resistant:

This study aimed at the determining of the effect of these new cotton genotypes on the population density of certain sucking insect pests and cotton leafworm and to evaluate their role in reducing their infestation levels.

Weekly counted the main cotton sucking insect pests (e.g. Aphid, *Aphis gosspyii* Glover, the cotton whitefly, *Bemisia tabaci* Genn, the cotton leafhopper Jasside, *Empoasca lybica* Berg being from the first of May to the end of September. Ten plants were inspected from each genotype in three replicates and taking three leaves from each plant in three levels lower, middle and upper. Cotton leafworm reared under laboratory conditions and fed on the leaves of each genotype. Ten larvae for each replicate counted after feeding with 1, 2, 3, 5, 7, 9, 11 and 14 days, then the reduction rate calculated according to the equation of Henderson and Tilton (1955) as follows:

% Reduction = 100 (1- Ta / Tb X Cb / Ca)

Where:

Ta Number of insects in treatment after treated

Tb Number of insects in treatment before treated

Cb Number of insects in check before treated

Ca Number of insects in check after treated

RESULTS AND DISCUSSION

A. Yield and yield components:

Number of bolls per plant

Table (1) showed that number of bolls per plant in 2003 season ranged from 8.2 for Giza 88 ok to 11.0 for each of Giza 80 and Giza 83. While it ranged from 9.6 for Giza 88 ok to 11.8 for Giza 83 in season 2004. The lines Giza 80 ok, Giza 83 ok and Giza 85 ok had insignificant difference number of bolls/plant for the control variety Giza 80, Giza 83 and Giza 85. Sambamurth Jsv and Ranganathacharyuln N (1998) found that the okra leaf was best parent for bolls/plant.

Boll weight:

In Table (1), it was clear that boll weight ranged from 2.7 gm for Giza 80 ok to 3.0 gm for Giza 80 in season 2003. The boll weight in 2004 season ranged from 2.7 gm for Giza 88 ok to 3.0 gm for Giza 80. The lines Giza 80 ok, Giza 83 ok, Giza 85 ok and Giza 88 ok gave lower insignificant weight than the check variety Giza 80, Giza 83 and Giza 85. Hassan *et al.* (2001) found that the okra leaf shape gave highest boll weight than the check.

Seed cotton yield:

Results in Table (1) showed that seed cotton yield in 2003 season ranged from 6.37 K/F for Giza 88 ok to 2.02 K/F for Giza 83 in the 2nd season, it was ranged from 7.33 K/F for Giza 88 ok to 9.91 K/F for Giza 83. Giza 83 gave insignificant highest seed cotton yield in the two seasons, while, the line Giza 88 ok gave the lowest seed cotton yield in the two seasons. Thaxton *et al.* (1998) mentioned that the okra leaf lines had seed cotton yield similar to that of the conventional varieties.

Lint yield:

Table (1) showed that the lint yield/feddan ranged from 7.27 K/F for Giza 88 ok to 11.11 K/F for Giza 83 variety in the first season, while it ranged from 8.48 K/F for Giza 88 ok to 12.37 K/F for (Giza 83 variety) in the second season. Insignificant lower lint yield was noticed for okra leaf lines than the control varieties in the two seasons. Thaxton *et al.* (1998) found insignificant differences between the okra lines lint yield and the commercial cultivars.

Lint percentage:

Data in Table (1) cleared that the lint percentage in 2003 season ranged from 36.18% for lines Giza 88 ok to 40.39% for Giza 80 while it ranged from 36.6% for line Giza 88 ok to 40.8 for Giza 80 in 2004 season. The lines Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 88 ok and (Giza 80 x 83) ok gave lowest significant lint percentage than the check varieties Giza 80, Giza 83 and Giza 85.

Seed index:

The results presented in Table (1) showed that the seed index ranged from 9.4 gm for Giza 80 ok to 10.6 gm for Giza 80 and Giza 85 in the 1st season. In the second season, seed index ranged from 9.1 gm for Giza 80 ok to 10.3 gm for Giza 80. Higher significant seed index's were found for the check varieties Giza 80, Giza 83 and Giza 85 than the Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 80 x Giza 83 ok and Giza 88 ok.

Lint index:

Results in the Table (1) cleared that the lint index ranged from 5.83 for Giza 88 ok to 6.63 for Giza 80 variety in 2003 season. While it ranged from 5.67 for Giza 88 ok to 6.3 for Giza 80 ok in 2004 season. Significant difference was found between Giza 83 ok and its parent variety Giza 83.

From the above results of yield components it could be concluded that we had a good lines namely Giza 80 ok, Giza 83 ok, (Giza 80 x 83) ok and Giza 88 ok descending from discontinuous backcrossing between the American line MAR GN-8 and the Egyptian genotypes Giza 80, Giza 83, Giza 85, Giza 88 and Giza 80 x Giza 83. These lines had good seed and lint cotton yield but more selection must be done to improve lint percentage, seed index and lint index's.

Fiber quality:

Fiber fineness and maturity (Mic) reading presented in Table (2) showed that (Mic) ranged from 3.9 for Giza 88 ok to 4.3 for Giza 80 in the first season while it ranged from 3.7 for Giza 88 ok to 4.1 for Giza 80 in the second season. Significant differences between the lines Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 80 x g. 83 ok and Giza 88 ok and the check variety Giza 80, Giza 83 and Giza 85.

Fiber length at 2.5% span length:

The results of fiber length in all genotypes study ranged from 29.3 to 32.3 in the first season and from 30.5 to 34.5 in the second season (Table, 2). From the above mentioned, we can conclude that the lines Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 88

ok and Giza 80 x Giza 83 ok had a good fiber length and it fill in the long staple category. Percy (2000) found that the fiber length for okra leaf was shorter than the fiber of recurrent parent.

Yarn strength:

All the lines, Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 88 ok and Giza 80 x Giza 83 ok had a lower significant yarn strength than the parents in the two seasons (Table, 2). This indicated that we must make discontinuous backcrossing to the recurrent parent to come back to its normal yarn strength trait.

Fiber strength:

Insignificant differences were found and the fiber strength ranged from 34.6 for Giza 85 ok to 38.8 for Giza 80 in the first season and ranged from 30.9 for Giza 83 ok to 39.2 for Giza 85 (Table, 2). Percy (2000) found that the fiber strength of okra leaf trait was weaker than the fiber strengths of the recurrent parents. From the results of fiber quality we can conclude that the lines Giza 80 ok, Giza 83 ok, Giza 85 ok, Giza 88 ok and Giza 80 x Giza 83 ok produced fiber within long staple fiber classification limits.

From the above results, it could be concluded that selection must be done to improve yarn strength.

Chemical constituents of leaves:

The results presented in Table (3) revealed that backcrossing between *G. barbadence* and *G. hirsutum* induced some morphological, physiological and biochemical responses such as photosynthesis pigments. The okra leaf shape tended to a significant increase in leaves contents of chlorophyll a, b, total chlorophylls and carotinoids as comprised with the normal leaf cotton. The higher leaf content of chlorophyll may reflect higher photosynthetic efficiency for okra leaves; the okra leaf type provides an "open-canopy" cotton crop due to decreased leaf surface area, the feature may permit greater air circulation and light penetration to the inner, lower portions of the canopy than that of conventional cotton (Meredith, 1984). Due to this increase in air movement and light penetration, temperature within the canopy is also affected and these characteristics may significantly increase the photosynthesis pigments.

Concerning the results of leaves chemical analysis of okra and normal cotton leaves, data presented in Table (3) showed significant increase in phenols, gossypol, total amino nitrogen and indole contents of okra leaves. The increase in chlorophyll contents could be a reason for increasing carbohydrates levels in leaves. Another

possible reason for higher carbohydrates in okra leaves is through the decrease of leaf area surface, and thus, expending less metabolic energy in vegetative structures allowing more available assimilates within normal cotton leaves. The higher sugar accumulation in leaves of okra leaves may induce the biosynthesis of mono and poly phenols such as tannins and gossypol, both of which are associated with the resistance to certain insect pests such as hopper jasside, whitefly, pink bollworm and cotton leaf worm. Also, poly-phenols play an important role in decreasing IAA oxidation in fresh cotton leaves and this reflect directly on increase boll setting percent and decrease the shedding percentage of young bolls (Alia, 2003).

Cotton aphid, *Aphis gossypyii* Glover:

Data in Table (4) cleared that the cotton lines Giza 83 ok was more resistance for cotton aphid in the first season which recorded the lowest number 0.71 insect/leaf during 2002 season followed by Giza 88 ok , Giza 80 ok, Giza (80 x 83) ok, Giza 83, Giza 80 and Giza 85 ok which recorded 1.22, 2.37, 2.5, 3.79, 4.65 and 5.33 insect/leaf, respectively, while the cotton variety Giza 85 recorded the highest number 10.71 insect/leaf.

In the second season, all cotton genotypes recorded the highest infestation but the cotton line Giza (80 x 83) ok recorded the lowest number 0.02 insect/leaf followed by Giza 83 ok, Giza 88 ok, Giza 80 ok, Giza 85 ok Giza 80, Giza 83 and Giza 85 which recorded 0.04, 0.1, 0.15, 0.22, 1.07, 1.12 and 1.2 insect/leaf, respectively.

Cotton leafhopper (Jasside), *Empoasca lybica* DeBerg:

The results in the same Table showed that cotton okra leaf lines recorded the lowest number for Jasside during the first season 3.76, 4.5, 4.58, 4.61 and 4.81 insect/leaf for Giza (80 x 83) ok, Giza 85 ok, Giza 83 ok, Giza 80 ok and Giza 88 ok. Highest population 6.33, 8.27 and 8.3 insect/leaf recorded for Giza 85, Giza 80 and Giza 83, respectively, while in the second season the cotton lines Giza 83 ok recorded the lowest number 4.71 insect/leaf, while other genotypes recorded the highest infestation which ranged between 6.3 – 9.3 insect/leaf.

Cotton whitefly, *Bemisia tabaci* Genn:

The present data in the 1st season revealed that the cotton inter-specific crosses Giza 88 ok and Giza 80 ok recorded the lowest number 2.63 and 3.35, Giza 85 ok and Giza 83 ok, Giza (80 x 83) ok, Giza 85 ok and Giza 83 had 3.35, 3.69, 5.35 and 5.63 insect/leaf (Table, 4). Whereas the cotton varieties Giza 85 and Giza 80 recorded the highest level of infestation 8.25 and 9.2 insect/leaf.

In the 2nd season data cleared that more inter-specific crosses and Giza 83 variety recorded the lowest number of whitefly 2.12, 2.5, 2.6, 2.8 and 2.9 insect/leaf for Giza 80 ok, Giza 83 ok, Giza 88 ok, Giza 83 and Giza 80 x 83 ok, respectively, while Giza 85, Giza 83 and Giza 85 ok, recorded the highest number 4.2, 3.74 and 3.50 insect/leaf, respectively. Tamara et al. (2004) recorded that the okra leaf strains have decreased numbers of whitefly.

Leafworm:

The experiments carried out in order to study these cotton genotypes (parents and inter-specific crosses) on 2nd instar larvae of cotton leafworm. Data in Table (5) showed that all the inter-specific crosses recorded high reduction rate ranged between 54.35 – 73.13%. These lines recorded 73.13, 69.57, 68.65, 64.88 and 54.35% for Giza 80 x 83 ok, Giza 82 ok, Giza 85 ok, Giza 88 ok and Giza 83 ok, respectively. While, the parents recorded the lowest reduction rate which of 10.22, 10.23 and 16.17% for cotton varieties Giza 85, Giza 83 and Giza 80, respectively.

Generally, the cotton okra leaf lines reduced the population of sucking insect pests than commercial cotton varieties (parents). So, in the experiment Semi field on the cotton leafworm larvae, the cotton lines gave the highest reduction in the population than the recurrent parent cotton varieties.

The decrease in infection of insects may be referred to the morphological change in leaf structure, which observed in okra leaf plant. Adding to this character (okra leaf) contains a higher content of some chemical substances (phenols, tannins and gossypol contents) may cause a high role insects resistance as compared with normal lines.

It could be concluded that the five okra leaf lines had good yield and yield components, desirable fiber quality and good level of insect resistance.

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Table (1): Mean of yield components of the eight genotypes in 2003 and 2004 seasons.

Treatments	No. of bolls/plant		Boll weight		Seed cotton yield		Lint yield		Lint %		Seed index		Lint index	
	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004	2003	2004
G.80 ok	9.7	10.7	2.7	2.8	8.16	9.14	9.93	11.3	38.6	39.1	9.4	9.1	6.37	6.30
G.83 ok	10.5	11.5	2.9	2.9	8.65	9.59	10.28	11.54	37.66	38.6	9.7	9.4	5.87	5.80
G.80 x 83 ok	10.2	11.1	2.7	2.8	7.98	8.94	9.53	10.82	37.9	38.4	10.0	9.7	6.10	6.03
G.85 ok	8.9	9.9	2.9	2.9	7.10	7.99	8.33	9.50	37.25	37.7	9.8	9.8	5.87	5.87
G.88 ok	8.2	9.6	2.8	2.7	6.37	7.33	7.27	8.48	36.18	36.6	10.3	9.8	5.83	5.67
G.80	11.0	11.3	3.0	3.0	8.48	9.02	10.81	11.79	40.39	40.8	10.6	10.3	6.63	5.63
G.83	11.0	11.8	2.9	2.9	9.02	9.91	11.11	12.37	39.10	39.6	9.8	9.4	6.26	6.20
G.85	9.8	11.3	2.8	2.8	8.27	9.24	9.76	11.42	38.25	38.5	10.6	10.1	6.26	6.10
L.S.D at 5%	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	0.83	1.31	0.6	0.5	0.4	0.4

Table (2): Mean of fiber quality for the eight genotypes in 2003 and 2004 seasons.

Treatment	Micronair		2.5% SL		F. St.		P .r.	
	2003	2004	2003	2004	2003	2004	2003	2004
Giza80 ok	4.3	3.9	29.8	30.5	36.8	35.4	1678.3	2226.6
Giza83 ok	4.2	3.7	32.3	34.5	37.7	30.9	2058.3	2150.4
Giza80x83ok	4.2	3.9	31.1	32.1	34.6	36.1	1976.6	2166.6
Giza85 ok	4.1	3.9	29.3	31.7	36.5	35.3	2011.6	2138.3
Giza88 ok	3.9	3.7	30.9	31.8	37.3	36.3	2291.6	2210.0
Giza80	4.3	4.1	31.67	30.5	38.8	35.1	2393.3	2078.3
Giza83	4.2	4.1	31.10	31.5	36.1	36.4	2130.6	2183.3
Giza85	3.9	3.8	30.87	30.7	38.5	39.2	2411.6	2726.6
L.S.D at 5%	0.2	0.2	1.3	2.3	N.S.	N.S.	359.7	167.2

Table (3): Some chemical constituents of cotton leaves of the eight genotypes.

Treatment	Pigments concentration mg/gm dry wt.				Phenols mg/gm dry wt.				Gossypol mg/gm dry wt.	T.A.N. mg/gm dry wt.	Indoles	Total soluble sugars
	Chlorophyll a	Chlorophyll b	Total (a + b)	Carotenoids	Mono	Poly	Total	Poly/ total				
G.80 ok	4.90	3.92	8.82	0.75	2.51	13.46	15.97	84.18	1.93	7.07	1.93	12.80
G.83 ok	5.17	3.64	8.81	0.74	2.23	12.41	14.64	84.76	1.11	6.99	1.23	14.38
G.80x83ok	6.31	4.20	10.51	0.42	3.47	13.29	16.76	79.29	1.17	7.37	2.36	13.40
G.85 ok	6.68	4.10	10.78	0.46	2.05	14.36	16.41	87.50	1.18	7.80	2.70	13.06
G.88 ok	6.72	5.00	11.72	0.24	1.64	13.44	15.08	89.12	1.11	7.22	2.10	13.48
G.80	4.04	3.00	7.04	0.81	2.41	8.79	12.20	72.04	1.08	6.95	1.86	11.30
G.83	5.01	3.30	8.41	0.72	1.32	7.13	8.45	84.37	1.07	6.52	1.55	12.66
G.85	5.18	3.10	8.28	0.88	1.41	12.29	13.70	75.66	1.03	5.95	1.39	11.91
L.S.D at 5%	0.19	0.30	0.75	0.18	0.07	0.20	0.14	1.02	0.02	1.02	0.04	0.47

Table (4): The average No. of sucking insect pests on the different cotton varieties at Giza Governorate during 2003-2004 seasons.

Treatment	Aphids		Jasside		Whitefly	
	2003	2004	2003	2004	2003	2004
Giza80 ok	2.37	0.15	4.61	6.48	5.14	2.12
Giza83 ok	0.71	0.04	4.58	4.71	3.35	2.50
Giza80x83ok	2.50	0.02	3.76	7.50	3.69	2.90
Giza85 ok	5.33	0.22	4.50	6.50	5.35	3.50
Giza88 ok	1.22	0.10	4.81	8.10	2.63	2.60
Giza80	4.56	1.07	8.27	9.30	9.20	3.70
Giza83	3.79	1.12	8.30	6.30	5.63	2.80
Giza85	10.71	1.20	6.33	7.43	8.25	4.20
L.S.D at 5%	2.1	1.9	2.0	1.9	N.S.	0.80

Table (5): Reduction rate for cotton leafworm after feeding on Egyptian cotton leaves and inter-specific crosses under lab-conditions during 2003 season.

Treatments cotton varieties	Inspection days								General mean
	1 day	2 days	3 days	5 days	7 days	9 days	14 days	21 days	
G.80 ok	40.0	51.7	72.4	72.4	18.5	76.9	80.7	84.0	69.57%
G.83 ok	3.0	41.3	48.2	55.1	53.5	61.5	69.2	76.0	54.35%
G.80 x 83 ok	33.3	48.2	65.5	79.3	82.1	88.4	92.3	96.0	73.13%
G.85 ok	23.3	62.0	62.0	65.5	71.4	84.6	88.4	92.0	68.65%
G.88 ok	26.6	44.8	58.6	72.4	75.0	73.0	80.7	88.0	64.88%
G.80	3.3	6.8	6.8	17.2	21.4	23.0	26.9	24.0	16.17%
G.83	0.0	5.5	10.3	10.3	10.7	15.3	15.3	20.0	10.23%
G.85	3.3	3.4	6.8	6.8	7.6	19.2	19.2	16.0	10.22%

تقييم بعض تراكيب القطن المصرى ذات الأوراق غائرة التفصيص للصفات المحصولية وصفات الجودة والصفات الكيميائية والمقاومة للحشرات

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أجريت هذه الدراسة فى مزرعة مركز البحوث الزراعية بالحيزة فى موسم ٢٠٠٣ و ٢٠٠٤ وذلك لتقييم خمسة تراكيب وراثية للقطن المصرى تحمل صفة الأوراق غائرة التفصيص وهى جيزة ٨٠ أوكرا و جيزة ٨٣ أوكرا و جيزة ٨٥ أوكرا و جيزة ٨٨ أوكرا و (جيزة ٨٠× جيزة ٨٣) أوكرا والتى تنتخب بالتهجين الرجعى الغير مستمر بين التراكيب المصرية جيزة ٨٠ و جيزة ٨٣ و جيزة ٨٥ و جيزة ٨٨ و (جيزة ٨٠ × جيزة ٨٣) مع السلالة الامريكية MAR GN-8 التى تتميز بالأوراق غائرة التفصيص ثم زراعة هذه التراكيب مع أصناف المقارنة جـ ٨٠ و جـ ٨٣ و جـ ٨٥ فى تجربة قطاعات كاملة العشوائية وكانت أهم النتائج المتحصل عليها ما يلى:

١. لم تكن هناك أى فروق معنوية بين هذه السلالات وآباء المقارنة الناتجة منها بالنسبة لعدد اللوز على النبات ووزن اللوزة ومحصول النبات الزهر ومحصول النبات الشعر.
٢. لم تكن هناك فروق معنوية بين هذه السلالات وآباء المقارنة بالنسبة لمتانة الشلة والطول.
٣. هناك فروق بسيطة بين هذه السلالات والآباء بالنسبة للميكرونير.
٤. نتج عن التهجين تغييرات مورفولوجية وفسيولوجية وكذلك تغيير فى مستوى المواد الكيماوية فوجد أن الأصناف الأوكرا حدث بها زيادة فى محتوى الأوراق من الكربوهيدرات والكلوروفيلات بأنواعها والفينولات الكلية وكذلك نسبة عالية من الجوسيبول وهذه المواد لها دور فى رفع مقاومة النبات للحشرات وزيادة نسبة العقد.
٥. من نتائج الحشرات وجد أن هذه السلالات أكثر مقاومة من الآباء بالنسبة لحشرات المن والجاسيد والذبابة البيضاء وديدان الورق.
٦. هذه السلالات أحدثت نسبة خفض عالية لدودة ورق القطن تراوحت بين ٥٤,٣٥ – ٧٣,١٣% مقارنة بالآباء التى أعطت نسبة خفض تراوحت بين ١٠,٢٢ – ١٦,١٧%.