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Application of the Cotton Varieties Maintaining Program in Egypt to Produce the Nucleolus (Breeder's Seed) of Super Giza 94 Cultivar, During 2019-2023 Seasons

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ABSTRACT

The present study was carried out during 2019-2023 seasons to produce the breeder's seed of Super Giza 94 cultivar. At the end of the 2019 season, fifty-six plants representing Giza 94 cultivar type were selected from the nursery to form the increase lines A. In 2020 season, the selfed seeds of the progenies of the 56 selected type plants were grown in number of rows as the amount of seeds allowed conveniently named increased lineA. According to the determination values of both agronomic and fiber characteristics on bulked families of increaseA, 17 families were selected from increaseA to form increase B in 2021. The 17 selected families as well as the three latest strains of Super Giza 94 cultivar were evaluated for yield, yield components and fiber properties. In 2022 season, according to the results of yield trail, the best six families representing the type of Super Giza 94 cultivar were selected from increase B and their selfed seeds were carefully massed together to form increase C. It was planted in an area of about 35 feddans. In 2023 season, it was also propagated as new nucleolus (breeder's seed) under the name of season (Super Giza 94 nucleolus/2023) in about 332 feddans.The results showed that performing the process of self-pollination with continuous selection, which takes place every season, is considered necessary to maintain genetic purity and eliminate any off-type plants from Super Giza 94 breeding population as a result of highly homozygous in minor genes or recombination among themselves.

Keywords: Nucleolus, Super Giza 94, Cotton.

INTRODUCTION

Egypt is a leading producer of the long and extra-long staple cotton varieties, because of specific breeding program, it's aimed to produce new cotton varieties of high yielding ability, early maturing, high lint percentage and desirable fiber quality able to satisfy the requirements of local and foreign spinners. The policy of maintaining the genetic purity of the currently grown commercial cotton varieties is parallel to the policy of producing new and promising varieties, as the breeder's seed renewal programs for the varieties help in continuing the cultivation of these varieties for a long period, preserving the distinctive economic characteristics of each variety and purity of its seed, as well as stability in the international reputation for quality homogeneity of the distinctive staple properties of Egyptian cotton, in addition to covering the cotton area of all varieties with pure seed renewed annually achieves inspection and certification standards. It is necessary to produce a genetically pure strain annually so that there is no deterioration of commercially grown strains because of six important causes mentioned by Lewis (1975), which are: mechanical mixtures, natural crosses, mutations, gene frequency changes caused by random genetic drift and natural selection, gene frequency changes caused by selection pressure exerted by the breeder, and loss of heterozygosity.

All Egyptian cotton varieties are maintained by pedigree selection and independent culling levels in Cotton Research Institute. There are many studies, such as: El-Akkad *et al.*, (1982), Younis *et al.*, (1993), Abo-Arab *et al.*, (1995), Lasheen (1997), El-Disouqui (2001), Nagib and Hemida (2001), Abd Al-Zaher (2004), Mohamed (2013), Al-Ameer (2014), Abd El-Salam (2015), Al-Hibbiny (2015), El-Dahan (2016), Heba (2016), Mahrous (2017), Soliman (2018), Badeaa (2019), Mabrouk (2019) and Al-Hibbiny (2020) stated that the pure seed and production of cotton cultivar using pedigree selection method is essential to produce renew and maintain the breeder's seed of the cotton cultivars in the commercial use. This method based on massing selfed seeds of homogeneous type families, according to their performance in evaluation with the latest nuclei. Cotton Varietal Maintenance Department is the responsible of maintaining and renewing breeder's seed of the commercial varieties in addition the further seed production steps are carried out with the collaboration with Central Administration for Seed Production and Central Administration for Seed Certification. The main goal of conducting this work is to follow the method of maintaining cotton varieties in producing breeder's seed that carry the genetic characteristics of the Super Giza 94 cotton cultivar.

MATERIALS AND METHODS

Super Giza 94 cotton variety is a commercial Egyptian cotton cultivar (*G. barabadense* L.) cultivated at lower Egypt and classified long stable with a stable length (33.0-34.0 mm) and represents of high yielding ability, early maturing, and high lint percentage. This variety was derived

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by the pedigree selection method from the cross between 10229 Strain x Super Giza 86. It was received by Cotton Varietal Maintenance Department in 2017 season. The present study was carried out at Sakha Agricultural Research Station, Cotton Research Institute, during five seasons from 2019 to 2023. For maintaining on Super Giza 94 cotton cultivar need five years to produce the nucleolus. The technical work could be illustrated as follows:

In 2019 season, sixty families representing the base population of Super Giza 94 are grown from selfed seeds in the breeding plot (nursery). Each family includes 40 individual plants with total number of plants equal 2400. At flowering stage, artificial self-pollination take place for most flowers on the plant by putting a drop of sticky material on the tip of bud to prevent any pollination by insects and/or honeybees. At picking time, 1200 individual plants were selected on the basis of visual field evaluation and picked separately. At the laboratory, 726 individual elite plants selected based on yield components such as boll weight, lint percentage, seed index and lint index. The 726 individual elite plants were screened for yield components as well as fiber properties. At the end of the 2019 season, fifty-six plants representing Super Giza 94 cultivar type were selected to form the increase lines A.

In 2020 season, the selfed seeds of the progenies of the 56 selected type plants were grown in number of rows as the amount of seeds allowed conveniently named increase line A, as well as the open pollinated seeds of same 56 selected type plants were grown adjacent progeny three rows to be increased for using it in yield trial in the next year. According to the determination values of both agronomic and fiber characteristics on bulked families of increase A, 17 families were selected from increase A to form increase B in 2021.

In 2021 season, the selfed seeds of the 17 families were grown in increase B. A yield trial included the 17 selected families as well as the three latest strains of Super Giza 94 were used as controls. The design of yield trail was a randomized complete blocks design (RCBD) with four replications. The 17 selected families as well as the three latest strains were evaluated for yield, yield components and fiber properties.

In 2022 season, according to the results of yield trail, the best six families representing the type of Super Giza 94 cultivar were selected from increase B and their selfed seeds were carefully massed together to form increase C. It was planted in an area of about 35 feddans. In 2023 season, it was also propagated as new nucleolus (breeder's seed) under the name of season (Super Giza 94 nucleolus/2023) in about 332 feddans at Ministry's farms.

Data were recorded in this work for the following characters:

- Seed cotton yield (SCY, kentar/feddan). Yield per feddan was calculated from the mean plot size.
- Lint cotton yield (LCY, kentar/feddan).
- Boll weight (BW, g).
- Lint percentage (L %).
- Seed index (SI, g).
- Lint index (LI, g).
- Fiber length at 2.5 % span length (2.5 % SL, mm).
- Uniformity index (UI %).
- Pressley index (PI).
- Strength, g/tex (ST, g/tex).
- Yarn strength (YS).
- Micronaire reading (MR).
- Elongation % (E %).
- Fiber reflection as percentage (Rd %).
- Yellowness (+b).

Means of the selected families and comparison, standard error (SE) and coefficient of variability (C V %) were calculated for all the studied traits, also analysis of variance (ANOVA) as described by Gomez and Gomez (1984) was carried out for yield and yield components in the yield trail.

RESULTS AND DISCUSSION

Ideal type plants in 2019 season:

Lint percent is of clear importance as it is closely related to the net income of cotton yield. Also, fiber length has been the dominant quality factor associated with quality. So, the characteristics of lint percentage and fiber length are the two most important traits that explain the extent of deviation or stability of the cotton variety, and therefore attention has been paid to studying them in some detail. Frequency distribution curves for L % and 2.5 % SL in 2019 before and after selection procedure are presented in Figures 1 and 2. As a result of selection, it was exhibited the mean increased, the variance decreased, and the skewness changed from negative to positive for both L% and 2.5%SL, which demonstrates the efficiency of the selection procedure. Mean of yield components and fiber properties for the 56 selected type plants of Super Giza 94 from the nursery in 2019 season are presented in Table 1.

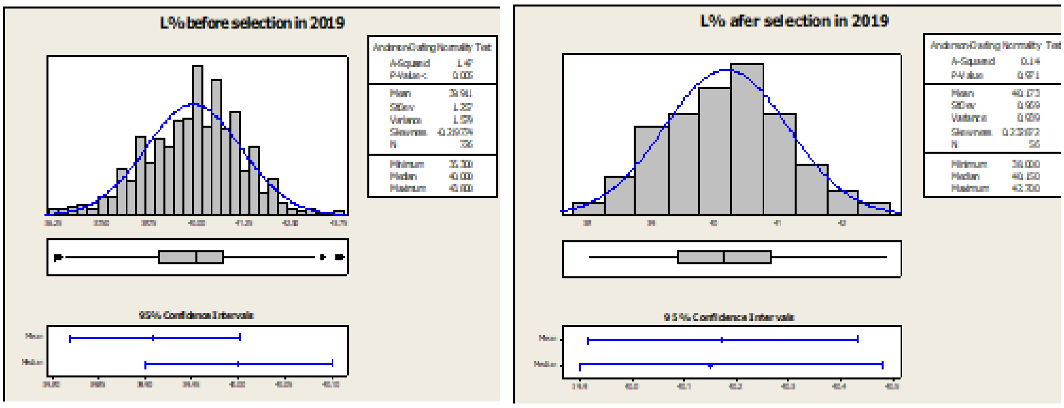

Fig.1. Frequency distribution curves for lint percentage in 2019

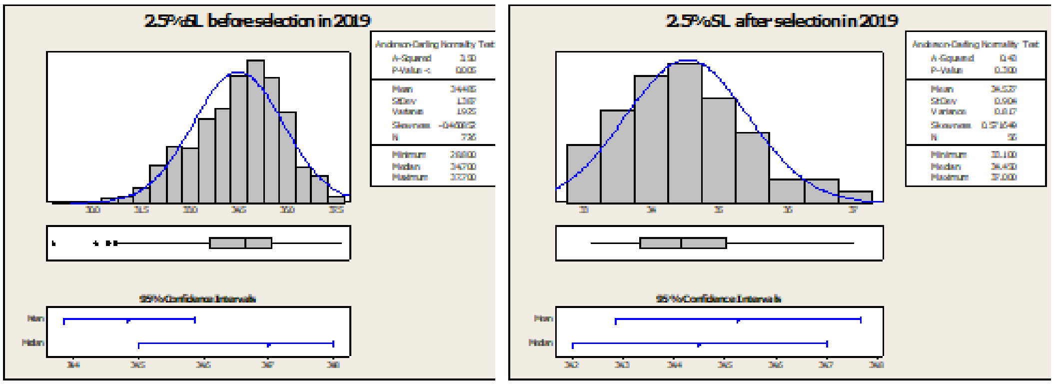

Fig.2. Frequency distribution curves for 2.5 % span length in 2019

Table 1. Means of yield components and fiber properties for the 56 selected type plants of Super Giza 94 from the nursery in 2019 season to form increases A in 2020 season.

No.	Selected families No.	BW (g)	L%	SI (g)	LI (g)	2.5 % SL (mm)	UI %	PI	MR
1	5/2019-12	3.0	39.6	9.0	5.9	34.2	90.5	9.8	3.4
2	5/2019-16	2.7	40.3	9.6	6.5	35.0	88.8	9.9	3.0
3	5/2019-22	3.2	40.1	10.6	7.1	34.3	88.5	9.8	3.4
4	5/2019-26	2.5	38.8	9.5	6.0	36.2	88.2	10.2	3.3
5	8/2019-13	3.6	41.4	10.6	7.5	34.0	87.7	10.1	4.1
6	8/2019-20	2.8	40.9	10.0	6.9	33.2	87.7	10.1	4.0
7	9/2019-14	2.2	39.2	7.7	5.0	33.6	87.2	10.0	2.9
8	9/2019-16	3.4	38.7	8.5	5.4	34.5	89.6	9.5	3.1
9	9/2019-30	2.4	41.4	8.5	6.0	35.7	88.0	9.4	3.2
10	12/2019-16	2.9	39.7	10.5	6.9	33.9	86.4	10.3	3.5
11	12/2019-18	2.2	40.6	9.0	6.2	34.7	88.0	10.4	3.8
12	12/2019-28	3.0	39.5	10.8	7.1	33.4	87.1	10.8	4.1
13	12-2019-29	2.7	41.5	10.3	7.3	35.0	88.0	10.1	4.0
14	13/2019-17	2.4	40.6	9.4	6.4	34.5	88.1	10.0	3.8
15	13/2019-27	3.2	38.7	10.0	5.8	35.1	87.5	10.6	4.1
16	13/2019-30	3.3	39.8	9.9	6.5	35.1	87.2	10.2	4.0
17	15/2019-12	3.3	39.0	9.8	6.3	33.1	86.3	10.0	3.6
18	15/2019-13	3.7	40.0	11.1	7.4	33.7	89.3	10.1	4.0
19	15/2019-26	3.3	39.0	9.7	6.2	34.1	88.2	10.0	3.5
20	18/2019-28	2.4	40.9	9.4	6.5	35.4	89.3	10.2	3.7
21	20/2019-4	2.8	40.8	9.2	6.3	34.2	87.0	10.6	3.7
22	27/2019-24	2.5	40.4	8.2	5.6	33.7	86.9	10.2	2.8
23	27/2019-27	3.8	42.2	10.3	7.5	37.0	88.0	11.1	3.9
24	27/2019-30	2.7	39.9	9.2	6.1	35.3	88.0	9.9	3.6
25	28/2019-9	3.0	40.5	9.9	6.7	35.0	86.3	10.4	4.0
26	28/2019-12	2.5	40.5	8.2	5.6	33.6	87.5	10.0	3.5
27	28/2019-20	3.0	39.4	10.1	6.6	34.2	88.0	10.5	3.5
28	29/2019-3	3.7	40.3	10.2	6.9	35.7	88.0	9.9	3.9
29	29/2019-13	2.8	40.3	8.9	6.0	34.2	89.0	10.5	3.0
30	31/2019-25	3.6	42.7	10.8	8.0	34.5	87.4	10.2	4.0
31	33/2019-13	3.0	38.5	9.5	5.9	34.5	88.0	10.6	3.4
32	33/2019-23	3.0	39.6	11.9	7.8	35.2	89.4	10.4	4.0
33	36/2019-25	2.7	39.2	10.1	6.5	34.8	89.8	10.8	3.6
34	37/2019-6	2.3	39.9	9.78	6.5	33.9	86.5	10.3	3.5
35	37/2019-8	2.8	39.3	8.2	5.3	33.5	88.2	10.3	3.7
36	38/2019-10	2.9	39.9	9.8	6.5	35.1	89.0	9.8	3.3
37	39/2019-4	3.5	40.4	9.1	6.2	33.2	87.9	10.2	3.7
38	39/2019-9	3.7	41.2	8.9	6.2	34.6	88.4	10.7	3.4
39	40/2019-29	3.2	40.7	10.3	7.1	34.7	89.4	10.5	3.4
40	41/2019-19	2.4	40.7	9.4	6.5	33.7	85.0	10.2	3.3
41	42/2019-4	3.0	39.6	8.8	5.8	36.4	88.0	10.4	3.9
42	42/2019-10	2.7	40.1	10.0	6.7	35.6	90.0	10.1	3.1
43	42/2019-31	3.2	39.2	9.2	5.9	34.8	90.0	10.8	2.8
44	44/2019-4	3.4	39.2	9.9	6.4	34.4	89.3	10.3	3.5
45	48/2019-11	3.3	40.0	9.8	6.5	33.9	87.7	9.9	3.4
46	49/2019-16	3.3	40.2	10.0	6.7	33.7	87.2	10.3	3.6
47	50/2019-9	3.2	41.2	9.5	6.7	34.0	88.4	10.0	3.4
48	53/2019-10	3.0	40.9	10.8	7.5	34.4	88.0	10.8	3.5
49	55/2019-6	2.9	40.3	9.6	6.5	35.4	89.0	10.0	3.2
50	55/2019-10	3.1	40.0	9.4	6.3	36.3	87.6	10.4	3.1
51	57/2019-8	3.0	41.4	8.4	5.9	34.4	87.3	10.2	3.4
52	58/2019-13	2.7	40.9	9.7	6.7	33.8	88.3	9.9	3.2
53	58/2019-21	2.7	41.1	9.8	6.8	36.0	89.1	10.2	3.1
54	58/2019-28	4.1	42.1	10.0	7.3	33.2	86.9	10.3	3.9
55	60/2019-13	2.5	38.0	7.3	4.5	33.2	85.6	10.1	2.8
56	60/2019-25	2.6	39.4	9.0	5.9	34.7	89.4	9.8	3.2
Mean of selected families		3.0	40.1	9.6	6.4	34.5	88.1	10.2	3.5
Mean of comparisons (Control)		3.2	40.2	9.9	6.7	35.7	86.6	10.2	3.5
Standard error		0.058	0.129	0.115	0.091	0.121	0.150	0.044	0.049
Coefficient of variability		14.5	2.4	8.9	10.6	2.6	1.3	3.3	10.5

Mean of selected families was relatively close to the comparison mean for most studied traits. Small values of SE indicate that the samples mean is more accurate reflection of the actual Super Giza 94 population mean. Whereas coefficient of variability was low for L %, 2.5 % SL, UI % and PI, indicating less dispersion for these traits, however coefficient of variability was relatively high for BW, SI, LI and MR, this could be due to environmental effects on these traits. Similar results were obtained by El-Dahan (2016), Heba (2016), Mahrous (2017), Soliman (2018), Mabrouk (2019) and Al-Hibbiny (2020).

Increase A (2020 season):

Means of yield components and fiber properties for the 56 selected progenies (increases A) compared with the three latest strains of Super Giza 94 are presented in Table 2. Mean of progenies (increase A) was relatively close to the comparison mean for most studied traits. Also, standard error (SE) was relatively low for most studied traits. Coefficient of variability (C V %) was low to moderate for all the studied traits, these results indicated gene fixation and homogeneity in the studied families of the Super Giza 94. Application of independent culling levels selection for increase A, revealed 17 families were selected according to Super Giza 94 standard characteristics to form increase B families, these families were compared in yield trail in 2021 season. As a result of selection, figure 3 showed an increase in the mean, and a shift in the skewness from negative to positive for L%. Also, figure 4 exhibited an increase in the mean, a decrease in variance, and an increase in the positive skewness because of the decrease in the minimum for 2.5 % SL (31.3 mm) this season as well as the increase in the number of families below mean.

Table 2. Means of yield components and fiber properties for the 56 selected progenies (increases A) in 2020 growing season.

No.	Selected progenies No.	BW (g)	L %	SI (g)	LI (g)	2.5 % SL (mm)	UI %	ST (g/tex)	YS	MR	E %	Rd %	+b
1	5/2019-12	2.9	39.1	10.7	6.9	32.0	84.4	44.8	2160	3.5	7.4	66.3	6.7
2	5/2019-16	3.2	39.9	11.5	7.6	32.0	84.8	44.3	2340	3.9	7.4	75.7	7.5
3	5/2019-22	2.9	39.4	11.5	7.5	32.1	86.5	45.8	2160	4.0	7.0	73.8	7.6
4	5/2019-26	3.0	40.2	10.4	7.0	32.5	84.3	45.3	2160	3.9	7.0	72.3	7.7
5	8/2019-13	3.1	41.2	11.8	8.3	32.6	85.5	46.2	2160	3.9	7.3	76.3	8.0
6	8/2019-20	3.5	40.5	11.6	7.9	32.3	84.8	43.3	2160	3.9	7.5	75.3	7.9
7	9/2019-14	3.4	41.2	11.6	8.1	32.5	86.8	46.1	2040	3.8	7.5	71.2	6.8
8	9/2019-16	3.1	41.0	11.5	8.0	33.1	85.7	45.2	2040	3.6	7.3	75.2	8.2
9	9/2019-30	2.9	40.7	11.2	7.7	32.6	85.9	45.1	2040	4.0	7.3	75.8	8.5
10	12/2019-16	3.1	40.2	11.5	7.7	32.6	85.2	46.2	2040	3.6	7.3	77.9	7.7
11	12/2019-18	3.3	41.4	10.6	7.5	31.8	85.0	44.5	2520	3.4	7.4	73.7	7.8
12	12/2019-28	3.1	40.3	11.4	7.7	31.8	86.2	43.5	2460	3.4	7.4	78.5	8.2
13	12/2019-29	3.2	40.6	11.2	7.7	31.8	83.3	43.5	2520	3.5	7.0	77.2	7.5
14	13/2019-17	3.5	40.7	10.5	7.2	31.3	84.0	43.6	2460	4.6	7.4	77.1	7.6
15	13/2019-27	3.2	40.9	12.5	8.7	31.5	85.8	44.3	2520	4.1	7.3	76.8	8.7
16	13/2019-30	3.3	41.3	11.9	8.4	32.8	85.4	45.4	2400	3.7	7.5	78.8	8.5
17	15/2019-12	3.0	40.5	10.6	7.2	32.2	85.4	45.0	2580	3.7	7.5	77.8	8.3
18	15/2019-13	3.4	40.6	11.0	7.5	32.3	85.0	42.5	2280	3.8	7.5	78.5	8.7
19	15/2019-26	3.4	40.2	11.4	7.7	32.2	84.4	45.5	2460	3.7	7.4	76.3	8.5
20	18/2019-28	3.0	41.1	11.5	8.0	31.7	85.8	44.4	2520	3.8	7.4	78.5	8.5
21	20/2019-4	3.0	40.8	10.9	7.5	32.7	86.2	45.5	2760	3.9	7.3	77.3	8.3
22	27/2019-24	3.1	41.4	11.2	7.9	33.4	84.2	45.5	2640	3.1	7.5	76.6	8.0
23	27/2019-27	3.2	40.6	10.8	7.4	32.5	84.5	43.9	2880	3.7	7.4	77.8	8.5
24	27/2019-30	3.3	40.7	11.9	8.2	33.0	86.0	45.7	2700	4.0	7.2	77.0	8.2
25	28/2019-9	3.1	41.5	11.7	8.3	32.8	85.5	43.0	2700	3.9	7.5	78.5	7.9
26	28/2019-12	3.6	40.3	11.2	7.6	31.7	86.8	42.7	2640	3.8	7.5	80.6	8.1
27	28/2019-20	3.1	40.7	10.2	7.0	32.3	84.8	45.5	2820	3.5	7.2	79.6	7.8
28	29/2019-3	3.4	40.9	10.4	7.2	33.4	86.1	43.7	2700	3.4	7.3	78.9	8.8
29	29/2019-13	3.5	41.8	12.6	9.0	34.0	85.9	46.5	2580	4.3	7.0	78.7	8.6
30	31/2019-25	2.9	40.2	12.5	8.4	31.3	86.3	44.0	2820	4.2	7.1	76.9	8.5
31	33/2019-13	3.4	40.6	12.9	8.8	32.1	85.5	43.9	2640	3.8	7.5	76.2	9.2
32	33/2019-23	3.3	40.6	11.7	8.0	33.1	85.7	45.1	2640	3.6	7.4	78.5	8.6
33	36/2019-25	3.3	41.0	11.9	8.3	32.4	85.8	45.1	2640	4.0	7.2	71.6	7.2
34	37/2019-6	3.2	40.5	11.2	7.6	32.4	85.0	46.9	2400	3.7	7.3	73.1	7.5
35	37/2019-8	3.1	40.9	11.5	8.0	32.7	85.0	46.5	2460	3.5	7.5	74.8	7.5
36	38/2019-10	3.0	40.9	10.6	7.3	31.3	84.8	44.0	2520	3.9	7.3	78.9	8.4
37	39/2019-4	3.1	40.0	11.7	7.8	32.8	85.8	46.3	2340	4.0	7.3	74.7	8.1
38	39/2019-9	3.0	39.4	12.0	7.8	32.9	86.7	48.2	2460	3.7	7.5	74.2	7.8
39	40/2019-29	3.5	40.1	11.4	7.6	31.6	84.0	45.1	2340	3.7	7.4	70.9	7.3
40	41/2019-19	2.8	42.1	11.2	8.1	32.2	85.6	46.4	2460	3.7	7.2	75.5	7.5
41	42/2019-4	2.9	40.5	11.1	7.6	31.3	85.8	44.0	2760	3.9	7.0	77.9	7.9
42	42/2019-10	2.8	39.7	10.6	7.0	32.0	84.2	44.0	2520	2.9	7.0	79.7	8.3
43	42/2019-31	3.4	40.8	12.4	8.5	31.9	86.0	45.0	2700	4.5	7.0	78.7	8.3
44	44/2019-4	3.2	40.0	12.5	8.3	32.8	86.6	44.6	2520	4.1	7.3	73.2	7.5
45	48/2019-11	2.9	40.8	11.9	8.2	32.0	86.3	45.1	2400	4.0	7.2	75.7	8.0
46	49/2019-16	2.8	40.3	10.3	7.0	32.6	86.0	44.1	2580	3.8	7.2	75.8	8.1
47	50/2019-9	2.9	40.4	11.2	7.6	31.6	85.0	42.5	2400	3.7	7.3	80.1	8.1
48	53/2019-10	3.4	41.8	11.4	8.2	31.8	85.4	43.3	2520	3.7	7.5	74.4	7.7
49	55/2019-6	3.2	40.7	11.1	7.6	33.0	86.0	43.8	2580	3.6	7.2	70.9	7.3
50	55/2019-10	2.8	41.4	10.6	7.5	32.6	85.1	43.3	2640	3.9	7.2	78.1	8.6
51	57/2019-8	3.3	42.0	10.6	7.7	32.4	85.0	45.3	2220	3.8	7.4	75.4	7.6
52	58/2019-13	2.9	41.2	10.6	7.4	32.0	85.1	42.7	2460	3.4	7.4	72.3	7.5
53	58/2019-21	3.0	41.5	11.7	8.3	31.9	84.3	45.4	2220	3.9	7.3	73.9	8.3
54	58/2019-28	3.5	41.7	11.7	8.4	33.2	-	-	2460	-	-	-	-
55	60/2019-13	2.9	40.5	10.6	7.2	32.4	85.4	46.4	2400	3.4	7.3	70.2	7.2
56	60/2019-25	3.0	40.3	10.9	7.4	31.6	86.1	45.5	2520	2.9	7.1	74.3	7.8
Mean of selected progenies		3.1	40.7	11.3	7.8	32.3	85.4	44.8	2465	3.8	7.3	75.9	8.0
Mean of Comparisons (Control)		3.0	40.5	11.9	8.1	32.1	85.6	46.0	2490	3.4	7.3	74.8	7.8
Standard error (SE)		0.029	0.085	0.086	0.066	0.079	0.106	0.165	28.45	0.043	0.021	0.387	0.069
Coefficient of variability(C V %)		7.1	1.6	5.7	6.3	1.8	0.9	2.8	8.6	8.4	2.2	3.8	6.5

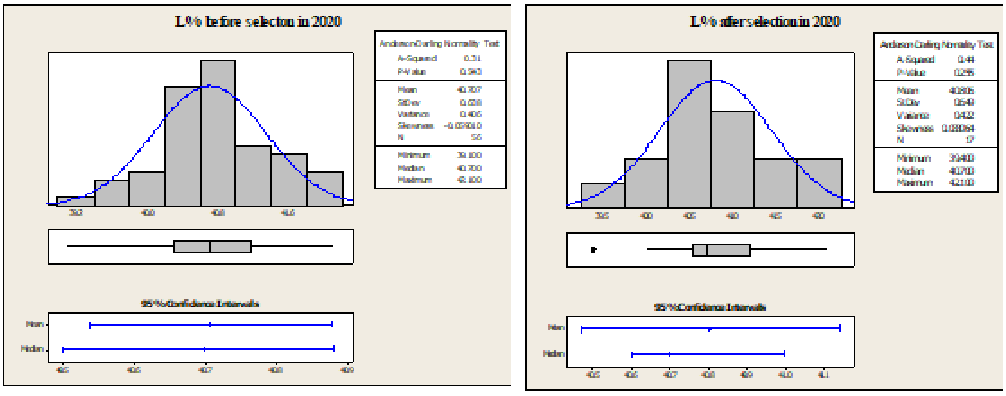

Fig.3. Frequency distribution curves for lint percentage in 2020.

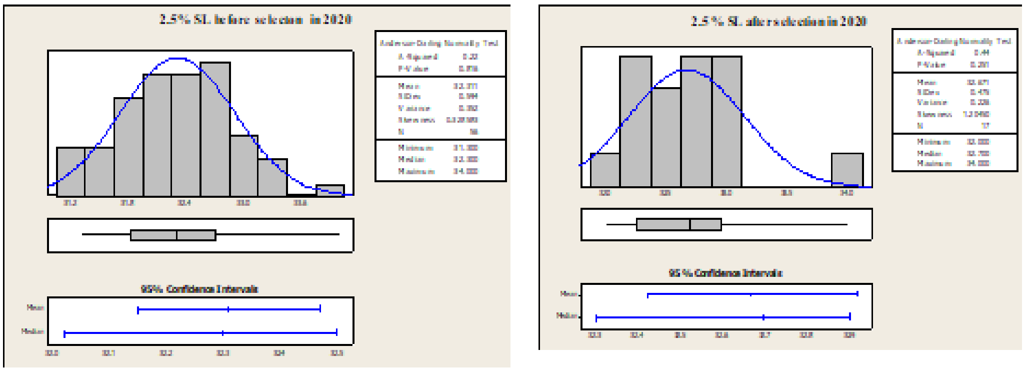

Fig.4. Frequency distribution curves for 2.5 % span length in 2020 .

Increase B (2021 season):

The 17 families selected in 2020 season were grown in 2021 season in number of rows according to seed quantity. These families were evaluated in yield trail with the latest three strains; Table 3 showed the mean values of these families for yield, yield components and fiber properties. It could be noticed that, the means of (increase B) exceeded the means of comparisons for SCY, LCY, SI, LI, 2.5 %SL, UI %, and Rd % and decrasad desarble value for MR and +b, indicating gene fixation along with improvement. Analysis of variance for yield and yield components showed there were significant differences between these families for SCY (kentar/feddan), LCY (k/f) and SI (P value > 0.05), also standard error was relatively low for all the studied traits. Coefficient of variability was low for all the studied traits, except for SCY k/f, LCY k/f, BW, MR and E% were relatively moderate to high, these results were agree with those obtained by Abdel-Al (1976), Lasheen (1997), El-Disouqui (2001), Nagib and Hemida (2001), Abd Al-Zaher (2004), Mohamed (2013), El-Dahan (2016), Heba (2016), Mahrous (2017), Soliman (2018), Mabrouk (2019) and Al-Hibbiny (2020).

Table 3. Means of yield, yield components and fiber properties of the 17 selected families (increases B) in 2021 growing season furnishing nucleolus in 2022 season.

No.	Selected progenies No.	SCY (k/f)	LCY (k/f)	BW (g)	L %	SI (g)	LI (g)	2.5 % SL (mm)	UI %	ST (g/tex)	YS	MR	E %	Rd %	+b
1	15/2019-12	9.93	12.34	3.4	39.5	12.6	8.2	33.3	88.0	41.3	2700	3.6	7.0	88.0	7.9
2	15/2019-26	8.78	10.93	3.2	39.5	12.8	8.4	35.9	90.5	45.8	-	4.0	5.4	76.8	8.8
3	20/2019-4	9.46	11.78	3.0	39.5	12.3	8.0	35.0	89.0	43.7	-	4.0	4.9	75.6	7.7
4	27/2019-27	9.25	11.51	3.1	39.5	12.6	8.2	35.2	86.1	47.9	2580	3.3	7.1	74.1	8.3
5	27/2019-30	8.57	10.74	3.1	39.7	12.5	8.3	34.4	87.4	43.5	2700	3.9	7.1	77.9	8.4
6	28/2019-9	8.38	10.40	3.1	39.4	13.3	8.6	34.5	87.8	39.5	-	4.0	6.1	74.5	7.8
7	28/2019-20	7.75	9.69	3.1	39.8	12.7	8.4	35.3	88.8	42.7	-	4.0	5.3	81.6	8.2
8	29/2019-13	8.04	10.01	3.4	39.4	12.7	8.2	34.5	87.8	43.7	2700	3.9	7.2	75.5	8.8
9	33/2019-23	7.66	9.64	3.5	40.0	12.9	8.6	35.7	87.8	44.4	-	4.1	5.1	80.0	8.3
10	36/2019-25	8.00	10.08	3.7	40.0	12.4	8.3	34.0	89.5	43.8	2700	4.2	7.2	78.8	8.2
11	37/2019-8	8.09	10.14	3.5	39.8	12.5	8.3	34.5	88.3	43.4	2735	4.2	5.2	79.4	8.7
12	39/2019-9	9.63	12.07	3.2	39.8	12.4	8.2	33.7	87.8	43.0	2600	4.1	6.0	81.7	8.1
13	41/2019-19	8.68	11.06	3.3	40.5	11.8	8.0	32.1	87.3	41.0	2460	4.0	7.1	77.5	8.3
14	44/2019-4	8.45	10.55	3.3	39.7	12.8	8.4	34.9	87.9	44.5	-	3.4	5.2	80.0	8.1
15	48/2019-11	8.81	11.14	3.6	40.1	12.2	8.2	34.1	86.5	41.1	2700	4.0	7.0	78.4	8.3
16	55/2019-6	8.08	10.21	3.4	40.2	11.7	7.9	32.8	86.5	40.4	2520	3.9	7.2	78.0	8.4
17	55/2019-10	8.76	11.10	3.7	40.4	12.4	8.4	33.8	88.5	44.3	2640	3.9	7.3	77.7	8.4
Mean of selected progenies		8.61	10.79	3.3	39.8	12.5	8.3	34.3	88.0	43.2	2640	3.9	6.3	78.6	8.3
Mean of comparisons (Control)		5.87	7.44	3.4	40.2	12.2	8.2	33.9	86.9	43.5	2740	4.0	7.1	77.8	8.7
Standard Error		0.160	0.196	0.053	0.083	0.093	0.047	0.243	0.268	0.503	26.80	0.061	0.228	0.798	0.076
Coefficient of variability		7.7	7.5	6.7	0.9	3.1	2.3	2.9	1.3	4.8	3.4	6.5	14.9	4.2	3.8
F-test		**	**	NS	NS	*	NS	-	-	-	-	-	-	-	-

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

Application of independent culling levels selection for (increase B) revealed 6 families were selected according to Super Giza 94 standard characteristics to form increase C. Table 4 presents the characters of the six-selected families. With the exception of BW, coefficient of variability (C V %) showed a decrease for all the studied traits, indicating the homogeneity among all selected families and with control in yield, yield components and fiber properties. Pure seeds of the 6 selected families were massed together to form increase C. This method in currently used for maintaining the purity of Egyptian cotton varieties is based on mixing progenies of several plants instead of progeny increase of one selected plant. Whereas, it was found advantageous to mix the seed of chosen progenies for the main reason, that the component progenies of a mixture may respond differently to seasonal and locality variations. If genotype x environment effects are strong, mixtures of seed might show less fluctuation in yield and quality than individual progenies, this discussion was compatible with Al-Didi (1974). Increase C was planted in an area of about 35 feddans. It was also propagated in 2023 as new nucleolus (breeder's seed) under the name of season (Super Giza 94 nucleolus/2023) in about 332 feddans at Ministry's farms. According to the concentric ring system, a different farm is chosen for Super Giza 94 within the geographical zone assigned to the variety. The field of the nucleus for Super Giza 94 is surrounded by the largest possible area of the next pure seed of the Super Giza 94. The whole area is subjected to a careful rogueing so that off-type plants in so far, they can be detected by visual examination are uprooted and removed. In the concentric ring system, the purity increases from outside to inside, and the inner ring, which is the nucleus, is the purest.

Table 4. Means of yield, yield components and fiber properties of the 6 selected families from increases B in 2021 growing season to form increase C of Super Giza 94 in 2022 season.

No.	Selected progenies No.	SCY (k/f)	LCY (k/f)	BW (g)	L %	SI (g)	LI (g)	2.5 % SL (mm)	UI %	ST (g/tex)	YS	MR	E %	Rd %	+b
1	27/2019-30	8.57	10.74	3.1	39.7	12.5	8.3	34.4	87.4	43.5	2700	3.9	7.1	77.9	8.4
2	29/2019-13	8.04	10.01	3.4	39.4	12.7	8.2	34.5	87.8	43.7	2700	3.9	7.2	75.5	8.8
3	36/2019-25	8.00	10.08	3.7	40.0	12.4	8.3	34.0	89.5	43.8	2700	4.2	7.2	78.8	8.2
4	37/2019-8	8.09	10.14	3.5	39.8	12.5	8.3	34.5	88.3	43.4	2735	4.2	5.2	79.4	8.7
5	39/2019-9	9.63	12.07	3.2	39.8	12.4	8.2	33.7	87.8	43.0	2600	4.1	6.0	81.7	8.1
6	55/2019-10	8.76	11.10	3.7	40.4	12.4	8.4	33.8	88.5	44.3	2640	3.9	7.3	77.7	8.4
Mean of selected progenies		8.52	10.69	3.4	39.9	12.5	8.3	34.2	88.2	43.6	2680	4.0	6.7	78.5	8.4
Mean of comparisons (Control)		5.87	7.44	3.4	40.2	12.2	8.2	33.9	86.9	43.5	2740	4.0	7.1	77.8	8.7
Standard Error		0.257	0.327	0.102	0.136	0.048	0.031	0.148	0.303	0.178	20.18	0.061	0.354	0.839	0.112
Coefficient of variability		7.4	7.5	7.4	0.8	0.9	0.9	1.1	0.8	1.0	1.8	3.8	12.9	2.6	3.3

Despite following this system, deterioration or genetic change may occur in cotton varieties in general cultivation through mechanical mixtures, natural crosses, mutations and natural selection. These results are like those obtained by Abdel-Bary and Bisher (1969), Abdel-Al (1976), El-Akkad *et al*., (1982), El-Kilany and Youssef (1985) and Al-Ameer (2014). Also, it is known that the 2023 season, which is the twenty-fourth generation of the cultivar Super Giza 94, and thus because of breeding and maintenance procedures, the variations due to major genes effects have been exhausted, but segregation of minor genes at a large number of loci with too small effects may occur. Thus, the gene frequency changes caused by selection pressure exerted by the breeder, and loss of heterozygosity (due to segregation of heterozygotes remaining even in the most highly bred varieties), could create some genetic modifications which considered the main reason for off-types plants appearance in the program. For these reasons continuous selfing and selection procedures carried out every season are considered essential in maintaining program to maintain genetic purity and eliminate any off-type plants from Super Giza 94 breeding population. The results are in agreement with those obtained by El-Dahan (2016) and Mabrouk (2019).

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تطبيق برنامج المحافظة على أصناف القطن في مصر لإنتاج بذرة المربي لصنف القطن سوبر جيزة 94 خلال الفترة من 2019 الي 2023م

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الملخص

يهدف هذا البحث إلى إتباع طريقة المحافظة على أصناف القطن في مصر لانتاج بذرة المربي تحمل الخصائص الوراثية لصنف القطن سوبر جيزة 94، أجريت هذه الدراسة خلال الفترة من 2019-2023م حيث تم انتخاب ستة وخمسين نباتاً تمثل طراز الصنف سوبر جيزة 94 تنتمي لأربعة أصول وهي 678 و682 و686 و696 المكونة للصنف سوبر جيزة 94 من حقل التربية موسم 2019 لتكون عائلات الأكثارات الأولية(أ). تم زراعة البذرة الذاتية لهذه النباتات المنتخبة في عدد من الخطوط بقدر ما سمحت به كمية البذرة مكونة اكثارات(أ) ذاتي موسم 2020. كما تم انتخاب سبعة عشر عائلة وفقا لصفات مكونات المحصول وخصائص التيلة لعائلات اكثارات(أ) ذاتي لتكوين اكثارات (ب). وتم زراعة البذرة الذاتية لكل عائلة من العائلات ال 17 في عدد من الخطوط بقدر ما تسمح به كمية البذرة مكونة اكثارات (ب) موسم 2021. كما تم زراعة البذرة الطبيعي لهذه العائلات مع أحدث 3 سلالات للصنف سوبر جيزة 94 (كمقارنة) في تجربة بنظام تصميم القطاعات الكاملة العشوائية في 4 مكررات. تم انتخاب أفضل ست عائلات من اكثارات (ب) طبقا لنتائج تجربة اختبار المحصول تمثل صنف القطن سوبر جيزة 94 وتم مزج بذور هذه العائلات مع بعضها لتكون اكثار(ج) وتم زراعتها في مساحة 35 فدان في موسم 2022. خلال موسم 2023 تم زراعة ناتج اكثار(ج) في مساحة 332 فدان بمزارع وزارة الزراعة لتكوين بذرة المربي تحت مسمي سوبر جيزة 94 نوية/2023. أوضحت النتائج أن إجراء عملية التلقيح الذاتي مع الانتخاب المستمر والتي تجري في كل موسم يعتبر ضروري للحفاظ على النقاوة الوراثية والتخلص من اي طرز مغايرة قد تظهر ببرنامج المحافظة على صنف القطن سوبر جيزة 94 نتيجة تأصيل الجينات الثانوية أو إعادة الاتحاد فيما بينها. كما أن هذه الطريقة المستخدمة حاليًا للمحافظة على النقاوة الوراثية لأصناف القطن المصري والتي تعتمد على مزج نسل عدة نباتات بدلاً من اكثار نسل نبات واحد منتخب تعتبر أكثر كفاءة للتغلب على التقلبات البيئية في المحصول وصفات الجودة.