Yield and Yield Components as Affected by Delaying Sowing Dates in Some Egyptian Cotton Varieties

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ABSTRACT: This investigation was carried out by Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Alexandria Egypt, during 2018 and 2019 seasons to study the effect of delaying of sowing dates on yield and yield components of Egyptian cotton varieties Giza 86, Giza 92 and Giza 94, Five late sowing dates were used i.e.: 15th, 28thApril, 7th, 17thand 27th May in 2018 season and 15th, 25th April, 8th, 18th and 29th May in 2019 season, respectively. The experiments were conductat Sakha Agriculture Research Station, Agriculture Research Center, Egypt. A split plot design with three replicates were used. Results showed that the highest mean values were recorded by Giza 94 (A3) for boll weight, number of bolls per plant, seed cotton yield per plant, seed cotton yield per feddan, lint cotton yield per plant, lint cotton yield per feddan, lint percentage and seed index in 2018 and 2019. For sowing dates, the highest mean values were attained from first sowing date (B1) for number of bolls per plant, seed cotton yield per plant, seed cotton yield per feddan, lint cotton yield per plant, lint cotton yield per feddan and seed index in both seasons. In addition there were significant interaction effect between cotton varieties and sowing dater for all studied characters.

The results also cleared that the least affected cultivar by planting dates was (Giza 94) cotton variety and the most affected cultivar by delaying sowing dates for yield and yield component was (Giza 92) cotton variety. From the afore mentioned results, (Giza 94) can be planted in the regions of delayed planting dates.

Keywords: Cotton – *Gossypium* spp. – Sowing dates – Varieties– Yield and yield components

INTRODUCTION

Cotton an international agricultural commodity of which quality and quantity are subject to various whines of nature, occupies an important position in global status of commercial crops with annual impact of about >50 billion dollars in worlds economy **(OECD)/FAO, 2019)** the lint quality in general and particularly seed cotton yield is highly sensitive to climatic conditions.

Sustainable cotton production in the future will depend on the development of cotton varieties with higher yield potential and quality of seed cotton as well as better Tolerance to biotic and abiotic stresses **(Aiken 2006).**The sowing time of cotton plays important rolein obtaining better seed cotton yield in a country where the climatic conditions. Vary **Saraz, (2008), Soomro et al., 2000and Usman and Ayatullah (2016)** stated that sowing time of cotton crop plays main role in cotton production through its effect onvegetative and reproductive phases and thus total duration of crop. To decide the best time of cultivation in a specific area can often be complex. Seed cotton and fiber quality parameters could be assessed by sowing at different late sowing times.

In Egypt, the cotton farmers got used to delay sowing of cotton to April and the first of May in order to take one or two extra cuts from Egyptian clover and large areas are planted now withe beans and wheat in competition with cotton and other summer crops. This delay in cotton sowing was always accompanied by a significant decrease in seed cotton yield and cotton fiber quality with different magnitudes which changed according to cotton genotypes. **Ebaid*et al.*(1988)**,studied delay in sowing date of cotton and they found that the number of open bolls/plant, boll weight, lint percentage and seed index were not significantly affected by sowing date however, early sowing date increased seed cotton yield by 13 to 14 % compared with the late sowing date.**Ali and El Sayed (2001),** recorded that the early sowing date (25 march) significantly increased number of open bolls per plant, boll weight, seed index, lint percentage, the number of days to the first flower, days to first opening boll seed cotton yield/plant and seed cotton yield/feddan. However, plant height was not significantly affected by sowing date. **Gadallah(2002)**, concluded that delaying cotton sowing from 20 march to 25 April was accompanied by a gradual decrease in plant height,

seed cotton yield/plant, seed cotton yield was decreased by 38.91 and 63.16% when delaying cotton sowing to 10 and 25April. When we compared with first sowing date at 20 March in both seasons. The average was 33.91 and 55.57% regarding fiber length at 2.5% span length and uniformity ratio. Also, the Presley index decreased with delaying sowing date of cotton. In addition, lint percentage and seed index responses were distinctive, where both traits increased when cotton was sown late. **Hayatulla*et al.* (2011)**, showed that, sowing cotton on 25 April significantly increased fiber traits compared tolate sowing on 15 May. **Emera (2012),** cleared that sowing date hadsignificant effects on all growth parameters such as; number of bolls/plant, boll weight, seed index and seed cotton yield/feddan, while sowing date didn't exhibit any significant effect on lint percentage, number of opening bolls/plant, boll weight, seed index and seed cotton yield/feddan, on the other side, sowing date didn't appear to had any significant effecton lint percentage. Also, he cleared that Giza 86 cotton variety gave a significant increase in all growth traits, boll weight, seed index, number of open bolls/plant and seed cotton yield/feddan due to earliness in sowing date (30 march)but, had no significant effecton lint percentage compared with the late sowing date on 30 April. **Elayon*et al.*(2013),** studied and evaluated three sowing dates (25 March, 25 April and 25May) and the results showed that sowing date had significant effects on plant growth traits, yield and yield components. Also, they cleared that, delaying sowing recorded that significant increase in plant height, number of days to opening first flower, but the results indicated that sowing cotton on 25 March was superior in seed index and seed cotton yield Kentar/feddan.**Ali and EL-Sayed(2001)**, reported that the Egyptian cotton cultivarGiza 88 recorded a significant increase in number of open bolls/plant, seed index, lint percentage, boll weight and number of days to opening first flower, seed cotton yield/plant and seed cotton yield/feddan in early sowing dates. **EL sayed and EL Menshawi(2011),** found that Giza 88 variety recorded a significant decrease in seed cotton due to late sowing date at the last week of April. **EL – Zeky*et al.*(2007),** stated that, the Egyptian cotton variety Giza 86 showed a significant decrease in boll weight, lint percentage, number of open bolls/plant, seed cotton yield/plant and seed cotton yield/feddanas the result of late sowing date.

The objective of this present investigation was to determine the effect of delaying sowing dates on yield and yield components of three Egyptian cotton varieties.

MATERIALS AND METHODS

This investigation was carried out by Plant Production Department, Faculty of Agriculture (Saba Basha), Alexandria University, Alexandria Egypt, during 2018 and 2019 seasons to study the effect of delaying sowing dates on yield and yield components of threeEgyptian cotton varieties. The experiments were conduct at Sakha Agriculture Research Station, Agriculture Research Center, Egypt. The design of the experiment was split plot design with three replicates the experimental plot size was 2.1 x 5 m (10.5 m2). Three Egyptian cotton varieties (factor A) were allocated to the main plots and five sowing dates (Factor B) were allocated to the sub plots. The treatments details are as follows:

Factor A (three Egyptian cotton varieties):

A_1 = Giza 86
A_2 = Giza 92
A_3 = Giza 94

Factor B (five sowing dates)

B_1= the first sowing date in 15th and 16thApril in 2018 and 2019 seasons,respectively.
B_2= the first sowing date in 27th and 25th April in 2018 and 2019 seasons, respectively.
B_3= the first sowing date in 7th and 8th May in 2018 and 2019 seasons,respectively.
B_4= the first sowing date in 17th and18th May in 2018 and 2019 seasons,respectively.
B_5= the first sowing date in 27th and28th May in 2018 and 2019 seasons,respectively.

The chemical fertilizers were applied atthe recommended doses by the Ministry of Agriculture and Land Reclamation. Nitrogen fertilizer was applied in the form of urea (46%) in two doses, the first dose was added at the first irrigation and the second dose was added before the second irrigation. phosphorus fertilizer was applied in the form of (18% P2O5) and was applied to the soil at the time of sowing. Potassium fertilization was added as foliar fertilizer in the form of Potesin F. The row spacing was 70 cm apart and the distance between hills was 30 cm. All cultural practices were performed as recommended by the Ministry of Agriculture and Land Reclamation. Ten plants from each sub plot were chosen at random to measure the studied characters. These plants were tagged and numbered separately. Data were recorded for the following parameters:

The studied characters were:

1. Boll weight (BW gm.)
2. Number of bolls per plant (No. B/P)
3. Seed cotton yield per plant (gm) (SCY/P)
4. Seed cotton yield per feddan(SCY kentar/feddan).
5. Lint cotton yield per plant (gm.) (LCY/P).
6. Lint cotton yield (LCY kentar/feddan).
7. Lint percentage (L %)
8. Seed index (gm.) (SI).

The data collected were subjected to statistical analysis of variance according to Gomez and Gomez (1984)and Duncan multiple range values were used to test the differences between treatment means. The statistical analyses was performed using MSTAT-C computer statistical software, M-stat c (1986).

RESULTS AND DISCUSSION

The mean squares of the analyses of variance and means of the studied characters ofthe three cotton varieties and five sowing dates and the interaction between them for yield and yield components are presented as follows.

Boll weight (BW gm) and number of bolls per plant (No. B/P):

The mean squares of boll weight and number of bolls per plant are presented at Table (1). The results showed highly significant effect due to the three Egyptian cotton varieties (factor A) and sowing dates (factor B) in the two seasons 2018 and 2019, respectively. In addition, the results also cleared that the interaction between cotton varieties and sowing dates (A x B) was highly significant for boll weight (BW) and significant for number of bolls per plant (No. B/P) in both seasons. These results are in agreement with those obtained by **Ali and EL-Sayed (2001),Elayon*et al* (2008) and EL-Sayed and EL-Menshawi (2011).**

Table (1): Mean squares of boll weight and number of bolls per plant for2018 and 2019 seasons

S.O.V.	d.f.	Boll weight		Number of bolls/ plant	
		2018	2019	2018	2019
Rep.	2	0.033	0.003	0.894	0.781
Factor (A)	2	1.021**	2.770**	42.426**	14.062*
Error A	4	0.016	0.005	1.116	0.868
Factor (B)	4	0.506**	0.238**	23.439**	33.027**
A x B	8	0.134**	0.034**	1.339*	1.914*
Error (B)	24	0.026	0.006	1.556	0.855

Factor A= cotton varieties, Factor B= sowing dates
***, **Significant at 0.05 and 0.01 levels of probability, respectively.**

The mean performance of the three Egyptian cotton varieties, five sowing dates and the interaction between them for boll weight (BW) and number of bolls per plant (No. B/P) are presented in Table (2). The results showed that (A3) Giza 94 variety gave the highest mean values for boll weight (3.41 and 3.48 gm) and number of bolls per plant(12.78 and 11.94) in 2018 and 2019 seasons, respectively. On the other hand, the lowest mean values were recorded by Giza 92 for boll weight(2.95 and 2.66 gm) and number of bolls per plant (9.47 and 10.04) in both seasons, respectively. These results are in agreement with those of **Ali and EL-Sayed (2001); Gadullah (2002); EL-Sayed and EL-Menshawi (2005) and Elayon*et al* (2008).**

As for the effect of sowing dates on boll weight (BW)and number of bolls per plant the results cleared that the highest mean values for boll weight were recorded by the second sowing date (B2) with the mean values of (3.36 and 3.20 gm) while the lowest mean values were recorded by the last sowing date (B5) with mean values of (2.76 and 2.79 gm) in2018 and 2019, respectively. Likewise, the first sowing date (B1) recorded the highest mean values for number of bolls per plant with the mean values of(13.40 and 13.49 bolls/plant), respectively. While, the lowest mean values were given by the last sowing date (B5) with the mean values of (9.08 and 8.27 bolls/ plant), in the two seasons, respectively. These results are in agreement with those of **Ali and EL-Sayed (2001); EL-Sayed and EL-Menshawi (2005); Elayon*et al.* (2008.); Pettigrew *et al.*(2009) and Hayatallah*et al.*(2011).**

For the interaction (A x B) the results cleared that the highest mean values for boll weight were recorded by (A3 x B3 in 2018 and A3 x B2 in 2019 seasons with the mean values of(3.64 and 3.73 gm), respectively, while the lowest mean values were given by the interaction A2 x B5 with the mean values of (2.29 and 2.44 gm) in 2018 and 2019, respectively. For the number of bolls per plant (No.B/P). The results cleared that the highest interaction mean values were recorded by A3x B1 in 2018 and A1 xB1 in 2019 with the mean values of (14.34 and 14.22), respectively, while, the lowest interaction values was recorded by (A2 x B4) in (2018 and (A2 x B5) in2019 with the mean values of(7.86 and 6.87 bolls/Plant), respectively. These results are in agreement with those of **Ali and EL-Sayed (2001); Gadullah (2002); EL-Sayed and EL-Menshawi (2005 and 2011) and Elayon*et al.*(2013).**

Table (2):The mean performances of three Egyptian cotton varieties, five sowing dates and their interactions for boll weight and number of bolls per plant for 2018 and 2019 seasons

Variable		Boll weight (gm)		Number of bolls/ plant	
		2018	2019	2018	2019
Cotton varieties (A)					
Giza 86 (A_1)		2.98 b	2.84b	10.60 b	10.64b
Giza 92 (A_2)		2.95 b	2.66c	9.47 c	10.04b
Giza 94 (A_3)		3.41 a	3.48a	12.78 a	11.94a
Sowing dates (B)					
First sowingdate	**(B_1)**	3.17 bc	3.08b	13.40 a	13.49a
Second sowingdate	**(B_2)**	3.36 a	3.20a	11.32 b	11.40 b
Third sowingdate	**(B_3)**	3.27 ab	3.01b	10.86 bc	11.17b
Fourth sowingdate	**(B4)**	3.01 c	2.88c	10.09 cd	10.04c
Fifth sowingdate	**(B5)**	2.76 d	2.79d	9.08 d	8.27 d
Interaction (A x B)					
A_1 x B_1		3.18cd	3.00de	13.53ab	14.22a
A_1 x B_2		3.08 cdef	3.07d	11.25de	10.79de
A_1 x B_3		3.08cdef	2.87ef	10.36de	10.54de
A_1 x B_4		2.88efg	2.69gh	9.44efg	9.56efg
A_1 x B_5		2.67g	2.57hi	8.40gh	8.11gh
A_2 x B_1		3.06def	2.87f	12.34ab	12.84ab
A_2 x B_2		3.48ab	2.82fg	9.56cde	11.01cde
A_2 x B_3		3.09cde	2.61h	9.46cde	10.93cde
A_2 x B_4		2.82fg	2.58h	7.86fg	8.56fg
A_2 x B_5		2.29h	2.44i	8.14h	6.87h
A_3 x B_1		3.26bcd	3.37c	14.34a	13.39ab
A_3 x B_2		3.52ab	3.73a	13.16bc	12.41bc
A_3 x B_3		3.64a	3.55b	12.75bcd	12.04bcd
A_3 x B_4		3.34bc	3.37c	12.96bcd	12.02bcd
A_3 x B_5		3.31bcd	3.38c	10.69ef	9.83ef

In the same column, under the same trait, means followed by the same letter are not significantly different according to Duncan's Multiple Range test, DMRT.

Seed cotton yield gram per plant (SCY/P) and seed cotton yield kentar per fed (SCY /fedd.):

The mean square of seed cotton yield per plant (SCY/P) and seed cotton yield per faddan (SCY/feddan) were calculated and the results are presented in Table (3). The results cleared highly significant effect among all three Egyptian cotton varieties (factor A) and sowing dates (Factor B) for the above two studied traits. The results also showed that the interaction between Egyptian cotton varieties and sowing dates (A x B) were significant for the two studied traits, these results are in agreement with many other, among them **Ali and EL-Sayed (2001); Arian *et al.*(2001);Akhtar *et al.* (2002); Aiken (2006) and Emara (2012).**

Table (3): Mean squares of seed cotton yield per plant and seed cotton yield per feddan for 2018 and 2019 seasons

S.O.V.	d.f.	Seed cotton yield/plant		Seed cotton yield/fedd.	
		2018	2019	2018	2019
Rep.	2	3.943	6.033	0.337	0.515
Factor (A)	2	978.7**	857.32**	83.78**	73.383**
Error A	4	3.465	5.111	0.296	0.434
Factor (B)	4	389.16**	425.84**	33.313**	36.430**
A x B	8	23.534*	21.265**	2.013*	1.817**
Error (B)	24	9.031	6.032	0.774	0.515

Factor A= cotton varieties, Factor B= sowing dates
*, **Significant at 0.05 and 0.01 levels of probability, respectively

The date for seed cotton yield per plant and seed cotton yield per feddan are presented in Table (4). there were highly significant differences between the three cotton varieties and the highest mean values for the seed cotton yield per plant was recorded for Giza 94 (43.53 and 41.50 gm/plant),and (12.73 and 12.14 Kent/feddan)for seed cotton yield per feddan in2018 and 2019 seasons, respectively. On the other hand the lowest mean values for seed cotton yield per plant(28.04 and 27.01 gm/plant) and seed cotton yield per feddan(8.20 and 7.90 Kent./feddan) were given by Giza 92 (A2) in 2018 and 2019 seasons, respectively. These results in agreement with of **Ali and EL-Sayed (2001); EL-Sayed and EL-Menshawi (2005); Elayon*et al.*(2008) and Hayatallah*et al.*(2011).**

Results in Table (4) showed highly significant differences between the five sowing dates. The results cleared that the highest mean values for seed cotton yield per plant were recorded by the first sowing date (B1) with the mean values of (42.43 and 41.52 gm per plant), while the lowest mean values for the same traits were given by the last sowing date (B5) with the mean values of(25.45 and 23.57 gm/plant)in both seasons, respectively. In addition the highest mean value for the seed cotton yield per feddan (12.41 and 12.15 kentar/feddan) were given by the first sowing date (B1) and the lowest mean values were recorded by (B5) with the mean values of (7.45 and 6.90 kentar/feddan) inseasons2018 and 2019 seasons, respectively. These results are in agreement with many researchers i.e.: **Ali and EL-Sayed (2001); Gadullah (2002); EL-Sayed and EL-Menshawi (2005); Emara (2012) and Elayon*et al.*(2013).**

The result for the interaction between factors A and B showed that the highest mean values for these traits were given by (A3 x B1) with the mean values of (46.65 and 45.00 gm/plant) for seed cotton yield / plant and (13.65 and 13.17 kentar/feddan) for seed cotton yield/feddan in 2018 and 2019 seasons, respectively. While the lowest mean values for seed cotton yield/plant (gm) and seed cotton yield/feddan were given by (A2 x B5) with the mean values of (18.56 and 16.73 gm/plant) for seed cotton yield/plant and (5.43 and 4.90 kentar/feddan) for seed cotton/feddan in both seasons, respectively as shown in Table (4). These results agreed with these of many researchers i.e.: **Hassan *et al* (2003); EL-Sayed and EL-Menshawi (2005); Elayon (2008); Pettigrew *et al.* (2009) and Hayatallah*et al.*(2011).**

Table (4): The mean performances of three Egyptian cotton varieties; five sowing dates and their interactions for seed cotton yield per plant and seed cotton yield per feddan for 2018 and 2019 seasons

Variable	Seed cotton yield/plant (Gm)		Seed cotton yield/feddan (Kentar)	
	2018	2019	2018	2019
Cotton varieties (A)				
Giza 86 (A_1)	31.81 b	30.52b	9.31 b	8.93b
Giza 92 (A_2)	28.04 c	27.01c	8.20 c	7.90c
Giza 94 (A_3)	43.53 a	41.50a	12.73 a	12.14a
Sowing dates (B)				
First sowing date (B_1)	42.43 a	41.52a	12.41 a	12.15a
Second sowing date (B_2)	38.10 b	36.75b	11.14b	10.75b
Third sowing date (B_3)	35.59 b	33.82c	10.41 b	9.89c
Fourth sowing date (B_4)	30.74 c	29.40d	8.99 c	8.60d
Fifth sowing date (B_5)	25.45 d	23.57e	7.45 d	6.90e
Interaction (A x B)				
A_1 x B_1	42.95a	42.72ab	12.56a	12.50ab
A1 x B2	34.60bc	33.07de	10.12bc	9.67de
A1 x B3	31.91cde	30.31ef	9.33cde	8.86ef
A1 x B4	27.17ef	25.70gh	7.95ef	7.52gh
A1 x B5	22.45fg	20.81ij	6.57fg	6.09ij
A2 x B1	37.68b	36.85cd	11.02b	10.78cd
A2 x B2	33.29bcd	31.02ef	9.74bcd	9.07ef
A2 x B3	28.82de	28.47fg	8.43de	8.33fg
A2 x B4	21.86g	21.98hi	6.39g	6.43hi
A2 x B5	18.56g	16.73j	5.43g	4.90j
A3 x B1	46.65a	45.00a	13.65a	13.17a
A3 x B2	46.41a	46.16a	13.58a	13.50a
A3 x B3	46.05a	42.69ab	13.47a	12.49ab
A3 x B4	43.18a	40.50bc	12.63a	11.85bc
A3 x B5	35.36bc	33.17de	10.34bc	9.71de

In the same column, under the same trait, means followed by the same letter are not significantly different according to Duncan's Multiple Range test, DMRT.

Lint cotton yield gram per plant (LCY/P) and lint cotton yield kentar/feddan(LCY/fed.)

The mean squares of lint cotton yield/plant and lint cotton yield/feddan in 2018 and 2019 seasons are presented in Table (5). The results showed highly significant difference between the three Egyptian cotton varieties (A) and the five sowing dates (B), while, the interaction between them (A x B) for the same traits was significant in both season 2018 and 2019. These results are in agreement with of**; Gadullah (2002); Hassan *et al.*(2003); Emara (2012); and Wenqing*et al.*(2012).**

Table (5):Mean squares of lint cotton yield per plant and lint cotton yield per feddan for 2018 and 2019 seasons

S.O.V.	d.f.	Lint cotton yield/plant		Lint cotton yield/feddan	
		2018	2019	2018	2019
Rep.	2	0.15	0.271	0.129	0.23
Factor (A)	2	192.38**	190.623**	161.50**	159.97**
Error A	4	0.334	0.533	0.285	0.446
Factor (B)	4	41.69**	47.380**	35.037**	39.802**
A x B	8	2.645*	2.282*	2.213*	1.921*
Error (B)	24	1.3	0.889	1.09	0.746

Factor A= cotton varieties, Factor B= sowing dates
*, **Significant at 0.05 and 0.01 levels of probability, respectively

The mean values of the three Egyptian cotton varieties (factor A), five sowing dates (factor B) and their interaction for lint cotton yield / plant (g) and lint cotton yield (Kentar/feddan)are presented in Table (6). The results showed that the highest mean values were recorded by A3 (Giza 94) with the mean values of(16.86 and 16.51 g/plant)for lint cotton yield / plant, and (15.45 ad 15.13 kentar/fedd.) for lint cotton yield/feddan in 2018 and 2019 seasons, respectively. While, the lowest mean values were given by A2 (Giza 92) with the mean values of (9.84 and 9.64 g/plant) for lint cotton yield / plant, and (9.02 ad 8.83 kentar/feddan) for lint cotton yield/feddan in both season, respectively.

Concerning sowing dates effect, the results cleared that the highest mean values were recorded by the first sowing date (B1) with the mean values of(15.66 and 15.51 gm/plant)for lint cotton yield per plant, and (14.35 ad 14.21 kentar/feddan) for lint cotton yield per feddan in 2018 and 2019 seasons, respectively, but the lowest mean values were given byB5 with the mean values of (9.96 and 9.43 gm/plant) for lint cotton yield per plant, and (9.13 ad 8.64 kentar/feddan) for lint cotton yield per feddan in both season, respectively.

On the other hand, the interaction (A x B) for these traits cleared that the highest mean values were recorded by (A3 x B1) and (A3 x B2) with the mean values (18.04 and 18.22 gm/plant) for lint cotton yield per plant, and (16.53 and 16.70 kentar/feddan) for lint cotton yield per feddan in 2018 and 2019 seasons, respectively. On the other hand, the lowest mean values were recorded by (A2 x B5) with the mean values of (6.86 and 6.25 gm/plant) for lint cotton yield per plant, and (6.29 and 5.73 kentar/feddan) for lint cotton yield per feddan in both seasons, respectively. These results are in agreement with of researchers **Ali and EL-Sayed(2001); Gadullah (2002); EL-Sayed and EL-Menshawi (2011); Emara(2012) and Elayon*et al* (2013).**

Table (6): The mean performances of three Egyptian cotton varieties; five sowing dates and their interactions for lint cotton yield per plant and lint cotton yield per feddan for 2018 and 2019 seasons

Variable	Lint cotton yield/plant (gm)		Lint cotton yield/feddan (kentar)	
	2018	2019	2018	2019
Cotton varieties (A)				
Giza 86 (A_1)	12.10 b	11.43b	11.09b	10.48b
Giza 92 (A_2)	9.84 c	9.64 c	9.02c	8.83c
Giza 94 (A_3)	16.86 a	16.51 a	15.45a	15.13a
Sowing dates (B)				
First sowing date (B_1)	15.66 a	15.51a	14.35a	14.21a
Second sowing date (B_2)	13.95b	13.66b	12.78b	12.52b
Third sowing date (B_3)	13.23b	12.64 c	12.12b	11.58c
Fourth sowing date (B_4)	11.87c	11.39d	10.88c	10.44d
Fifth sowing date (B_5)	9.96 d	9.43e	9.13d	8.64e
Interaction (A x B)				
A_1 x B_1	15.83bc	15.49c	14.51bc	14.20g
A_1 x B_2	12.71def	11.94ef	11.65def	10.95ef
A_1 x B_3	12.02efg	11.18fg	11.01efg	10.24fg
A_1 x B_4	10.88fgh	10.09g	9.97fgh	9.25g
A_1 x B_5	9.05hi	8.46h	8.30hi	7.75h
A_2 x B_1	13.11de	13.07de	12.01de	11.98de
A_2 x B_2	11.38efg	10.81fg	10.43efg	9.91fg
A_2 x B_3	10.15gh	10.20g	9.30gh	9.35g
A_2 x B_4	7.72ij	7.85h	7.08ij	7.20h
A_2 x B_5	6.86j	6.25i	6.29j	5.73i
A_3 x B_1	18.04a	17.97ab	16.53a	16.46ab
A_3 x B_2	17.76a	18.22a	16.27a	16.70a
A_3 x B_3	17.52ab	16.54bc	16.06ab	15.16bc
A_3 x B_4	17.01ab	16.24c	15.58ab	14.88c
A_3 x B_5	13.97cd	13.58d	12.79cd	12.45d

In the same column, under the same trait, means followed by the same letter are not significantly different according to Duncan's Multiple Range test, DMRT.

Lint percentage (L %) and seed index (SI) :

Mean squares of lint percentage and seed index in 2018 and 2019 season, are presented in Table (7). The results showed highly significant different between the Egyptian cotton varieties (factor A) and sowing days (factor B) for the two traits in 2018 and 2019 seasons., in addition the interaction between factor (A and factor B) was significant for the same traits in 2018 and 2019 seasons. These results are in agreement with those obtained by EL-Sayed and EL- Menshawi (2005) and (2011); Hayatallah*et al.*(2011) and Emara (2012).

Table (7):Mean squares of lint percentage and seed index for 2018 and 2019 seasons

S.O.V.	d.f.	Lint percentage		Seed index	
		2018	2019	2018	2019
Rep.	**2**	0.051	0.029	0.365	0.08
Factor (A)	**2**	13.315**	9.983**	13.23**	3.884**
Error A	**4**	0.114	0.021	0.259	0.028
Factor (B)	**4**	0.505**	0.257*	5.490**	4.492**
A x B	**8**	0.515**	0.187*	0.537*	0.082*
Error (B)	**24**	0.077	0.087	0.166	0.098

Factor A= cotton varieties, Factor B= sowing dates

*, **Significant at 0.05 and 0.01 levels of probability, respectively

The mean values of the three Egyptian cotton varieties five sowing dates and the interaction between them for lint percentage (L %) and seed index in 2018 and 2019 seasons are presented in Table (8).

For lint percentage, the results cleared highly significant differences among all studied Egyptian cotton varieties and the highest mean values were recorded by A3 (Giza 94) with the mean values of(38.78 and 39.85%)in 2018 and 2019 seasons, respectively, also, the lowest mean values were given by A2 (Giza 92) with the means of(35.31 and 35.87 %) at the two studied season, respectively. For sowing dates (factor B) the results showed that the highest mean value was recorded by B5 and B4 in 2018 season and by B5 in 2019 season, with the mean values (38.28,38.94 and 39.66 %), respectively. Also, the results

showed that the lowest mean value was recorded by B1, B2 and B3 in 2018 and 2019 seasons, with the mean values of (36.78, 36.38, 36.98, 37.21, 36.81 and 37.18%), respectively. Also, the results for the interaction between (A x B) cleared that the highest mean values was found for (A1 xB4 and A1 x B5) in 2018 season and by (A3 x B5) in 2019 season with the mean values of (40.06, 40.30 and 40.95), respectively. While, the lowest interaction was given by (A2x B1, A2 x B2, A2x B3 and A2xB4) with insignificant differences between them in 2018 and 2019 seasons. These results are in agreement with many researchers i.e.: **Ali and EL-Sayed (2001); Gadullah (2002); EL-Zeky*et al.*(2007);Hayatallah*et al.*(2011) and Emara (2012).**

Regarding character of seed index, the results showed that the highest mean values were recorded by A3 (Giza 94) with the mean values of(11.48 and 10.57gm), also, the lowest mean values were given by G86 and G92 varieties with the mean value of(9.81, 9.91, 9.71 and 9.68),in 2018 and 2019 seasons, respectively. Also, the results for factor B showed highly significant differences among all studied sowing dates, and the highest seed index (SI) value was recorded by the first sowing date (B1) with the mean values of(11.19 and 10.62 gm) in 2018 and 2019 seasons, respectively. While, the lowest mean values of seed index were given by the last sowing date (B5) with the mean values of (9.23 and 8.95 gm) in 2018 and 2019 seasons, respectively. For the interaction (A x B) the results cleared that the highest means of seed index were recorded by (A3x B1) with the man values of (12.84 and 11.46 gm) in 2018 and 2019 seasons, respectively. But the lowest mean values were given by (A2 x B5) in 2018 season and (A1 x B5) in 2019 season with the mean values of(8.99 and 8.64 gm), respectively. These results are in agreement with those of **Ali and EL-Sayed (2001); Gadullah (2002); EL-Sayed and EL-Menshawi (2005); Elayon*et al* 2008; Emara (2012) and Elayon*et al* (2013).**

Table (8): The mean performances of three Egyptian cotton varieties; five sowing dates and their interactions for lint percentage and seed index for 2018 and 2019 seasons

Variable	Lint percentage		Seed index (gm)	
	2018	2019	2018	2019
Cotton varieties (A)				
Giza 86(A_1)	38.33a	37.84b	9.81 b	9.71 b
Giza 92(A_2)	35.31b	35.87c	9.91 b	9.68 b
Giza 94(A_3)	38.78a	39.85a	11.48 a	10.57 a
Sowing dates (B)				
First sowing date (B_1)	36.78b	37.21c	11.19a	10.62 a
Second sowing date (B_2)	36.38b	36.81c	10.88 ab	10.53 ab
Third sowing date (B_3)	36.98b	37.18c	10.67 b	10.25 b
Fourth sowing date (B_4)	38.28a	38.38b	10.04 c	9.59 c
Fifth sowing date (B_5)	38.94a	39.66a	9.23 d	8.95d
Interaction (A x B)				
A_1 x B_1	36.86fg	36.25def	10.17cdef	10.15cd
A_1 x B_2	36.76g	36.15def	10.22cdef	10.43bc
A_1 x B_3	37.68defg	36.90de	9.96def	10.01cd
A_1 x B_4	40.06a	39.28c	9.71ef	9.31f
A_1 x B_5	40.30a	40.63ab	9.00gh	8.64h
A_2 x B_1	34.80h	35.48fg	10.56cd	10.26cd
A_2 x B_2	34.13h	34.81g	10.32cde	10.25cd
A_2 x B_3	35.17h	35.85efg	10.05def	9.86de
A_2 x B_4	35.39h	35.77efg	9.62fgh	9.26fg
A_2 x B_5	37.03efg	37.41d	8.99h	8.77gh
A_3 x B_1	38.67bcd	39.90abc	12.84a	11.46a
A_3 x B_2	38.25bcde	39.48bc	12.11b	10.90b
A_3 x B_3	38.09cdef	38.80c	12.00b	10.87b
A_3 x B_4	39.39abc	40.10abc	10.79c	10.20cd
A_3 x B_5	39.49ab	40.95a	9.68efg	9.44ef

In the same column, under the same trait, means followed by the same letter are not significantly different according to Duncan's Multiple Range test, DMRT.

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الملخص العربى

المحصول ومكوناته وتأثرهما بالتأخير فى مواعيد الزراعة لبعض أصناف القطن المصري

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اجريت هذه الدراسة بقسم الإنتاج النباتى كلية الزراعة سابا باشا جامعة الأسكندرية لدراسة تأثير التاخير في مواعيد الزراعة علي المحصول ومكوناته في بعض اصناف القطن المصري، حيث استخدم ثلاثة اصناف من القطن المصرى هي: جيزة 86 وجيزة 92 وجيزة 94 وذلك تحت خمسة مواعيد زراعة مختلفة خلال موسمين زراعة وهي 15 و 28 ابريل و 7 و 17 و 27 مايو 2018 موسم وكذلك في 15 و 25 ابريل و 8 و 18 و 29 مايو موسم 2019 . وتم تنفيذ التجربة بمحطة البحوث الزراعية بسخا بمركز البحوث الزراعية. وكانت الصفات المدروسة هي متوسط وزن اللوزة (جم) و متوسط عدد اللوز المتفتح للنبات و متوسط محصول القطن الزهر للنبات (جم) و متوسط محصول القطن الزهر بالقنطار للفدان و متوسط محصول القطن الشعر للنبات (جم) ومتوسط محصول القطن الشعر بالقنطار للفدان وتصافي الحليج بالاضافة لصفة معامل البذرة.

أوضحت النتائج المتحصل عليها ان المتوسط الأعلى للقيم سجل مع صنف القطن المصرى جيزة جيزة 94 لصفات وزن اللوزة ، عدد اللوز ، محصول القطن الزهر (نبات) ، محصول القطن الزهر (فدان)، محصول القطن الشعر (نبات)، محصول القطن الشعر (فدان)، النسبة المئوية للشعر (تصافى الحليج) ومعامل البذرة فى كلا الموسمين 2018 و 2019. أما بالنسبة لمواعيد زراعة القطن سجل الموعد الأول (15 إبريل) أعلى القيم لجميع الصفات سالفة الذكر عدا صفة نسبة القطن الشعر (تصافى الحليج) حيث سجل الموعد الأخير (27 و 29 مايو) أعلى القيم لهذه الصفة لموسمى الزراعة 2018 و 2019 على الترتيب. إضافاً كان التداخل بين الأصناف ومواعيد الزراعة معنوياً وعالى المعنوية فى جميع الصفات تحت الدراسة فى موسمى الزراعة.

وأيضاً ومن خلال النتائج المتحصل عليها كان الصنف جيزة 94 اقل الأصناف تأثراً بالتأخير في مواعيد الزراعة واعطي اعلي قيم اداء لكل الصفات تحت الدراسة، في حين ان الصنف جيزة 92 كان الاقل متوسط والاكثر انحرافا وتاثرا بالتاخير في مواعيد الزراعة، وبالتالي يمكن زراعة الصنف جيزة 94 في المناطق التي تنحرف فيها المواعيد للزراعة او يزرع القطن بعد محاصيل شتوية فيها دون التاثير الاقتصادي علي المحصول ومكوناته، كما انه يمكن استخدام الصنف جيزة 94 كأب في انتاج اصناف جديدة تتوافق مع مواعيد الزراعة المتأخرة .