Journal of Sustainable Agricultural and Environmental Sciences
https://jsaes.journals.ekb.eg/
JSAES, 2022,1(1): 27 - 39

ISSN-Print: 2735-4377
ISSN-Online: 2785-9878

Cotton Productivity and Fiber Quality Response to Nitrogen Fertilization Levels under Different Sowing Dates

EL-Refaey, R. A.[*1]; M. A. A. Emara[2]; Hanaa M. Ashri[1] and M. A. El-Sawy[1]

[1] Agronomy Department, Faculty of Agriculture, Tanta University, Tanta, Egypt.
[2] Cotton Research Institute, Agricultural Research Center, Giza, Egypt.

*Corresponding Author: El-Refaey, R. (ramadanelrefaey48@gmail.com)

J.Sust.Agri.Env.Sci. (JSAES)

Keywords:
Sowing dates, Nitrogen levels, Cotton productivity; Fiber quality.

ABSTRACT

The present study was carried out at a private farm in Gharbia Governorate Egypt, during 2017 and 2018 seasons to investigate the effect of sowing dates (30th March, 15th April and 30th April), nitrogen fertilizer rates (45, 60 and 75 kg N/fed.) on cotton cv Giza 94 productivity and fiber quality. The obtained results confirmed that, cotton plants that sowing in 30th March had the highest number of open bolls/plant, seed cotton yield/plant, seed cotton yield/fed and lint percentage. While, cotton plants that sowing in 30th April had the heaviest boll and 100-seed weight in 2017 and 2018 seasons and cotton plants that sowing in 15th April expressed the highest span length, uniformity ratio, fiber fineness and fiber strength in the first and second seasons. The increase of nitrogen fertilizer rates led to significant increases all yield and fiber properties traits in both seasons. Cotton plants that treated with 75 kg N/fed. showed the highest number of open bolls, average boll weight, seed cotton yield/plant, seed cotton yield/fed, lint percentage and 100-seed weight as well as the highest span length, uniformity ratio, fiber fineness and fiber strength in both seasons. The presented results showed that, cotton plant differ in their response to nitrogen fertilizer rates under the different sowing dates for all yield and fiber properties traits. Cotton plants that treated with 75 kg N/fed. exceeded both 45 and 60 kg N/fed. in all yield and fiber properties traits across all sowing dates. Cotton plants that treated with 75 kg N/fed. in the early sowing date (30th March) showed the highest number of open bolls, seed cotton yield/plant, seed cotton yield/fed. and lint percentage While cotton plant that treated with 75 kg N/fed. in the late sowing date (30th April) had the highest average boll weight and 100-seed weight in 2017 and 2018 seasons. Cotton plants that treated with 75 kg N/fed. in 15th April gave the highest span length, uniformity ratio, fiber fineness and fiber strength in 2017 and 2018 seasons.

1. INTRODUCTION

Cotton one of the most important summer crop rotation in Egypt until the beginning of the twenty-first century cotton was the master of the summer crops as it was the main source of the Egyptian national and farmer's income. The total harvested area of cotton in Egypt sharply decreased from one million feddan in 1994 to 375,000 feddan in 2010. The total harvested area was decreased again until reached 180,000 feddan in 2020 **(FAOSTAT, 2021)**. The main reason for the decline in the cotton area is the large reduction in lent and seed yield. This reduction almost caused as result of the delay in sowing dates, as Egyptian cotton farmers used to delay the dates for cotton sowing after March in order to obtain additional spices of alfalfa. Some farmers may delay sowing dates to late April and early May due to the long stay of winter crops such as wheat in the field.

Sowing cotton in a suitable time consider an important factor to forming the fruiting branch at a lower node on the stem and only an optimum height, increasing No. of bolls and yield of cotton, escaping from cotton leaf and boll-worms and aphids and picking early. Several researchers studied the effect of sowing time on cotton growth and yield such as; **Arshad *et al.* (2007)** where they reported that, early sowing produced 23% more open bolls and 18% more cotton yield. **Bange *et al*. (2008)** indicated that, early sown cotton produces taller plants with higher number of branches, number of bolls and yield. **Emara *et al.* (2015)** found that early sowing date significantly increased seed cotton yield/fed due to the increase of number of open bolls/plant and boll weight. However, **Emara (2012)** indicated that, sowing date gave significant effects on upper half mean length and micronaire reading in favor of early sowing. While, did not exhibit any significant on uniformity index and strength. **Deshish *et al.* (2015)** indicated that, fiber properties improved due to early sowing of cotton.

Nitrogen is one of the most important fertilizers in cotton plants. The suitable level of nitrogen fertilization may produce a higher yield and quality, but higher levels may result in excessive of vegetative growth with a lower yield and quality. Through cotton agronomy programs, many traits are usually assigned to determine the optimum nitrogen levels fertilization must apply for every new promising hybrid cotton and commercial varieties. In this respect, several studies were done to evaluate the response of cotton plants to different nitrogen levels such as; **El-Shahawy and Hamoda (2011) and Hamoda *et al.* (2014)** where they found that, plant height, No. of sympodia/plant, first sympodial position, No. of open bolls/plant, boll weight, seed index and seed cotton yield/fed increased by increasing nitrogen levels and also found that, the studied treatments did not exhibit any significant effect on all fiber properties. **Elhamamsey *et al.* (2016) and Emara *et al.* (2016)** revealed that, the high NPK fertilizer level did not exhibit significant effect on seed index, lint percentage and fiber properties. **Emara and Abdel-Aal (2017)** found that, the plant height, No. of fruiting branches/plant, No. of bolls/plant, boll weight, seed index, seed cotton yield/fed increased with increasing rates of NPK applied. Through the above review it can be said that, the cotton yield or any other economic characteristic are affected by different agricultural practices, especially the amount of fertilizer or sowing dates. Therefore, there are great necessary to determine the optimal dose of nitrogen fertilizers, and the suitable sowing time, in order to maximized productivity with high quality.

The objective of this study was to determine the optimal nitrogen fertilizer rate in addition to the suitable sowing date of the cotton cultivar Giza 94 which

maximized yield and quality under El-Gharbia Governorate conditions.

2. MATERIALS AND METHODS

Two field experiments were carried out at a private farm in Gharbia Governorate, Egypt, during 2017 and 2018 seasons to investigate the effect of sowing dates (30th March, 15th April and 30th April), nitrogen fertilizer rates (45, 60 and 75 kg N/fed.) on cotton cv Giza 94 productivity and fiber quality.

Soil texture of the experimental site was clay loam of pH tended to alkalinity. Some of agro climatological data for the experimental site during 2017 and 2018 summer seasons are presented in Table 1.

Table 1: Some of agro-climatological data for the experimental site during 2017 and 2018 seasons

Month	week	Air temperature, ℃				Rh, %	
		2017		2018		2017	2018
		Min	Max	Min	Max		
March	1	16.6	22.2	16.6	26.6	75.5	68.0
	2	20.1	22.2	14.7	23.9	73.0	67.5
	3	17.4	19.8	17.1	25.6	72.0	66.0
	4	19.2	23.9	17.8	26.9	70.5	59.5
April	1	19.5	25.0	17.2	24.4	71.0	63.0
	2	20.2	24.8	17.6	25.6	70.5	66.0
	3	21.7	26.5	21.1	30.9	70.5	60.5
	4	22.8	28.2	20.6	25.9	58.5	62.0
May	1	24.3	28.0	22.4	32.2	60.0	60.5
	2	25.1	31.5	22.9	29.2	63.0	60.0
	3	26.8	31.7	22.9	29.1	58.5	61.0
	4	26.2	29.8	25.5	34.1	59.5	55.5

For each season, the field experiment included treatments represented the combination between three sowing dates with three nitrogen fertilizer levels.

Factors under study were as follows:

A- Three sowing dates: 30 of March, 15 of April and 30 of April.

B- Three nitrogen fertilization levels: 45 kg N/fed., 60 kg N/fed. and 75 kg N/fed.

Nitrogen fertilizer was applied in form of ammonium nitrate (33% N), and divided into two equal parts and applied side dressed before the first and second irrigations in each season.

Cotton seeds were sown after two cuts of Egyptian clover Barseem (*Trifolium alexandrinum* L.) in 2017 and 2018 seasons. The experimental design was laid out using split plot arranged in four replications in the two seasons. Each of the three sowing dates was distributed in the main plots, whereas the three nitrogen fertilizer levels were arranged at random in sub plots. The sub-plot size was 19.5m^2 including six rows, (5 m long and 0.65 cm width). The distance between hills was 25cm.

Cotton sowing was done by the local method of dibbling 5 to 7 seeds in each hill by hand. Cotton plants were thinned after about 35 days from sowing date, leaving the required number of plants/hill. Other cultural practice are done as recommended in the area in which the study done.

Characters studied:

Productivity traits:

Ten guarded cotton plants were taken

randomly from each sub-plot to determine number of open bolls per plant, average boll weight (g), seed index (g), seed cotton yield/plant (g) and seed cotton yield/fed (kentar). Also, Lint percentage was calculated as:

$$\textbf{Lint percentage} = \frac{\textbf{Lint cotton yield/plant}(g)}{\textbf{Seed cotton yield/plant}(g)} x\ \mathbf{100}$$

Seed cotton yield/fed (kentar) was calculated by convert seed cotton from each sub- plot to feddan where one kentar = 157.5 kg.

Fiber properties:

The quality of cotton sample is mainly depending on the various physical properties of the fibers in the sample. The most important physical characters are 2.5% span length (mm), uniformity ratio (%), fiber strength (Pressley units) and fiber fineness (micronaire reading).Samples of lint cotton were taken from the above ten representative plants from each sub- plot after ginning seed cotton yield on a laboratory gin stand.

All fiber tests for the samples were made at the laboratories of the Cotton Technology Research Division, Cotton Research Institute, Agricultural Research Center, Giza, Egypt, at a constant relative humidity $65\% \pm 2$ and temperature $21^{\circ}C \pm 2$ according to cotton laboratories under controlled atmospheric conditions according to **A.S.T.M. (2004)**, D1776-04.

1. 2.5% span length (mm):

It is termed as distance spanned by a specified percentage of fibers in the specimen being tested when the fibers are paralyzed and randomly distributed and where the initial starting point of the scanning in the test is considered 100 percent. The most commonly used measure is the 2.5% span length, which is the measure of fiber length and is tested using Fibro-graph and was expressed in terms of 'mm'.

2. Uniformity ratio (%):

The uniformity ratio is the ratio of mean fiber length i.e. 50% span length to upper half mean length i.e. 2.5% span length and expressed as percentage. It is obtained from the following formula:

$$\text{Uniformity ratio (\%)} = \frac{\text{50\% Span length x 100}}{\text{2.5\% Span length}}$$

Fiber upper half mean length (mm.) and uniformity index (%), were determined on digital fibro graph instrument 630 according to **A.S.T.M. (2012)**, D1447-07.

3. Fiber fineness (micronaire reading):

Fiber fineness was determined on micronaire instrument 675 according to **A.S.T.M. (2012)** D1448-97.

4. Fiber strength (Pressley index):

Fiber strength was determined on Pressley instrument at zero-gauge clamp spacing using a simple inclined plane breaker and simple specimen preparation and clamp loading techniques according to A.S.T.M. (2012), D1445-67.

Statistical analysis:

The analysis of variance was carried out according to the procedure described by **Gomez and Gomez (1984)**. Data were statistically analyzed according to MSTAT-C Statistical Software Package **(Michigan State University, 1983)**. Where the comparison between means were calculated by least significant difference (LSD) test at 0.05 level of probability.

3. RESULTS AND DISCUSSION

3.1 Effect of sowing dates, nitrogen fertilizers rates and their interactions on yield and its components of cotton plants:

A. Sowing dates:

The presented data in Table 2 indicated that, all cotton yield traits significantly affected by sowing dates. The data cleared that, delayed sowing dates leads to significant decrease on all cotton yield traits except for average boll weight and 100-seed weight in both seasons. Cotton plants that sowing in 30th March had the

significantly highest number of open bolls/plant (19.92 and 20.27), seed cotton yield/plant (55.54 and 55.09 g), seed cotton yield/fed., (10.58 and 10.49 kentar) and lint percentage (40.15 and 39.92%). While, cotton plants that, sowing in 30th April had the heaviest boll (2.73 and 2.71 g) and weight of 100 seeds (11.23 and 11.52 g) in 2017 and 2018 seasons, respectively. In contrast, sowing cotton plants in 30th April expressed the lowest number of open bolls/plant (13.73 and 13.56), seed cotton yield/plant (47.12 and 47.96 g), seed cotton yield (kentar)/fed (8.97 and 9.14 (kentar) and lint percentage (34.77 and 34.56%) While, cotton plants that sowing in 30th March had the lowest boll (2.63 and 2.63 g) and 100-seed weight (9.72 and 9.64 g) in both seasons, respectively.

Several authors obtained similar trend of results before such as **Awan *et al.* (2011)** where they revealed that, seed yield was greater (2828 kg/ha) in the plots sown in April as compared to lowest seed cotton yield (2569 kg/ha) recorded in the plots sown on May. **Emara (2012)** found that, sowing date gave significant effects on all growth parameters, such as number of sympodia/plant, number of open bolls/plant, boll weight and seed cotton yield/fed in favor of early sowing. **Saleem *et al*. (2014)** indicated that, cotton plants that sowing in March produced more seed cotton yield per plant and this almost due to the more number of opened bolls compared with sowing in May. **Deho *et al*. (2014)** showed that, the early sowing in March showed significantly highest values for boll weight and seed cotton yield/plant, seed cotton yield/fed. While, the maximum sympodial branches/plant was observed in late sowing dates of April and May. Also, **Elayan *et al*. (2015) and Shoaib *et al.* (2015)**, indicated that, early sowing leads to significant increase in number of open bolls/plant, boll weight, seed cotton yield /plant and seed cotton yield/fed. compared to the late sowing. In the same line, **Emara *et al.* (2016), Emara *et al.* (2018 a&b), Deshish *et al.* (2020)** found that, the earlier sowing date in March surpassed the late sowing date in May.

Only boll weight and 100-seed weight were higher in the late sowing date than early sowing date. These findings are in agreement with those of **Deho *et al.* (2012)** where they showed that, sowing in 1st May produced the heaviest bolls compared with early sowing dates in March and April.

A. Nitrogen fertilizer rates:

Data in Table 2 pointed out that, all cotton yield traits significantly affected by nitrogen fertilizer rates. The increase of nitrogen fertilizer rates led to significant increases in all yield traits in both seasons. Cotton plants that treated with 75 kg N/fed. showed significant highest number of open bolls (19.69 and 19.45), average boll weight (2.74 and 2.73), seed cotton yield/plant (55.67 and 55.30 g), seed cotton yield/fed (10.63 and 10.53 kentar), lint percentage (39.31 and 39.41%) and 100-seed weight (10.81 and 10.96 g). While, cotton plants under the low nitrogen fertilizer rate (45 kg N/fed) showed the lowest number of open bolls (15.10 and 15.02), average boll weight (2.63 and 2.61), seed cotton yield/plant (45.28 and 46.55 g), seed cotton yield/fed (8.63 and 8.87 kentar), lint percentage (34.99 and 34.09%) and 100-seed weight (10.04 and 10.12 g) in both seasons, respectively. However, fertilized plants with 60 kg N/fed gave values of average boll weight and 100-seed weight not significantly differ than 75 kg N/fed. in both seasons.

In this study, all cotton yield traits significantly affected by nitrogen rates. These results are in the same way with those reported by, **Elhamamsey *et al.* (2016), Emara and Abdel-Aal (2017), Deshish *et al*. (2020) and Emara *et al.* (2020)** where they found that, the different doses of nitrogen, significantly affected the

No. of open bolls/plant, seed cotton yield/plant, boll weight and seed cotton yield/ha. Sowing cotton under the highest level of nitrogen gave the maximum mean values. The increase of nitrogen fertilizer rate resulted in a large increase in cotton yield traits. Similar trend of results were obtained before, where it found that, boll weight in the highest treatment of nitrogen was found to be 16.6% higher than the lowest N rate. Also the highest productivity was observed at the 140 kg N /ha, compared with zero kg N/ha, and 70 kg N/ha. **Mubarak and Janat (2018)** indicated that, seed cotton yield/ha could be optimized at application nitrogen levels of 150 kg N/ha as compared to 0, 50, 100 and 200 kg N/ha. **Xinghu *et al.* (2020)** showed that, cotton yield was increased with N rates increase from 120 to 180 kg, while the yield was not increased when the N rate was beyond 180 kg, or even decreased (9 ~ 29%). **Shah *et al*. (2021)** showed that, the higher total yield was produced under 180 kg N/ha. **Win *et al*. (2021)** showed that, the maximum values of yield components, seed cotton yield was achieved by 60 kg N/ha.

B. Sowing dates x Nitrogen fertilizer rates: The presented results in Table 2 showed that, cotton differ in their response to nitrogen fertilizer rates under the different sowing dates. Cotton plants which fertilized with 75 kg N/fed. when interacted with 30th March sowing date gave the significantly highest number of open bolls/plant in both seasons. The interactions between 30th March and 75 kg N/fed., 15th April and 75 kg N/fed., 30th April and 60 kg N/fed. and 30th April and 75 kg N/fed. gave the significantly highest average boll weight in both seasons ,where there is no significant differences between these interactions in this respect. The interaction between 30th March and 75 kg N/fed. gave the significantly highest seed yield/plant in both seasons and the interactions between 30th March and 60 kg N/fed. and 15th April and 75 kg N/fed. gave the highest seed yield/plant in the first season only, with no significant differences between the two interactions for the trait in question. The sowing date of 30th March when interacted with 60 kg N/fed. or 75 kg N/fed. gave the significantly highest seed cotton yield (kentar)/fed. in both seasons. While, the interactions between 15th April and 60 kg N/fed. and 30th April and 75 kg N/fed. gave the significantly highest seed yield /fed. in the first season. The sowing date of 30th March when interacted with either 60 kg N/fed or 75 kg N/fed. gave the significantly highest lint percentage in both seasons with no significant differences between the two interactions. The sowing date of 15th April when interacted with 75 kg N/fed. and the interactions between 30th April and each of nitrogen fertilizer rates 45, 60 and 75 kg N/fed. gave the significantly highest of 100-seed weight in both seasons, where these is no significant differences between these interactions in this concern.

Table 2: Effect of sowing dates, nitrogen fertilizers rates and their interaction on yield traits of cotton plants

Factors		Number of open bolls Per plant		Average boll weight (g)		Seed cotton, yield/plant (g)		Seed cotton, yield/fed. (kentar)/plant		Lint percentage		100-seed weight (g)	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
Sowing Dates													
30- Mar.		19.92	20.27	2.63	2.63	55.54	55.09	10.58	10.49	40.15	39.92	9.72	9.64
15-Apr.		17.51	17.33	2.68	2.67	49.86	50.42	9.50	9.60	36.50	36.29	10.39	10.45
30-Apr.		13.73	13.56	2.73	2.71	47.12	47.96	8.97	9.14	34.77	34.56	11.23	11.52
F test		**	**	**	**	**	**	**	**	**	**	**	**
LSD 0.01		2.15	2.32	0.03	0.03	2.96	2.50	0.82	0.69	1.90	1.89	0.76	0.94
Nitrogen Levels													
45		15.10	15.02	2.63	2.61	45.28	46.55	8.63	8.87	34.99	34.09	10.04	10.12
60		16.37	16.69	2.67	2.68	51.55	51.62	9.82	9.83	37.12	37.27	10.48	10.52
75		19.69	19.45	2.74	2.73	55.67	55.30	10.60	10.53	39.31	39.41	10.81	10.96
F test		**	**	*	*	**	**	*	*	**	**	*	*
LSD 0.05		-	-	0.10	0.10	-	-	0.53	0.47	-	-	0.52	0.57
LSD 0.01		1.68	1.70	-	-	2.22	2.03	-	-	1.58	1.65	-	-
Sowing	Nitrogen												
30-Mar	45	17.54	18.17	2.57	2.55	51.58	51.07	9.82	9.73	37.83	36.86	9.43	9.34
	60	18.87	19.70	2.63	2.64	56.57	54.83	10.78	10.44	40.14	40.29	9.70	9.40
	75	23.35	22.95	2.70	2.71	58.46	59.36	11.14	11.31	42.50	42.61	10.02	10.18
15-Apr	45	15.58	15.11	2.63	2.62	44.47	46.75	8.47	8.90	34.39	33.51	10.16	10.26
	60	16.80	17.03	2.68	2.67	50.24	50.86	9.57	9.69	36.49	36.63	10.34	10.46
	75	20.15	19.84	2.73	2.73	54.86	53.65	10.45	10.22	38.63	38.73	10.66	10.63
30-Apr	45	12.19	11.77	2.69	2.65	39.80	41.83	7.58	7.97	32.75	31.91	10.54	10.76
	60	13.44	13.34	2.71	2.72	47.85	49.16	9.11	9.36	34.75	34.88	11.39	11.71
	75	15.56	15.57	2.77	2.75	53.69	52.89	10.23	10.07	36.79	36.89	11.76	12.09
F test		**	**	**	**	**	**	**	**	**	**	**	**
LSD0 01		2.91	2.94	0.39	0.08	3.84	3.51	1.09	0.94	2.73	2.86	1.36	1.51

3.2 Effect of sowing dates, nitrogen fertilizers rates and their interaction on fiber quality of cotton plants:

A. Sowing dates:

Data listed in Table 3 cleared that, all fiber properties significantly affected by sowing dates. Cotton plants that, sowing in 15th April expressed the significantly highest span length (37.42 and 37.44 mm), uniformity ratio (89.15 and 89.04%), fiber strength (4.43 and 4.42 PI) in the first and second seasons, respectively. For fiber strength, the plants sown in 30th April did not significantly differ than those sown in 15th April in both seasons .On the other side, sowing cotton plants sown in 30th March had the lowest span length (32.67 and 32.15 mm), uniformity ratio (77.88 and 76.65%), fiber fineness (9.63 and 9.58 MR) and fiber strength (3.87 and 3.80 PI) in both seasons, respectively.

The results showed that, cotton fiber properties significantly affected by sowing dates, where cotton plants that sowing in the first half of April had the highest fiber qualities. These results are in harmony with those of, **Awan *et al.* (2011)** where they indicated that, some fiber quality traits like fiber strength was affected significantly by sowing time. **Deho *et al.* (2012)** found that, the sowing in May 1st produced the highest value of micronaire. **Emara (2012)** found a significant effect on upper half mean length, micronaire reading and yellowness in early sowing. **Wenqing *et al.* (2012)** reported that, early sowing gave the strongest fibers. **Emara *et al.* (2016) Emara *et al.* (2018 a and b)** found that, sowing date had insignificant effect on all

fiber properties. **Abd El-Moneim *et al.* (2017)** showed that, fiber technological traits including micronaire-reading, fiber maturity, fiber upper half mean length (UHML), uniformity index (UI), short fiber (SF) and fiber strength (Str.) were least affected by sowing dates. **Deshish *et al.* (2020)** showed that, sowing dates had a significant effect on fiber properties. Early sowing date significantly gave good fiber properties. On the other hand, **Elayan *et al.* (2015)** showed that, fiber length, uniformity Index, fiber strength (g/Tex) and micronaire reading decreased with delaying cotton sowing.

B. Nitrogen fertilizer rates:

Data shown in Table 3 revealed that, all fiber properties significantly affected by nitrogen fertilizer rates. The increase of nitrogen fertilizer rates leads to significant increases of all fiber properties in both seasons. Cotton plants that treated with 75kg N/fed. gave the significantly highest span length (36.72 and 36.06 mm), uniformity ratio (87.16 and 85.81%), fiber fineness (10.82 and 10.69 MR) and fiber strength (4.33 and 4.26 PI). While, cotton plants sown under the low nitrogen fertilizer rate (45 kg N/fed.) showed the lowest span length (33.43 and 33.51 mm), uniformity ratio (79.69 and 79.86%), fiber fineness (9.92 and 9.94 MR) and fiber strength (3.96 and 3.95 PI) in both seasons, respectively. However, the plants fertilized with 60 kg N/fed. did not significantly differ than those fertilized with 75 kg N/fed. with respect to fiber fineness in both seasons , span length in the second season and fiber strength in the first season.

In this study, all fiber quality traits significantly affected by nitrogen fertilizer rates. These results are in agreement with those of, **Hamoda (2010)** who found that, the increasing nitrogen fertilizer level exhibited significant increases in good fiber quality. **Saleem *et al.* (2010)** revealed that, fertilizer application by the rate of 180 kg N/ha proved to be best nitrogen fertilizer level for obtaining high fiber fineness. **Ayissa and Kebede (2011)** revealed that, the highest N rate significantly increase fiber finesses. **Rashidi *et al.* (2011)** revealed that, fiber fineness was markedly increased by increasing nitrogen fertilizer levels. **Deshish (2013)** found that, increasing nitrogen fertilizer levels up to 60 kg N/ha caused significant increases in upper half mean length. **Main *et al.* (2013)** showed that, 50% span length, fiber strength and length uniformity ratio were significantly increased with rising nitrogen fertilizer levels, except micronaire reading trait which was decreased. **Patil *et al.* (2013)** revealed that, 50% span length and 2.5% span length were significantly increased by increasing nitrogen fertilizer levels. **Saleem *et al.* (2014)** showed that, among nitrogen levels more 50% span length, fiber strength and length uniformity ratio and fiber fineness were recorded with 175kg N/ha. **Ran *et al.* (2015)** indicated that, fiber strength and micronaire values were significantly improved with increasing nitrogen fertilizer. On the other side, **Emara *et al.* (2020)** showed that, the fertilization levels treatments had insignificant effect on fiber properties.

C. Sowing dates x Nitrogen fertilizer rates:

The results shown in Table 3 illustrated that, cotton plants differ in their response to nitrogen fertilizer rates under the different sowing dates for all fiber properties. Cotton plants that sown in 15th April when interacted with either 60 kg N/fed. or 75 kg N/fed. gave the significantly highest values for span length and uniformity ratio(%) in both seasons , with no significant differences between these two interactions for the traits in consideration. The cotton plants sown in 30th April when interacted with 75 kg

N/fed. had the significantly highest values for span length in both seasons. The cotton plants sown in 15th April or 30th April when interacted with each of 45, 60 and 75kg N /fed. had the significantly highest values for fiber fineness and fiber strength in both seasons, with no significant differences between all these interactions in this concern.

Table 3: Effect of sowing dates, nitrogen fertilizers rates and their interaction on fiber quality of cotton plants

Factors		Span length (mm)		Uniformity ratio (%)		Fiber fineness (micronaire reading)		Fiber strength (Presley index)	
		2017	2018	2017	2018	2017	2018	2017	2018
Sowing Dates									
30- Mar.		32.67	32.15	77.88	76.65	9.63	9.58	3.87	3.80
15-Apr.		37.42	37.44	89.15	89.04	11.10	11.08	4.43	4.42
30-Apr.		35.48	35.38	84.25	84.35	10.45	10.47	4.18	4.19
F test		**	**	**	**	**	**	**	**
LSD 0.01		1.64	1.84	3.90	4.31	0.51	0.52	0.28	0.31
Nitrogen levels									
45		33.43	33.51	79.69	79.86	9.92	9.94	3.96	3.95
60		35.41	35.39	84.42	84.37	10.45	10.49	4.19	4.20
75		36.72	36.06	87.16	85.81	10.82	10.69	4.33	4.26
F test		*	*	**	**	*	*	*	**
LSD 0.05		0.95	0.96			0.52	0.51	0.32	
LSD 0.01				2.22	1.46				0.18
Sowing Date	Nitrogen Levels (kg/fed)								
30-Mar	45	30.32	30.53	72.25	72.77	8.97	9.13	3.59	3.61
	60	32.96	32.9	78.53	78.45	9.65	9.74	3.9	3.89
	75	34.74	33.01	82.85	78.74	10.28	9.87	4.11	3.91
15-Apr	45	35.63	35.74	84.98	85.16	10.65	10.57	4.22	4.23
	60	37.96	38.04	90.48	90.59	11.26	11.29	4.49	4.50
	75	38.66	38.53	91.99	91.36	11.4	11.37	4.57	4.54
30-Apr	45	34.35	34.27	81.84	81.65	10.14	10.12	4.06	4.05
	60	35.31	35.24	84.25	84.06	10.43	10.45	4.18	4.17
	75	36.77	36.64	86.65	87.33	10.77	10.83	4.3	4.34
F test		**	**	**	**	**	**	**	**
LSD0 01		2.51	2.53	3.84	3.87	1.37	1.35	0.86	0.87

4. REFERENCES

Abd El-Moneim, M. H.; M. A. Omar; S. S. EL-Tabbakh and A. I. Nawar (2017). The effect of date and pattern of sowing on growth, productivity and technological characters of cotton (*Gossypiumbarbadense,* L.) variety Giza 86. Alexandria Science Exchange J., 38(3):390-396.

Arshad, M.; A. Wajid; M. Maqsood; K. Hussain and M. Aslam (2007). Response of growth, yield and quality of different cotton cultivars to sowing dates. Pak. J. Agric., 44(2):208–212.

A.S.T.M. (2004). American Society for Testing and Materials. Standard Atmosphere for Conditioning and Testing Designation, (D 1776-04).

A.S.T.M. (2012). American Society for Testing and Materials. Designation, (D1447-07), (D1448-97) and (D1445-67).

Awan, H.; I. Awan, M. Mansoor, E. Khan and M. Khan. (2011). Effect of sowing time and plant spacing on fiber quality and seed cotton yield. Sarhad J. Agric. 27(3):411-413.

Ayissa, T., and F. Kebede. (2011). Effect of nitrogenous fertilizer on the growth and yield of cotton (*Gossypiumhirsutum*, L.) varieties in Middle Awash, Ethiopia. J. Drylands, 4 (1):248-258.

Bange, M.; S. Caton and S. Milroy (2008). Managing yields of high fruit retention in transgenic cotton (*Gossypiumhirsutum L.*) using sowing date. Australian J. Agric. Res., 59(8):733–741.

Deho, Z.A; S. Laghari, S. Abro, S.D. Khanzada and Fakhuruddin. (2012). Effect of sowing dates and picking intervals at boll opening percent, yield and fiber Quality of cotton cultivars. Sci., Tech. and Dev., 31(3):288-293.

Deho, Z. A.; S. Tunio, Q.Chachar and F. C. Oad. (2014). Impact of sowing dates and picking stages on yield and seed maturity of cotton (*Gossypiumhirsutum, L.*) varieties. Sarhad Journal of Agriculture, 30(4):404-410.

Deshish, El-D. El-D. (2013). Suitable agricultural management practices for the new promising hybrid cotton [Giza 84 (Giza 70 x 51 B)] pima 62. J. Plant Production, Mansoura Univ., 4(12):1885-1896.

Deshish, El-D. El-D.; S.A.F. Hamoda and Azza A.M. El-Hendawy (2020). Effect of sowing dates and rates of nitrogen and potassium fertilization on growth and productivity of Giza 96 cotton variety. Menoufia J. Plant Prod., 5:413–422.

Deshish, El-D.; S.A.F. Hamoda and M.A.A. Emara (2015). Study of new irrigation systems under sowing dates to increasing productivity of cotton. Egypt. J. of Appl., Sci., 30(12):564–573.

Elhamamsey, M. H.; E. M. Shalaby; E. A. Ali and M. A. Emara (2016). Effect of some cultural practices on shedding and yield of Egyptian cotton. Assiut J. Agric. Sci., 47(4):41-51.

El-Shahawy, M.I.M. and S.A.F. Hamoda (2011). The Proper agricultural management practices four the new promising hybrid cotton (Giza77 * Pima S6). J. Plant Production, Mansoura Univ., 2:1551-1561.

Emara, M.A.A. (2012). Response of cotton growth and productivity to application of potassium and zinc under normal and late sowing dates. J. Plant Production, Mansoura Univ., 3(3):509–524.

Emara M.A., Amal S. Abdel-Aal, and Azza A. El-Hendawy (2020). Effect of Sowing patterns and fertilization levels on growth, yield, and quality of cotton variety Giza 94. J. Agric. and

Env. Sci. Damanhour University, 2020, 19(2):1-17 ISSN 1687-1464.

Emara M.A.; S.A. Amal Abdel-Aal and S.A.F. Hamoda (2015). Effect of times and methods of potassium fertilizer on yield and yield components of new hybrid cotton (Giza 86 x 10229) under early and late sowing. Fayoum J. Agric. Res., and Dev., 30(1):17–26.

Emara M.A.A. and Amal S. Abdel-Aal (2017). Effect of Nano-Fertilizer on Productivity of Cotton under Nutrient Stress Conditions. Egypt. J. of Appl. Sci., 32(12B):445-458.

Emara M.A.A.; Amal S. Abdel-Aal, Rokaya, M. Hassan and A.E. El-Gabiery (2016). Effect of sowing dates and bio-fertilizer under different NPK fertile levels on growth, yield and fiber of promising hybrid cotton Giza 86 x 10229. Egypt. J. of Appl. Sci., 31(12): 357–376.

Emara M.A.A.; S.A.F. Hamoda, and Maha M.A. Hamada (2018a). Effect of nano-fertilizer and nutrient stress on chemical composition in leaves, productivity of Egyptian cotton under different sowing dates. The 15st International Agrnomy Conference, October 1-2, Cairo, Egypt. J. Agron., the 15th Int. Conf. Crop Science, pp. 125-137.

Emara, M.A.A.; S.A.F. Hamoda and Maha, M.A. Hamada (2018b). Effect of potassium silicate and NPK fertilization levels on cotton growth and productivity under different sowing dates. The 15st International Agrnomy Conference, October 1-2, Cairo, Egypt. J. Agron., the 15th Int. Conf. Crop Science, pp. 115-123.

FAOSTAT (2021): Food and Agriculture Organization of the United Nation: Annual Report, May 2021.

Gomez, K. A., and A. A. Gomez. (1984).Statistical Procedures for Agricultural Research. 2nd, (Ed). John Wiley and Sons, NY, U.S.A.

Hamoda, S.A.F. (2010). Impact of water stress and nitrogen fertilizer levels on cotton grown under high temperature conditions in Upper Egypt. Minufia J. Agric.Res., 35 (5):1797-1814.

Hamoda, S.A.F., M.A.A. Ibrahim, and M.A.A. Emara (2014). Effect of sowing patterns and fertilization under two sowing dates on growth, yield and quality of new hybrid cotton [Giza 84 (Giza 75 x 5844)] Giza 80. Egypt. J. Agric. Res., 92(1):125-137.

Main, C.; L. Barber, R. Boman, K. Chapman, D. Dodds, S. Duncan, K. Edmisten, P. Horn, M. Jones, G. Morgan, E. Norton, S. Osborne, J. Whitaker, R. Nichols and K. Bronson (2013).Effects of nitrogen and sowing seed size on cotton growth, development, and yield. Agronomy J. 105 (6):1853-1859.

Michigan State University. (1983). MSTAT-C: Micro-computer Statistical Program, Version 2. Michigan State University, East Lansing.

Mubarak, I., and M. Janat (2018). Response of new cotton variety (Rassafa) to nitrogen fertilizer and partial root-zone drying drip irrigation. Open Agric. J., 12:1-10.

Patil, P. N.; B. Gangaiah and B. G. Shivakumar (2013). Performance of BG1 and BGII cotton (*Gossypiumhirsutum*, L.) hybrids under different levels and methods of nitrogen fertilization. J. Agri-Food and Appl. Sci., 1(4):104-109.

Ran, L.J; Z.W. Qing; Z.Z. Guo; D.H. Lin; Z.X. Hua and M.Y. Li (2015). Effects of nitrogen rates and sowing dates on yield, quality and photosynthetic contents in the subtending leaves of cotton boll. J. of P. Nut. and Fert., 21(4):951-961.

Rashidi, M., M. Seilsepour, and M. Gholami (2011). Response of yield,

yield components and fiber properties of cotton to different application rates of nitrogen and boron. American-Eurasian J. Agric. and Environ. Sci., 10(4):525-531.

Saleem, M. F., M. F. Bilal, M. Awais, M. Q. Shahid, and S. A. Anjum (2010).Effect of nitrogen on seed cotton yield and fiber qualities of cotton (*Gossypiumhirsutum,* L.) cultivars. J. Animal and Plant Sci., 20 (1):23-27.

Saleem, M.F.; M. F. Bilala; S.A. Anjuma; H.Z. Khana; M. Sarwara and W. Farhadb (2014). Sowing time and N nutrition on cell membrane thermo stability, bolls retention and fiber traits in cotton. The Journal of Animal and Plant Sciences, 24(3):829- 837.

Shah, A. N.; Y. Wu; J. Iqbal; M. Tanveer; S. Bashir; S. U. Rahman; A. Hafeez; S. Ali; X. Ma; S. S. Alotaibi; A. El-Shehawi and G. Yang (2021). Nitrogen and plant density effects on growth, yield performance of two different cotton cultivars from different origin. Journal of King Saud University – Science 33:101512.

Wenqing, Z.; Y. Wang, H. Shu and Z. Zhou (2012). Sowing date and boll position affected boll weight fiber quality and fiber physiological parameters in two cotton (*Gossypiumhirsutum L.*) cultivars. African J. of Agric., Res., 7(45):6073-6081.

Win, T. Z.; K. Ngwe; S. S. Mar and A. A. Khaing (2021). Yield and quality of rainfed cotton (*Gossypiumhirsutum L.*) in response to nitrogen rates under different plant available water capacity sites in central dry zone of Myanmar. Open Access Library J. Volume 8, e7891, ISSN Online: 2333- 9721.

Xinghu, S.; H. Ying; Y. Yuan; S. A. Tung; B. Souliyanonh and Y. Guozheng (2020). Cotton N rate could be reduced further under the sowing model of late sowing and high-density in the Yangtze River valley. Journal of Cotton Res., 3(28):1-10.

Journal of Sustainable Agricultural and Environmental Sciences
https://jsaes.journals.ekb.eg/
JSAES, 20200, 1(1): 24 - 38

ISSN-Print: 2735-4377
ISSN-Online: 2785-9878

إستجابة إنتاجية القطن وجودة الالياف للتسميد الأزوتى تحت مواعيد زراعة

رمضان على الرفاعى[١]- مصطفى عطية أحمد عمارة[٢]– هناء محمد عشرى[١]– محمد أحمد الصاوى[١]

[١] قسم المحاصيل – كلية الزراعة – جامعة طنطا – مصر.
[٢] معهد بحوث القطن – مركز البحوث الزراعية – مصر.

مجلة العلوم الزراعية والبيئية المستدامة

الكلمات المفتاحية:
ميعاد الزراعه، مستوي النتروجين، انتاجيه القطن ، جوده الالياف

الملخص العربى

أجريت الدراسة الحالية في مزرعة خاصة بمحافظة الغربية بمصر خلال موسمي ٢٠١٧ و ٢٠١٨ لدراسة تأثير مواعيد الزراعة (٣٠ مارس، ١٥ أبريل و ٣٠ أبريل) ومعدلات التسميد الأزوتى (٤٥ ، ٦٠ ، ٧٥ كجم نيتروجين/فدان). على إنتاجية صنف القطن جيزة ٩٤ وجودة الألياف. أكدت النتائج المتحصل عليها أن نباتات القطن التي زرعت في ٣٠ مارس كان لها أعلى عدد لوز متفتح/نبات،محصول ألياف وبذور/نبات،محصول ألياف وبذور/فدان ونسبة شعر،بينما نباتات القطن التي زرعت في ٣٠ أبريل كان لها أعلى وزن لوز/نبات. وزن ١٠٠ بذرة في موسمي ٢٠١٧ و ٢٠١٨ بينما أعطت نباتات القطن التي زرعت في ١٥ أبريل أعلى طول ونسبة تجانس ونعومة للألياف وأعلى متانة للألياف في الموسمين الأول والثاني. أدت زيادة معدلات الأسمدة النيتروجينية إلى زيادة معنوية في كل صفات المحصول وخواص الألياف في الموسمين. أظهرت نباتات القطن التي سمدت بـ ٧٥ كجم نيتروجين/فدان على عدد من اللوز المتفتح، وأعلى متوسط لوزن اللوز،أعلى محصول ألياف وبذور/نبات،وأعلى محصول شعر وبذور/فدان،أعلى نسبة شعر،ووزن ١٠٠ بذرة بالإضافة إلى أعلى طول للألياف،أعلى انتظامية ونعومة ومتانة للألياف في كلا الموسمين. أظهرت النتائج المعروضة أن نبات القطن يختلف في استجابته لمعدلات السماد الآزوتي تحت مواعيد الزراعة المختلفة لجميع صفات المحصول وخواصا لألياف. نباتات القطن التي تم تسميدها بـ ٧٥ كجم نيتروجين/فدان تفوقت على مستويات التسميد ب٤٥ و ٦٠ كجم نيتروجين/فدان في جميع صفات المحصول وخواص الألياف في جميع مواعيد الذراعة. أظهرت نباتات القطن التي سمدت بـ ٧٥ كجم نيتروجين/فدان في تاريخ الزراعة المبكر (٣٠ مارس) أعلى عدد من اللوز المتفتح،أعلى محصول شعر وبذور للنبات والفدان بينما أظهرت نبات القطن الذي تم تسميدها بـ ٧٥ كجم نيتروجين/فدان في تاريخ الزراعة المتأخر (٣٠ أبريل) أعلى متوسط وزن للوزة و وزن ١٠٠ بذرة في موسمي ٢٠١٧ و ٢٠١٨. أعطت نباتات القطن التي تم تسميدها بـ ٧٥ كجم نيتروجين/فدان في ١٥ أبريل أعلى طول وتجانس ونعومة ومتانة للألياف في موسمي ٢٠١٧ و ٢٠١٨.