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EFFECT OF SOME NITROGEN SOURCES, NITROGEN DOSES AND TIME OF SPLITTING ON YIELD AND QUALITY OF EGYPTIAN COTTON UNDER SOIL SALINITY

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ABSTRACT

Two field experiments were carried out at El-Serw Agricultural Experiment Station during 2001 and 2002 seasons to evaluate the effect of three different nitrogen sources; namely ammonium sulphate, urea and ammonium nitrate at two rates (60 and 90 kg N/fed.) and three splitting N doses and their interaction on yield and quality of Egyptian cotton (Giza 86). A split split-plot design with 4 replicates was used. The results obtained could be summarized as follows:

Nitrogen sources had a significant effect on plant height, number of fruiting branches, number of open bolls/plant, boll weight, seed index, lint percentage, earliness %, seed cotton yield/fed, protein percentage, oil percentage, total chlorophyll and nitrogen content in cotton leaves. Increasing N-rates up to 90 kg/N/fed. significantly increased plant height, number of fruiting branches, number of open bolls per plant, seed index, lint percentage, earliness percentage. Splitting N sources three times markedly increased plant height, number of open bolls per plant, boll weight, earliness percentage and seed cotton yield kentar per feddan. The interaction between N sources and N rates had significant effect on number of open bolls/plant, earliness %, protein %, oil % and total chlorophyll in cotton leaves. While the interaction between N sources and number of N additions had a significant effect on earliness percentage and total chlorophyll in cotton leaves in 2001 season only. The interaction between N sources x N rates x number of N additions had significant effect on earliness %.

INTRODUCTION

The most important element for all forms of life is nitrogen which found in nucleic acids, proteins and chlorophyll and recognized as the most important single element in crop production and is considered the first limiting element in plant growth.

Soil salinity causes great losses to agriculture by decreasing the yields of various crops. The problem of salinity received much attention in Egypt in both old cultivated and newly reclaimed areas. Most of the local reclaimed lands are found in the northern part of Nile Delta (El-Gabaly, 1975).

Egyptian soil is deficient in nitrogen and the application of nitrogenous fertilizers is among the most important factors affecting yield and quality of cotton. Nitrogen uptake, like that of other nutrients, is proportional to crop growth and development. It is widely recognized that N supply exerts a marked influence on vegetative and reproductive growth. Producers tended to increase yield potentials by applying higher N doses than recommended rates Ghourap *et al.* (1995).

Filed studies showed that optimum yield can be obtained by preplant application of 60-75 kg N/feddan and increasing rates of N application above this rate may increase plant height and the number of flowers and bolls, but

may not increase seed cotton yield because of increased shedding of lower bolls (Boquet *et al.*, 1993).

Regarding the effect of N sources on yield and yield quality. Amer and Abu-Amin (1969). Tiwari and Bisen (1972) found that yield of seed cotton, was not affect by N. sources. While, Gueinov and Ruzicw (1975) reported that urea and ammonium nitrate when applied at 150 kg N/ha in combination with superphosphate gave higher seed cotton yield than ammonium sulphate + superphosphate. Khare and Singh (1975) showed that application of N as calcium nitrate increased seed cotton when compared with application of urea or ammonium sulphate. Ahmed (1979), reported that the response of cotton yield to urea and ammonium sulphate was similar, but the use of urea was more economical and was recommended on alkaline soils. However, Yorovenko *et al.* (1970) found that application of 80-120 kg N/Ecar. as ammonium form, compared with nitrate form, increased boll formation and seed cotton yield and improved lint quality. Shahine (1980) found that N sources had significant effect on plant height (ammonium sulphate had the superior effect compared with urea), while it had no significant effect on number of fruiting branches, number of open bolls/plant, boll weight, seed index, lint percentage, fiber properties, seed cotton yield/fed. and earliness percentage.

Concerning the effect of N levels on cotton yield and its components, El-Shinnawy *et al.* (1984) reported that increasing N rate significantly increased seed cotton yield, number of fruiting branches, number of open bolls, boll weight, lint percentage and seed index. Lasheen (1989), found that the highest seed cotton yield is obtained at 60 kg N/fed. However, N level had insignificant on plant height. El-Kashlan *et al.* (1992) reported that increasing nitrogen fertilization increased number of open bolls per plant, boll weight, seed cotton yield per plant and per fed., seed index and seed content of oil and protein, while resulted delaying effect on crop maturity and decreased lint percentage.

El-Gahel *et al.* (1995) showed that number of fruiting branches, number of open bolls, boll weight and seed cotton yield were increased as N rate, raised.

Khalil (1998) found that increasing N rate increased the N concentration in the leaf blades. He added that N concentration in leaf petioles was higher with urea than ammonium nitrate.

Wassel *et al.* (2000) found that nitrogen fertilization increased number of open bolls, seed index, seed cotton yield per plant and per feddan, seed content of oil and protein and leaf chlorophyll content.

El-Beily *et al.* (2001) indicated that nitrogen stimulate plant growth increasing the level up to 90 kg/fed. and significantly increased final plant height and number of green bolls per plant.

Ghourab *et al.* (1995) obtained that increasing N rates up to 90 g N/fed. significantly increased plant height, number of open bolls per plant, seed cotton yield/fed. and seed protein percentage, while decreased leaf pigments. They added that nitrogen forms had significant effect on plant height, number of open bolls per plant, seed cotton yield, seed protein

percentage and leaf pigments. The interaction between N rates and N forms had significant effect on plant height, number of open bolls per plant, seed cotton yield, seed protein percentage and leaf pigments.

This study was carried out to evaluate the effect of three different nitrogen sources namely ammonium sulphate, urea and ammonium nitrate at two rates, two number of addition and their interaction on Egyptian cotton yield and its quality.

MATERIALS AND METHODS

This study was conducted on a salinity soil at El-Serw Agricultural Experiment Station during the two successive seasons 2001 and 2002 using the Egyptian cotton cultivar Giza 86 (*G. barbadense* L.). The aim of this study was to test the evaluate nitrogen sources, nitrogen rates, number of addition and their interaction on growth, yield and yield component, seed oil and protein percent, total chlorophyll and nitrogen percentage in leaves.

Soil samples from the experimental site were collected before sowing The determine main soil physical and chemical characters out lined by (Page *et al.*, 1982) are presented in Table (1).

Table (1): Mechanical and chemical analysis of experimental soil.

Analysis		2001	2002
Mechanical analysis:			
Course sand	%	2.75	2.35
Fine sand	%	10.50	11.35
Silt	%	26.35	23.80
Clay	%	60.40	62.50
Soil texture		Clayey	Clayey
Calcium carbonate	%	1.45	1.50
organic matter	%	1.20	1.15
pH		8.7	8.9
E.C		5.57	6.10
Cations: N. equivalent/L			
Ca^{++}		4.50	5.8
Mg^{++}		9.70	11.6
Na^{+}		40.90	43.2
K^{+}		0.60	0.4
Anions: m. equivalent/L			
CO^{-}_{3}		-	-
HCO^{-}_{3}		3.2	3.9
Cl^{-}		36.9	38.8
SO^{-}_{4}		15.6	18.3

Split split-plot experimental design with four replication was used. Three sources of nitrogen (ammonium sulphate, urea and ammonium nitrate) represented the main plot, two rates of nitrogen fertilizer (60 and 90 kg/feddan) represented the sub-plots and number of addition (2 and 3 times) represented the sub-sub-plot. The area of the sub-sub-plot was 12 m^2

including 5 rows which were 60 cm apart and 4 m long. The treatments including three N sources [Ammonium sulphate (20% N), urea (46.5% N) and ammonium nitrate (33.5% N)], two rates of N application (60 and 90) kg/feddan, number of addition (2 and 3 times) and their interactions. The nitrogen fertilizer was side in two equal doses before the first and the second irrigation or in three equal doses before the first, second and the third irrigation. Seeds were hand sown on April 7 and April 9 in 2001 and 2002 seasons, respectively.

All the agricultural practices were carried out as follows in El-Serw region. A random sample of ten plants was chosen from each plot at harvest in order to estimate the following characters.

1.Growth characteristics:

Final plant height (cm) and number of fruiting branches per plant.

2.Yield and yield components characteristics:

Number of open bolls per plant, boll weight (g), seed index was determined by weighting 100 seeds in grams, lint percentage was obtained by using percentage of the lint from a given weight of seed cotton. The yield of seed cotton (kentar/fed.) and earliness % (percentage of the first pick to total yield) were estimated.

3.Fiber properties as fineness and strength were estimated according to A.S.T.M. Designation (D) 1447 and 1448 (1967).

4.Chemical characters:

Oil and protein seed percentage, leaf nitrogen % was determined according to A.O.A.C. (1975) and total chlorophyll: leaf samples were taken after the end of application by two weeks to determine total chlorophyll according to Amon (1949).

All the data collected were subjected to analysis of variance outlined by Snedecor and Cochran (1981), where the mean values were compared by L.S.D. at 5% level of significant.

RESULTS AND DISCUSSION

The results are presented and discussed in the following sequence:

1. Plant height:

The results in Table (2) showed significant differences between the three nitrogen sources in plant height. Cotton plants fertilized with ammonium sulphate were significantly taller than those treated with other N sources. The superior effect of ammonium sulphate on plant height may be due to the acidifying effect of that carrier which may lead to a higher utilization of N as well as other nutritive elements present in the soil such as P and micronutrients. In addition, ammonium sulphate is excellent source of sulpher, which in needed by cotton plants specially under soil salinity. Similar results were reported by Ghourab *et al.* (1995).

Table (2): Main effects of N-fertilization sources, rates and No. of additions on some cotton characteristics during 2001 and 2002 seasons and their interactions.

Cotton characteristics	Plant height (cm)		No. of fruiting branches		No. of open bolls/plant		Boll weight (gm)		Seed index (gm)		Lint %		Earliness %	
Treatments	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
(A) N-sources:														
Ammonium sulphate	119.20	121.70	8.84	10.54	12.80	13.95	2.68	2.57	10.74	10.66	35.88	36.78	53.64	51.94
Urea	111.70	114.20	6.75	9.05	9.53	10.40	2.67	2.55	10.36	10.48	35.27	36.23	63.83	62.08
Ammonium nitrate	115.00	117.50	7.77	8.18	10.45	11.62	2.60	2.48	10.49	10.61	33.27	34.79	56.17	54.62
F. test	*	*	**	**	**	**	*	*	**	**	**	**	**	**
L.S.D. 0.05%	4.15	5.80	0.66	0.53	0.05	0.32	0.06	0.06	0.18	0.17	0.30	0.41	2.25	1.79
(B) N-rates:														
60 kg/fed.	112.60	115.10	7.43	8.56	10.26	11.38	2.61	2.50	10.47	10.56	35.13	35.86	59.33	57.48
90 kg/fed.	11800	120.50	8.25	9.63	11.60	12.58	2.63	2.56	10.60	10.72	34.82	36.80	56.44	54.88
F. test	**	**	*	**	**	**	N.s	N.S	*	*	**	*	**	**
L.S.D. 0.05%	2.74	2.73	0.69	0.41	0.37	0.32	-	-	0.09	0.09	0.17	0.25	1.82	0.83
(C) No. of additions:														
2	114.00	116.50	7.96	8.78	10.60	11.68	2.62	2.50	10.53	10.65	35.83	35.88	59.86	57.62
3	116.60	119.10	8.07	9.42	11.26	12.40	2.68	2.56	10.53	10.64	35.10	35.99	55.98	54.32
F. test	*	*	N.S	**	**	**	*	*	N.S	N.S	N.S	N.S	**	**
L.S.D. 0.05%	2.48	2.49	-	0.39	0.42	0.39	0.05	0.05	-	-	-	-	1.35	0.64
Interactions: L.S.D. at 0.05%														
A x B	-	-	-	-	0.64	0.56	-	-	-	-	-	-	3.16	2.22
A x C	-	-	-	-	-	-	-	-	-	-	-	-	2.34	3.11
B x C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A x B x C	-	-	-	-	-	-	-	-	-	-	-	-	3.31	3.84

Table (3): Main effects of N-fertilization sources, rates and No. of additions on some cotton characteristics during 2001 and 2002 seasons and their interactions.

Cotton Characteristics	Seed cotton yield kentar/fed.		Pressley index		Micronair value		Protein %		Oil %		Total chlorophyll		Nitrogen content in cotton leaves	
Treatments	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002	2001	2002
(A) N-sources:														
Ammonium sulphate	6.58	7.21	11.01	10.98	3.97	3.95	23.85	24.92	21.66	21.86	5.54	5.48	2.78	2.77
Urea	5.50	6.42	10.97	10.97	3.91	3.89	23.42	22.46	21.51	20.38	5.37	5.33	2.43	2.37
Ammonium nitrate	5.58	6.43	10.97	10.97	3.96	3.94	23.24	21.98	21.08	20.79	5.07	5.14	2.45	2.44
F. test	**	**	N.S	N.S	N.S	N.S.	*	**	**	**	**	*	**	**
L.S.D. 0.05%	0.40	0.29	-	-	-	-	0.60	1.41	0.18	0.28	0.13	0.30	0.07	0.07
(B) N-rates:														
60 kg/fed.	5.55	6.22	10.98	10.99	3.95	3.93	23.89	22.72	21.53	20.07	5.28	5.25	2.51	2.52
90 kg/fed.	6.21	7.15	10.94	10.96	3.94	3.92	24.44	23.84	21.61	20.94	5.37	5.39	2.53	2.55
F. test	*	*	N.S	N.S	N.S	N.S	**	*	N.S	N.S	N.S	N.S	N.S	N.S
L.S.D. 0.05%	0.62	0.66	-	-	-	-	0.65	1.21	-	-	-	-	-	-
(C) No. of additions:														
2	5.63	6.34	10.98	10.98	3.96	3.94	24.45	23.24	21.50	20.91	5.28	5.31	2.51	2.50
3	6.13	7.04	10.98	10.96	3.93	3.91	23.43	23.34	21.34	21.11	5.37	5.32	2.53	2.55
F. test	*	**	N.S	N.S	N.S	N.S	N.S	N.S	N.S.	N.S.	N.S	N.S	N.S	N.S
L.S.D. 0.05%	0.42	0.41	-	-	-	-	-	-	-	-	-	-	-	-
Interactions:														
L.S.D. at 0.05%														
A x B	-	-	-	-	-	-	-	-	0.46	0.42	-	-	-	-
A x C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
B x C	-	-	-	-	-	-	-	-	-	-	-	-	-	-
A x B x C	-	-	-	-	-	-	0.76	1.65	-	-	-	-	-	-

Also data in Table (2) showed that plant height was significantly affected by N rates. Increasing nitrogen rates up to 90 kg/fed. increased plant height compared with the other rate 60 kg/fed. The increase in plant height may be due to the increase in number and length of internodes/plant.

Also, the tallest plants were produced when plants were fertilized by nitrogen in three splitting doses compared with the two equal application.

No. significant differences were detected in plant height as affected by any of the interactions. Similar results were reported by Shahine (1980), El-Kalla *et al.* (1994), Ghourab *et al.* (1995) and Khalifa and Abou Zeid (2002).

2. Number of fruiting branches:

Data in Table (2) indicated that number of fruiting branches per plant was significantly affected by N sources. Ammonium sulphate resulted in the highest number of fruiting branches/plant followed by ammonium nitrate in the first season and urea in the second season.

Also, N rates were affected on number of fruiting branches per plant. The maxim values were obtained from plants fertilized by 90 kg N/fed.

On the other hand, nitrogen fertilization when applied three times gave the highest number of fruiting branches per plant than the other significantly two splitting doses especially under soil salinity. These results are in general agreement with those obtained by Ghourab *et al.* (1995) and Khalifa and Abou Zaid (2002).

The interactions of the main factors under study did not exert any significant effect on number of fruiting branches/plant in both seasons.

3.Number of open bolls per plant:

Results in Table (2) indicates that number of open bolls per plant was significantly affected by N forms in the two seasons. The highest number of open bolls/plant was obtained when plants were treated by ammonium sulphate while the lowest number was realized with urea fertilizer. Also increasing N-level up to 90 kg/fed. had a significant increased number of open bolls/plant in both seasons. The results indicate also that the highest number of open bolls/plant was obtained when plants were treated by N fertilizer at three splitting dose when compared with two times of splitting dose in both season.

On the other hand there was significant effect for the interaction between N-sources x N-rates on number of open bolls per plant in both season. While the ammonium sulphate under N-rates 90 kg/fed. gave higher number of open bolls per plant (Table 4). These findings are in line with those reported by El-Kalla *et al.* (1994), Makram *et al.* (1994), Ghourab *et al.* (1995) and Khalifa and Abou Zaid (2002).

4. Boll weight (g):

Data in Table (2) showed that ammonium sulphat as N-source significantly caused greet increase in boll weight followed by urea and ammonium nitrate came in the last rank especially under soil salinity. While, nitrogen rates did not reach the level of significance in both seasons.

As for number of splitting nitrogen dose additions it could be noticed that N application 3 times caused a significant increase in boll weight than N application 2 times. This increase might be due to continuous supply of cotton plant with the necessary nutrition alements during vegetative growth specially under soil salinity. Similar results were reported by Makram *et al.* (1994), Ghourab *et al. (1995) and Khalifa and Abou Zaid (2002).*

No significant differences were detected in boll weight as affected by any of the interactions.

Table (4): Main effects of the interaction between N. sources x N. rates on some cotton characteristics on 2001, 2002 seasons.

Cotton characters	No. of open polls/plant		Earliness %		Protein %		Oil %	
Treatments	2001	2002	2001	2002	2001	2002	2001	2002
N. sources x N rates:								
Ammonium sulphate x 60 kg/fed.	11.95	13.10	56.28	54.36	25.09	22.00	21.35	20.48
20% 90 kg/fed.	13.65	14.68	51.00	49.52	24.40	23.66	21.77	21.25
Urea (46.5%) . x 60 g/fed.	10.18	11.34	68.44	66.64	23.40	23.87	22.12	22.14
90 kg/fed.	10.75	11.95	59.23	57.52	23.75	26.25	21.11	20.63
Ammonium nitrate x 60 kg/fed.	8.65	9.70	53.28	51.44	22.74	22.34	21.12	20.63
33.5% 90 kg/fed.	10.40	11.10	59.08	57.80	22.99	21.63	21.05	20.96
LSD 5%	0.64	0.56	2.87	2.22	0.76	1.65	0.46	0.42

5.Seed index (g):

From Table (2) it is clear that seed index significantly affected by N-sources in both seasons. The highest seed index was obtained from ammonium sulphate, while the lowest seed index was detected from urea. While ammonium nitrate come in the second rank.

Concerning N rates, results in Table (2) show that application of 90 kg N/fed. significantly increased seed index compared with 60 kg N/fed. in the two seasons. This increase in seed index may be due to the role of nitrogen in increasing the seed weight and size. These results are in accordance with Ghourab *et al.* (1995) and Khalifa and Abou Zaid (2002).

Seed index was not markedly affected by number of N splitting additions in both seasons. Also, all the interactions between the different treatments were not significant.

6. Lint percentage:

Data in Table (2) shown significant differences between the three nitrogen sources on lint percentage in both seasons. The high value of lint percentage was obtained from ammonium sulphate as N source. Urea fertilizer came in the second rank.

On the other hand it is shown from Table (2) that increasing N-rates up to 90 kg/fed. decreased the lint percentage in the first season. This decrease may be due to the increase of seed weight. These results are in agreement with Girgis *et al.* (1993).

Lint percentage was not markedly affect by timing of splitting N additions in both seasons. Also, the interaction between N-sources, N-rates

and number of N additions had no significant effect on lint percentage in both seasons.

7. Earliness percentage:

Results in Table (2) revealed that urea fertilizer caused significant increase in earliness percentage compared with the two other compounds under soil salinity. Ammonium nitrate fertilizer significantly surpassed ammonium sulphate in earliness percentage and come in the second rank. Same results were reported by Girgis *et al.* (1993) and Ghourab *et al.* (1995).

As for N rates, it could be noticed that high dose of nitrogen fertilization at 90 kg/fed. had a significant negative effect of which to prolonged vegetative period and thus delayed development and maturity. These results are in agreement with those obtained by Ziadah (1991) and Girgis *et al.* (1993).

Also, N application 3 times had a significant negative effect on earliness percentage compared with 2 times additions.

The interactions between N-sources X number of N splitting had a significant effect on earliness % in both seasons (Table 5). The maximum earliness % value was recorded under using urea with two splitting N dose in both season.

Table (5): Main effects of the interaction among N-sources x No. of N splitting.

Cotton characteristics			Earliness %	
Treatments			2001	2002
N-sources x No. of N splitting				
Ammonium sulphate	x	2	54.64	52.52
		3	52.60	51.36
Urea	x	2	65.56	63.88
		3	62.11	60.28
Ammonium nitrate	x	2	59.40	57.92
		3	52.96	51.32
L.S.D. 0.05%			2.34	3.11

Table (6): The interaction among N-sources x N-rates x N-no of additions on earlinesis and oil % in 2001 season.

Cotton characteristics		Earlinsis		Oil %	
Treatments		2	3	2	3
Ammonium sulphate	x 60	59.92	54.64	21.05	21.64
	90	51.36	50.64	22.38	21.16
Urea	x 60	67.76	69.12	22.19	22.05
	90	63.36	55.10	21.15	21.06
Ammonium nitrate	x 60	58.72	47.84	21.15	21.08
	90	60.08	58.08	21.06	21.04
L.S.D. 0.05%		3.31	3.84	0.76	0.75

8. Seed cotton yield kentar/feddan:

Data in Table (3) showed that ammonium sulphat was more effective in increasing yield than the other two sources of nitrogen specially under soil salinity.

As for N-rates data show that seed cotton yield/fed markedly increased by increasing N-rates up to 90 kg N/fed. This increase might be due to improvement cotton growth, number of fruiting branches, boll weight and number of open bolls per plant.

Concerning number of splitting nitrogen additions results also showed that application of N for three times gave the highest seed cotton yield per feddan and this was might be due to continuous supply of cotton plant with the major necessary nutritional element during vegetative growth specially under soil salinity.

No significant differences were detected in seed cotton yield due to any of the interactions. These results are in agreement with those obtained by Girgis *et al.* (1993) and Ghourab *et al.* (1995). Ammonium sulphate application markedly increased seed cotton yield compared with the rest of other sources. More, no marked differences were detected between urea and ammonium nitrate.

9. Fiber properties (strength, fineness):

The effect of N-sources, N-rates and number of splitting N additions had not significant effect on fiber properties as shown in Table (3). The insignificant effect may be explained by the fact that these characters have high heritability values, affected mostly by the genetic constituents of the cultivar. Also, no significant effects due to the interactions among the different treatments. These results are in line with those obtained by Wassel (1990) and Girgis *et al.* (1993).

10. Seed contents of oil and protein:

It is evident from Table (3) that there were significant effect in seed oil and/or protein percentages among the different treatments. Ammonium sulphate caused significant increase in seed oil and/or protein percentage compared with the two other compounds in both seasons.

Also, seed protein percentage was significantly increased as nitrogen rates increased up to 90 kg/fed. and this increase may be due to that nitrogen had a major role as a constituent of protein (Epstein, 1972). As for oil, it is increased when nitrogen rate was increased from 60 to 90 kg/fed. but these increases did not reach the level of significance.

There is no significant effect on seed oil or protein percentage due to splitting of N addition in both seasons.

The interaction between N sources x N rates shows significant effect on protein and oil percentage in both seasons as data presented in Table (3-6).

These results were agreement with those obtained by Ghourab *et al.* (1995).

11. Leaf chlorophyll content:

Data presented in Table (3) reveal that leaf chlorophyll was significantly affected by N sources in both seasons. The highest value was obtained from adding ammonium sulphate. However, leaf chlorophyll content was not affect either by N rates or number N additions. Also, the interactions between different treatments had no significant effect on this character. These results are in agreement with those obtained by Ghourab *et al.* (1995).

12. Leaf nitrogen concentration:

It is evident from Table (3) that nitrogen in leaves was at its maximum from adding ammonium sulphate as N source. However, nitrogen in leaves was not affected by N rates or number of N additions in both seasons. Also, the interactions between the different treatment s had no significant effect on leaf nitrogen concentration. Girgis *et al.* (1993) obtained the same results.

Generally, it can be concluded that in some Egyptian soils such as saline soils, ammonium sulphate can be used as nitrogen source at the rate 90 kg/fed. and 3 times additions. In this study ammonium sulphate gave the best results in promoting cotton plant growth and yield in the area of the experimentation.

REFERENCES

Ahmed, N.Y.N. (1975). Evaluation of urea and ammonium sulphate as nitrogen fertilizer for Southern Iraq Soils. Zad. Sci. Conf., Sci. Res. Found. 6-11 Dc. 1975 (C.F. Field Crop Abst., 32: 5031, 1979).

Amer, F. and H. Abu-Amin (1969). Evaluation of cotton response to rates, sources and timing of nitrogen application by petiolic analysis. Agron., J. 61: 635-637.

A.O.A.C. (1975). Associated of Official Agricultural Chemists. Official Methods of Analysis. 12th Ed. Washington, D.C. 94-117

Arnon, D.I. (1949). Copper enzymes in isolated chloroplast. Plant Physiol., 24: 1-15.

A.S.T.M. (1967). American Society for Testing and Materials, Philadelphia, USA. (D-1447 and 1448).

Boquet, D.J.; E.B. Moser and G.A. Breitenbeck (1993). Nitrogen effects on boll production of field grown cotton. Agron. J., 85: 34-39.

El-Beily, M.A.A.; W.M.O. El-Shazly; S.A Aly and K.A. Zidan (2001). Response of cotton cultivar Giza 85 to nitrogen rates and hill spacings under levels of growth regulator (pix). Minufiya J. Agric. Res., 26(1): 51-84.

El-Gabaly, M.M. (1975). Reclamation and managements of salt affected soil. International Symposium on new developments in the field of salt affected soils. Dec. 4-9, p. 401-434. Ministry of Agriculture, Egypt.

El-Gahel, S.M.F.; M.I. El-Shanawy and H.M. Abou-Zeid (1995). Response of new hybrid cotton (Giza 77 x Giza 45 "A") to different stands under different nitrogen levels. J. Agric. Res. Tanta Univ., 21(1): 91-100.

El-Kall, S.E.; A.T. El-Kassaby; A.A. Leilah; A.M. Ghonem and M.M. Ismail (1994). Effect of sowing dates. Population and distribution plants and nitrogen fertilizer levels on growth and yield of Egyptian cotton 6th Conf. Agron Al-Azhar Univ., Cairo, Vol. 1: Sept. 1994.

El-Kashlan, M.K.; E.A. Girgis and N.A. Abd El-Shafy (1992). Effect of some nutrients on Egyptian cotton variety Giza 76. Comm. In. Sci. and Dev. Res., 40(601): 1-16.

Epstein, E. (1972). Mineral Nutrition of Plants. Copyright by John Willey and Sons. Part III. : 285-311.

El-Shinnawy, A.; F.M. Ghaly and A.A. Hosny (1984). Effect of hill spacing and nitrogen levels on Giza 80 cotton variety. Agric. Rev. Cairo, 62(6): 101-111.

Girgis, E.A.; N.A. El-Shafy and M.K. El-Kashlan (1993). Effect of harvest aid chemicals under two nitrogen levels on cotton yield and quality. J. Agric. Res. Tanta Univ., 19(2): 1993, 348-361.

Ghourab, M.H.H.; O.M.M. Wassel and M.S. Saeed (1995). Effect of some nitrogenous fertilizers and nitrogen rates on yield and quality of Egyptian cotton. Zagazig J. Res., 22(4): 955-961, 1995.

Gueinov, D.M. and S. Ruziev (1975). Effect of different nitrogen fertilizers on growth and yield of cotton grown on meadowscroozem soil (C.F. Field Crop Abst., 31, 43-46, 1978).

Khalil, F.A. (1998). Effect of some nitrogen fertilizers on the yield and composition of cotton plants. Assiut. Journal of Agricultural. Sciences, 29(4): 145-154.

Khalifa, H.E. and M.K.M. Abou-Zaid (2002). Cotton production as affected by irrigation intervals, nitrogen and potassium fertilization in the newly reclaimed soil of West Nubaria Region. J. Adv. Agric. Res., 7(2): 315-328.

Khare, A.K. and G. Singh (1970). Forms of nitrogen in relation to uptake of nitrogen, phosphorus, potassium and their ratio in rainfed cotton in black cotton soils (C.F. Field Crop Abst., 28: 793, 1975).

Lasheen, A.F.S. (1989). Effect of some micro elements, nitrogen and growth retardants on yield and its components of Egyptian cotton. M.Sc. Thesis Fac. of Agric. Kafr El-Sheikh, Tanta Univ.

Makram, E.A.; M.I. El-Shahawy; S.F. El-Gahel and R.R. Abdel-Malik (1994). Effect of hill spacing. Soil fertilization and its interaction on growth yield and earliness in Egyptian cotton cultivars. 1. Giza 70. J. Agric. Sci. Mansoura Univ., 19(1): 1-13 (1994).

Page, A.L.; R.H. Miller and D.R. Keeney (Eds.) (1982). Methods of Soil Analysis Part. 2: Chemical and microbiological properties. Miner. Soc. Agron. Madison, Wisconsin.

Shahine, I.M.M. (1980). Effect of different levels and forms of nitrogen fertilizer on the yield and yield components of cotton plants. Ph.D. Thesis Fac. Agric. Moshtohor Zagazig Univ. Egypt.

Snedecor, G.W. and W.G. Cochran (1981). Statistical Methods. 6th Iowa State Univ. USA.

Tiwari, B.P. and C.R. Bisen (1972). Response of different forms nitrogen and their time of application with and without phosphate on the yield of rainfed American cotton. Indian J. Agric. Sci., 42: 313-317.

Wassel, O.M. (1990). Effect of topping, defoliant and plant density on yield and fiber properties of cotton. Ph.D. Thesis, Fac. of Agric. Al-Azhar Univ.

Wassel, O.M.M.; M.H.M. Ghourab and Gamalat A. Wahdan (2000). Response of cotton plant to nitrogen fertilizer and some micronutrients. Menofiya. J. Agric. Res., 25 (6): 1413-1424.

Yorovenko, G.I.; A. Yusupov; G. Khalmukhamedov and I.N. Kib (1970). Effect of forms and rates of N on physiologic biochemical processes in cotton under different moisture regimes. G.F. Field Crop. Abs., 26: 1890-1973.

Ziadah, K.A.R. (1991). Effect of some cultural practices on growth and yield of cotton, Ph.D. Thesis, Fac. of Agric. Kafr El-Sheikh, Tanta Univ.

تأثير بعض مصادر ومعدلات وعدد مرات إضافة الآزوت على محصـــول وجـــودة القطن المصرى تحت ظروف التربه الملحية

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أجريت تجربتان حقليتان بمزرعة محطة البحوث الزراعية بالسرو خلال الموســمين الزراعيين ٢٠٠١ ، ٢٠٠٢م بغرض تقييم تأثير ثلاثة مصادر للسماد الآزوتى (سلفات الأمونيوم ، اليوريا ، نترات الأمونيوم) بمعدلات تسميد أرضى (٦٠كجم آزوت ، ٩٠كجم آزوت للفدان) وعدد مرات إضافة جرعة السماد مرتين (قبل الرية الأولى والثانيـــة) ، وثلاث مرات (قبل الرية الأولى والثانية والثالثة) على المحصول ومكوناته ، التبكير ، وجودة البذور والألياف ومحتـــوى الأوراق من النيتروجين والكلورفيل فى القطن المصرى صنف جيزه ٨٦ وكان التصميم المتبع قطع منشقة مرتين.

ويمكن تلخيص أهم النتائج المتحصل عليها ما يلى:

١- كان هناك تأثير معنوى لمصادر التسميد الآزوتى على طول النبات وعدد الأفرع الثمرية على النبات وعدد اللـــوز المتفتح على النبات ووزن اللوزة وتصافى الحليج ومعامل البذره والنسبة المئوية للتبكير والنسبة المئوية للـــبروتين والزيت فى البذره ومحتوى الأوراق من الكلورفيل والنيتروجين.

٢- أدى زيادة معدلات التسميد الآزوتى من ٦٠ إلى ٩٠ كجم نيتروجين للفدان إلى زيادة معنوية فى طول النبات وعدد الأفرع الثمرية للنبات وعدد اللوز المتفتح على النبات ومعامل البذره وتصافى الحليج والنســـبة المئويـــة للتبكـــير وكذلك محصول القطن الزهر قنطار/فدان وأيضا النسبة المئوية للبروتين فى البذره.

٣- أدى إضافة جرعة السماد الآزوتى لنباتات القطن على ثلاث دفعات (قبل الريات الأولى والثانية والثالثة) إلى زيادة معنوية فى كل من طول النبات/سم وعدد الأفرع الثمرية على النبات وعدد اللوز المتفتح ووزن اللـــوزة والنســـبة المئوية للتبكير ومحصول القطن الزهر قنطار/فدان.

٤- أظهر التفاعل بين مصادر ومعدلات التسميد الآزوتى تأثيرا معنويا على كل من عدد اللوز المتفتح علـــى النبـــات والنسبة المئوية للتبكير والنسبة المئوية للبروتين والزيت فى البذره ومحتوى الأوراق من الكلورفيل الكلى.

٥- أظهر التفاعل بين مصادر وعدد مرات إضافة التسميد الآزوتى تأثيرا معنويا على النسبة المئوية للتبكير والنســـبة المئوية للزيت فى البذره فى موسم ٢٠٠١م فقط.

٦- كان التفاعل بين مصادر ومعدلات وعدد مرات إضافة السماد الآزوتى معنويا على كل من النسبة المئوية للتبكـــير والنسبة المئوية للزيت فى البذره.

وتوصى هذه الدراسة بتسميد القطن بسماد سلفات النشادر بمعدل ٩٠ كجم/فدان على ثـــلاث دفعـــات قبـــل الريات الاولى والثانية والثالثة للحصول على أعلى محصول من القطن الزهر والجودة العالية تحت ظروف الاراضـــى الملحية فى منطقة السرو.