INFLUENCE OF INDOL ACETIC ACID (IAA) APPLICATION UNDER DIFFERENT PLANTING DATES ON GROWTH AND YIELD OF GIZA 88 COTTON CULTIVAR

EL-SAYED, E.A. AND M. EL-MENSHAWI

Cotton Res. Inst., ARC, Egypt

(Manuscript received 11 September 2005)

Abstract

Two application methods of Indol Acetic Acid (IAA), soaking seeds and spraying plants at the beginning of flowering, were employed with two concentrations (25 and 50 ppm) plus non-treated check (water) on two planting dates (25 March and 25 April) of cotton in 2003 and 2004 seasons at Sakha Agricultural Research Station. Giza 88 cultivar was used. Soaking seeds in solution of IAA was done for 12 hours before sowing. The data revealed that sowing cotton in 25th March had significantly decreased final plant height, while number of main stem internodes, number of sympodia per plant, nodal position of the first sympodium, days to first flowers and first open boll, earliness percentage, number of open bolls per plant, boll weight, seed cotton yield per plant and per feddan, seed index and fiber fineness were increased. Comparing with untreated plants with IAA, the obtained results showed that the application of IAA, in general, increased all studied characters except nodal position of the first sympodium and fiber properties, which were not significantly affected. The best results were obtained by soaking seeds 12 hours before sowing in a solution of 25 ppm Indol Acetic Acid. The application of IAA either soaking seeds or spraying plants increased seed contents (oil and protein %) and total chlorophyll in leaves, especially when applied at low concentration (25 ppm) compared with untreated plants. Soaking seeds before sowing in 25 ppm of solution IAA gave the highest values of oil %, protein % in seeds, total chlorophyll in leaves, reducing sugars, non-reducing sugars, soluble sugar and phenols, while carotenoides were decreased. The interaction between planting date and IAA treatments had significant effect on final plant height, number of open bolls per plant, boll weight and seed cotton yield per feddan in 2003 season.

Generally, it could be concluded that Indol Acetic Acid (IAA) gave the highest yield, yield components and seed quality characters when it was applied at early sowing date by soaking seeds in solution of 25 ppm of IAA.

INTRODUCTION

It is well known that vegetative characters, yield and its components and earliness measurements of cotton are governed by many environmental factors such as planting date which ranks high among the important factors affecting the cotton production, while auxins application to cotton plants can modify some developmental activities such as boll setting in relation to yield and yield components. In the last few decades, the pronounced reduction in cotton yield mainly occurred from applying

unproper practices in growing cotton, such as late sowing which lead to more growth late maturation, higher boll damage and subsequently lower seed cotton yield. So that, early sown cotton usually gives high yield and this may be due to fitting cotton cultivar to full season in order to obtain complete heat units requirements (Young *et al.*, 1980). In the this respect, early sown increased seed cotton yield (Ali and El-Sayed, 2001) and earliness (Hammouda, 1984). On the other hand, delaying sowing increased final plant height and internode length. Ali and El-Sayed (2001) found that yield and its components such as number of open bolls per plant, boll weight, seed index, seed cotton yield per plant and feddan were significantly increased when cotton plants were sowing early, while number of unopened bolls per plant and lint percentage were not influenced by sowing date.

The practices of late sowing cotton are still facing problems due to the reduction in the number of fruiting branches, number of open bolls, boll weight and seed cotton yield. So, many investigators study the effect of spraying cotton plants of or soaking its seeds with some growth regulators to improve growth, flowering and productivity of fruits.

Most of the detailed work concerning auxin physiology, such as concentrations at which it is active, factors affecting its activity, and the mechanism of its action, have therefore been related to studies on cell elongation.

Mathur (1963) found that IAA application enhanced flowering and increased the final number of bolls/plant. Moreover, Abdel Aal (1998) found that spraying cotton with 50 ppm IAA caused an increase in the number of flowers, boll set, boll weight and seed cotton yield. Concerning methods and concentration of IAA applications, El-Sayed (1992) proved that there was no clear effect to the application methods at different concentration of IAA on final plant height, number of vegetative branches and number of fruiting branches/plant but the total number of open bolls tended to be higher in plants treated with IAA at a concentration of 25 ppm than 0 or 50 ppm either as foliar application or as soaking. He added that soaking the root system in 25 ppm gave the highest values of average boll weight, seed cotton yield per plant over the untreated plants. Increasing the concentration of IAA up to 50 ppm tended to decrease the previous characters.

This investigation was carried out to study the effect of Indol Acetic Acid (IAA) application methods and concentrations on two planting dates of Giza 88 cotton cultivar.

MATERIALS AND METHODS

Two field experiments were carried out at Sakha Agricultural Research Station, during 2003 and 2004 seasons, to study the effect of Indol Acetic Acid (IAA)

application methods and concentrations on two planting dates of Giza 88 cotton cultivar. Split-plot design with four replications was used. The plot size was 18 m^2 including 6 rows, 5 m long and 60 cm width. The main plots included two sowing dates (25 March and 25 April), while the sub-plots were devoted to Indol Acetic Acid treatments as follows: 1) Untreated plants (control). 2) Soaking seeds for 12 hours before sowing in a solution of 25 ppm IAA. 3) Soaking seeds for 12 hours before sowing in solution of 50 ppm IAA. 4) Spraying plants with solution of 25 ppm IAA at the beginning of flowering. 5) Spraying plants with solution of 50 ppm IAA at the beginning of flowering.

Cotton seeds were sown in hills spaced 25 cm apart leaving two vigorous seedlings per hill at thinning time without replanting. Nitrogen fertilizer in the form of ammonium nitrate 33.5 % N (60 kg/fed.) was added in bands and divided in two equal portions, the first one was applied after thinning just before the second irrigation and the second part before the third irrigation. Other practices were done as recommended in cotton production that is involved as basic dose of 150 kg calcium superphosphate (15.5 % P_2O_5) at land preparation besides 50 kg potassium sulphate (48 % K_2O) per feddan before the fourth irrigation for all sub-plots. Soil samples were taken in the two seasons before planting cotton to estimate the soil characters using the standard methods as described by Chapman and Pareker (1981). The results are shown in Table 1. The monthly air temperature (°C) and relative humidity % for Sakha weather station through the two growing seasons are given in Table 2. Ten guarded plants were chosen at random to determine the following characters:

A. Plant growth:

Final plant height in cm, number of main stem internodes, number of monopodia and number of sympodia per plant.

Table 1. Mechanical and chemical analysis of soil sample in 2003 and 2004 seasons.

Soil characteristics		2003	2004
Soil structure		Clay	Clay
pH		8.72	8.40
Organic matter	%	1.90	1.82
Total SS	%	0.63	0.56
Bicarbonate	%	1.82	1.73
Chloride	%	7.30	7.40
Sulfuric	%	4.30	4.70
Ca	%	1.41	1.41
Mg	%	1.30	1.32
Na	%	4.28	4.51
Available N	ppm	11.35	13.10
Available P	ppm	8.95	9.51
Available K	ppm	325.00	386.20

B. Earliness measurements:

Nodal position of the first sympodium, number of days from planting to the appearance of the first flower, number of days to the first open boll and earliness percentage.

C. Yield and yield components:

Number of open bolls per plant, number of unopen bolls per plant, boll weight in (g) seed cotton yield per plant, lint percentage and seed index. Seed cotton yield was estimated from picking all plants of the four inner rows of each sub-plot and transformed to kentars per feddan, the two outer rows of each subplot were picked separately to avoid any border effect. Oil content (in seed) was determined according to A. O. A. C. (1975) method. Protein content (in seed) was determined using the method described by A. O. A. C. (1965).

D. Chemical analysis:

For chemical analysis a random sample of the top forth node leaves were taken 15 days after thinning for soaking treatments and 15 days after spraying treatment to determine some chemical constituents, i.e. chlorophyll, carotenoides, total soluble sugars, reducing sugars and polyphenols (A. O. A. C. 1965).

E. Fiber properties:

1. Micronaire value was tested by micronaire.
2. Fiber strength was tested by pressley apparatus at zero gauge length.
3. Fiber length. fiber 2.5 % span length measured on a digital fibrograph according to standard method of testing fiber length.
4. Fiber elongation % was measured by the stelometer instrument (D-1445).

Statistical analysis was performed according to Snedecor and Cochran (1981) and means were compared by L.S.D. at 5% level.

Table 2. Monthly air temperature (°C) and relative humidity (%) during 2003 and 2004 seasons.

	2003				2004			
Months	Air temp. °C		R. H. %		Air temp. °C		R. H. %	
	Max.	Min.	7.30	13.30	Max.	Min.	7.30	13.30
March	20.1	7.1	80.0	52.0	21.2	7.3	79.7	51.8
April	26.4	11.2	75.0	45.5	27.0	11.4	73.8	46.3
May	32.2	15.0	84.7	54.2	31.3	14.9	83.0	48.7
June	33.5	18.7	86.2	43.2	32.9	17.8	85.7	44.3
July	32.6	19.7	84.4	52.6	33.1	18.9	83.5	51.7
Aug.	33.7	19.9	91.3	55.0	34.3	19.3	89.9	56.0
Sept.	33.0	18.0	88.3	48.9	33.2	18.2	87.8	47.7
Oct.	30.0	15.1	81.5	47.3	30.2	16.0	82.3	46.8

RESULTS AND DISCUSSION

A. Growth characters:

Data presented in Table 3 show the influence of planting dates, methods and concentrations of IAA on some growth characters in 2003 and 2004 seasons.

Sowing dates:

It is evident that planting dates significantly affected all growth characters whereas number of main stem internodes and number of sympodia per plant have their maximum values when cotton seeds were sown on 25th March. Final plant height was shorter and number of monopodia/plant was less in early sowing. The superiority of early sowing date may be due to the favorable condition of temperature which enhanced the germination rapidness and gave better growth. These results are in harmony with those obtained by Ali and El-Sayed (2001).

Applications of IAA:

The data given in Table 3 clear that final plant height, number of main stem internodes and number of sympodia per plant were significantly affected by IAA treatments while number of monopodia per plant did not affected. Also, it could be noted that soaking seeds 12 hours before sowing in solution of 25 ppm IAA gave the highest values of growth characters as for 12 hours compared with other treated plants. High concentration of IAA, i.e. 50 ppm, decreased all characters as compared to low concentration. The present data are in agreement with those obtained by Nadagoudar and Patil (1971) who imbibed cotton seed for 36 hours in IAA and found that IAA increased the growth of roots and shoots at 35 days after sowing compared with the untreated control. It seemed reasonable to assume that growth substances play a role in the development of embryos through various stages in their ontogeny. The obtained results are in agreement with those obtained by Raghavan (1964) and Blesa *et al.* (1967).

B. Earliness measurements:

The data presented in Table 4 show the effect of different planting dates, methods and concentrations of IAA and their interactions on some earliness measurements.

Table 3. Some growth characters as affected by different planting dates and applications of Indol Acetic Acid and their interactions in 2003 and 2004 seasons.

Treatments	Season	Planting dates (P)		Sig.	L.S.D	IAA applications (I)					Sig.	L.S.D.	Inter
		25	25			Without	Soaking		Spraying				
characters		March	April			application	25 ppm	50 ppm	25 ppm	50 ppm			P x I
Final plant	2003	120.35	135.40	*	6.10	127.60	130.30	127.20	129.50	124.60	*	0.71	*
height (cm)	2004	120.20	136.00	*	5.80	125.60	133.20	126.78	128.80	123.80	*	1.8	NS
Number of main	2003	22.40	17.90	*	1.20	19.10	21.70	20.80	20.30	18.65	*	0.70	NS
stem internodes	2004	21.30	16.90	*	0.80	18.40	22.55	18.90	18.70	18.80	*	0.08	NS
Number of	2003	0.45	2.20	N.S	-	1.1	1.75	1.40	1.20	1.20	NS	-	-
monopodia/plant	2004	0.47	2.10	N.S	-	0.77	1.50	1.40	1.10	1.00	NS	-	-
Number of	2003	16.10	9.80	*	0.21	11.30	14.30	13.10	12.90	11.60	*	0.25	NS
sympodia/plant	2004	14.30	9.50	*	0.12	10.70	12.85	11.70	11.60	11.40	*	0.05	NS

* Significant at 0.05 level of probability
N.S. = Not significant

Sowing dates:

The differences between averages of both sowing dates were significant for all earliness measurements studied. Position of first sympodium was markedly low in case of early sowing date plantation. Earliness parameters were markedly proportional in case of late sowing time, i.e. days to first flower appearance, days to first cracking boll and earliness percentage. These results may be due to relatively high temperature of air and soil in case of late sowing (25th April) which pushed the cotton plants to form excessive vegetative growth with few fruiting branches throughout short plant life, while in case of early sowing (25th March) the heat units accumulation was that help cotton plants to form more fruiting branches and more bolls per plant. At harvest (first pick) most bolls in case of early sowing reached maturity age, in the same time fewer bolls reached maturity in case of late planting which was reflected on earliness %. These results are in agreement with those obtained by Ali and El-Sayed (2001).

Application of IAA:

The results in Table 4 show that the different application methods of IAA at different concentrations had no marked effect on node number carrying the first fruiting branch. However, the first sympodium was high on the stem of plants treated with 50 ppm IAA. Moreover, the lowest fruiting node number was obtained form plants soaked before sowing for 12 hours in 25 ppm solution of IAA. Treating cotton plants with IAA at different concentrations either as soaking or spraying gave a significant effect on the number of days from sowing to the first flower and first boll opening and earliness percentage. It is evident that there was a slight increase in the number of days from sowing to the opening of first boll with increasing the concentration of IAA from 0 to 25 and 50 ppm. These results indicate that IAA delayed the opening of the first boll and the application of high concentration of auxin causes inhibition of the flowering process. The obtained results are in agreement with those conducted by El-Sayed (1992).

C. Yield and yield components:

The results in Table 5 show the effect of different planting dates, methods and concentration of Indol Acetic Acid and their interactions on seed cotton yield and its components.

Sowing dates:

From Table 5 it is well noticed that sowing date had a significant effect on number of open bolls/plant, boll weight, seed cotton yield per plant and per feddan and seed index, while number of unopen bolls per plant and lint percentage were not affected by sowing dates in the two seasons. Cotton plants sown in early date (25th

March) produced higher number of open bolls per plant, boll weight, seed index, seed cotton yield per plant and per feddan composed with plants sown in late date (25-April). These results could be explained on the basis that early sowing date allows longer growing season and gave enough time to develop a heavy boll load with large seeds (Young *et al.,* 1980). It could be concluded that higher temperature in the first two months of late planting date, had an adverse effects on shortening the boll development and, thereby, limiting the fruiting capacity. Based on the photosynthate required/boll/day the above mentioned lint of cotton fruiting capacity during fruiting and bolling cycles seemed to suppress boll load and subsequently seed cotton yield. Similar results were obtained by Abd El-Aal (1998).

Application of IAA:

From Table 5, the results indicate the significant effect of methods and concentrations of IAA on seed cotton yield and its components except number of unopen bolls/plant and lint percentage. It is well noted that the total number of bolls, that finally matured per plant, were produced from application of 25 ppm of IAA either as foliar application or as soaking seeds before sowing. Moreover, increasing the concentration of IAA over 25 ppm tended to decrease the number of mature bolls per plant.

From the results, it could be seen that a significant improvement in boll weight was obtained by soaking seeds in 25 ppm IAA. Similar results were obtained by Abdel-Aal (1981), who found that spraying cotton with IAA, regardless of its concentration, significantly increased boll weight. It is evident that soaking seeds in 25 ppm IAA gave the highest seed cotton yield per plant and feddan but the lowest yield was given by plants sprayed or soaked in 50 ppm solution of IAA. This indicate that increasing IAA concentration reduced the stimulating effect of IAA.

Effect of sowing date x applications of IAA:

This interaction had a significant effect on final plant height, number of open bolls/plant, boll weight and seed cotton yield per feddan in 2003 season. Table 6 revealed that the highest values of this traits were obtained from plants sown early at 25th March and soaked seed of plants in solution of 25 ppm IAA before sowing while the lowest values resulted from plants without application and sown late at 25th April.

Table 4. Some earliness measurements as affected by different planting dates and applications of Indol Acetic Acid and their interactions in 2003 and 2004 seasons.

Treatments characters	Season	Planting dates (P)		Sig.	L.S.D.	IAA applications (I)					Sig.	L.S.D.	Inter
		25 March	15 April			Without application	Soaking 25 ppm	Soaking 50 ppm	Spraying 25 ppm	Spraying 50 ppm			P x I
Nodal position of	2003	5.10	8.10	*	0.95	6.80	5.10	6.70	6.40	6.65	NS	-	NS
the first sympodium	2004	5.00	7.40	*	0.46	6.70	5.70	6.20	6.10	6.40	NS	-	NS
Days to first	2003	94.65	88.00	*	0.55	90.20	91.20	92.20	91.00	92.20	*	0.75	NS
flower	2004	96.70	88.50	*	1.30	91.80	92.50	93.60	91.10	93.90	*	0.12	NS
Days to first	2003	147.90	138.70	*	1.10	142.90	143.70	144.10	142.00	143.70	*	0.15	NS
open boll	2004	147.95	139.75	*	0.22	144.10	145.25	146.20	143.10	143.80	*	0.12	NS
Earliness	2003	60.75	41.90	*	2.10	46.80	54.70	52.80	50.80	47.70	*	2.10	NS
percentage	2004	65.11	40.10	*	1.80	49.00	54.80	52.88	51.95	50.80	*	0.95	NS

* Significant at 0.05 level of probability

N.S. = Not significant

Table 5. Seed cotton yield and its components as affected by different planting dates and applications of Indol Acetic Acid and their interactions in 2003 and 2004 seasons.

Treatments characters	Season	Planting dates (P)		Sig.	L.S.D.	IAA applications (I)					Sig.	L.S.D.	Inter P x I
		25 March	15 April			Without application	Soaking 25 ppm	Soaking 50 ppm	Spraying 25 ppm	Spraying 50 ppm			
No. of open bolls/plant	2003	18.30	12.10	*	1.80	13.00	17.50	15.20	16.15	14.22	*	0.21	*
	2004	19.20	12.50	*	1.20	13.80	17.80	16.1	16.30	15.20	*	0.08	NS
No. of unopen bolls/plant	2003	1.50	2.90	NS	-	1.70	2.60	2.40	2.30	2.10	NS	-	NS
	2004	1.60	3.75	NS	-	2.30	3.10	2.70	2.50	2.40	NS	-	NS
Boll weight (g)	2003	2.80	1.90	*	0.22	2.00	2.90	2.20	2.65	2.1	*	0.05	*
	2004	2.70	1.90	*	0.18	1.80	2.90	2.32	2.46	2.2	*	0.08	NS
Seed cotton yield/plant (g)	2003	51.24	22.99	*	6.21	26.00	50.75	35.64	40.15	29.86	*	0.28	NS
	2004	51.84	23.75	*	5.35	24.84	51.62	37.45	39.76	33.44	*	1.56	NS
Seed cotton yield (kentar/feddan)	2003	11.50	7.40	*	3.80	6.73	13.14	9.23	10.40	7.73	*	0.96	*
	2004	11.70	7.30	*	2.10	6.28	13.06	9.90	9.95	8.46	*	0.02	NS
Lint percentage	2003	36.90	36.70	NS	-	35.80	38.40	36.40	36.95	36.80	NS	-	NS
	2004	37.50	35.70	NS	-	36.10	37.90	36.50	36.82	36.80	NS	-	NS
Seed index	2003	11.40	9.75	*	0.81	10.00	11.35	10.56	10.76	10.20	*	0.02	NS
	2004	11.20	9.60	*	0.75	9.32	11.50	10.66	10.85	9.90	*	0.04	NS

* Significant at 0.05 level of probability

N.S. = Not significant

Table 6. Characters as significantly affected by the interaction between different planting dates and concentration of Indol Acetic Acid in 2003 season.

Characters	L.S.D	Planting dates	Application of IAA				
			Without application	Soaking		Spraying	
				25 ppm	50 ppm	25 ppm	50 ppm
Final plant height (cm)	3.5	25 March	123.98	125.33	123.78	124.93	122.48
		25 April	130.80	134.60	132.40	132.40	129.90
No. of open bolls/plant	2.1	25 March	15.65	17.90	17.23	17.75	16.26
		25 April	13.15	15.15	14.30	14.40	13.85
Boll weight (g)	0.18	25 March	2.40	2.85	2.50	2.73	2.45
		25 April	1.95	2.40	2.05	2.28	2.00
Seed cotton yield (kentar /feddan)	1.8	25 March	9.12	12.32	10.37	10.95	9.62
		25 April	7.07	10.27	8.32	8.90	7.57

d. Seed quality (oil and protein %):

It is clearly obvious from Table 7, that oil and protein percentage in cotton seeds were not significantly affected by planting dates in 2004 season, but there was slight increase in favour of early planting date. These results are expected, since early planting gives these components a good chance to complete their formation. Also, the results in Table 7, show that IAA treatments had excreted significant effect on seed oil and protein percentage in 2004 season. The highest values were obtained from sprayed plant or its seeds soaked in solution of 25 ppm IAA compared with untreated plants. The available results agreed with those obtained by El-Kashlan *et al.* (1990).

Results showed that there was insignificant effect of interaction between date of sowing and IAA concentrations on oil and protein % in cotton seeds.

Table 7. Seed contents from oil and protein in seeds as affected by different planting dates and methods and concentration of Indol Acetic Acid in 2004 season.

Planting date / Concentration & application methods	Oil %		Protein %	
	25 March	25 April	25 March	25 April
Without application	20.30	19.00	19.80	18.20
Spraying:				
25 ppm	24.20	22.30	20.70	19.50
50 ppm	23.10	20.10	20.00	19.10
Soaking:				
25 ppm	26.80	24.10	22.50	21.00
50 ppm	24.70	23.20	21.70	19.00
L.S.D. 0.05 for:				
Planting date	NS		NS	
Methods and concentrations	1.4		0.94	
Interaction	NS		NS	

Table 8. Effect of different planting dates and applications of Indol acetic acid and their interaction on total chlorophyll, carotenoids, carbohydrates and phenols in 2004 season.

Planting date / IAA application	Total chlorophyll		Carotenoides		Carbohydrates						Phenols			
					R.S		Non R.S.		T.S.S.		Mono.		Poly	
	25 March	25 April	25 March	25 April	25 March	25 April	25 March	25 April	25 March	25 April	25 March	25 April	25 March	25 April
Without application	3.22	3.00	0.90	0.80	9.00	8.10	4.60	4.11	13.60	13.10	8.30	8.10	14	14.2
Spraying														
25 ppm	4.61	4.10	0.74	0.78	9.40	8.30	4.66	4.31	13.80	13.5	8.70	8.30	14.30	14.3
50 ppm	3.70	3.10	0..85	0.81	9.10	8.20	4.60	4.20	13.70	13.2	8.20	8.40	14.70	14.4
Soaking														
25 ppm	4.80	4.25	0.72	0.74	9.50	8.90	4.75	4.60	13.95	13.7	9.80	8.50	14.8	14.7
50 ppm	4.00	3.80	0.80	0.81	9.20	8.70	4.70	4.42	13.80	13.6	9.30	8.70	14.5	14.5
L.S.D. 0.05 for														
Planting date	0.35		NS		NS		NS		NS		NS		NS	
IAA applications	0.28		0.02		0.04		0.02		0.03		002		0.02	
Interaction P x I	N.S		NS		NS		NS		NS		NS		NS	

R.S. = Reducing sugars, T.S.S. = Total soluble sugars, non- R.S. = non reducing sugars.

Table 9. Fiber properties of cotton as affected by different planting dates and applications of Indol Acetic Acid and their interactions in 2003 and 2004 seasons.

Treatments / characters	Seasons	Planting dates (P)		Sig.	L.S.D.	IAA applications (I)					Sig.	L.S.D.	Inter
		25 March	25 April			Without appl.	Soak. 25 ppm	Soak. 50 ppm	Spray 25 ppm	Spray 50 ppm			P x I
Fiber fineness	2003	3.84	3.82	*	0.01	3.80	3.83	3.80	3.81	3.80	NS	-	NS
(micronaire unit)	2004	3.83	3.80	*	0.02	3.80	3.82	3.80	3.81	3.80	NS	-	NS
Fiber strength (PI)	2003	11.3	11.1	NS	-	11.20	11.20	11.20	11.10	11.10	NS	-	NS
	2004	11.2	11.0	NS	-	11.10	11.20	11.10	11.20	11.10	NS	-	NS
Fiber length (mm)	2003	35.12	35.11	NS	-	35.20	35.10	35.20	35.10	35.10	NS	-	NS
(2.5 % S.L.)	2004	35.11	35.10	NS	-	35.20	35.20	35.20	35.10	35.00	NS	-	NS
Fiber elongation %	2003	5.70	5.50	NS	-	5.60	5.70	5.60	5.60	5.60	NS	-	NS
	2004	5.60	5.50	NS	-	5.50	5.70	5.60	5.60	5.60	NS	-	NS

* Significant at 0.05 level of probability

N.S. = Not significant

E. Chemical constituents of cotton leaves:

Results of leaf pigment analysis are shown in Table 8. It is obvious that total chlorophyll was significantly increased by early sowing of cotton plants. This may probably due to favorable condition of temperature which enhance the germination rapidness and better growth. It is also clear that total chlorophyll was increased by spraying plants or soaking seeds in solution of 25 ppm IAA compared with untreated plants. The highest total chlorophyll in leaves was obtained by plants sowned early in 25th March and soaking its seeds in 25 ppm IAA solution. This may be due to the great stimulation in formation of phytol which is an essential compound for chlorophyll formation. (Alia and Kassem, 2002).

Results in Table 8 indicate that spraying or soaking IAA gave an increase in carbohydrate components (reducing sugars, total soluble sugars and non reducing sugars) compared with control. These increases may be due to either the stimulation of carbohydrate formation by photosynthesis as a result of IAA application or the induce of the hydrolytic enzymes to breakdown polysaccharides to soluble carbohydrates. On the other hand, IAA application had negative effects on carotenoids at all treatments. This reduction may be due to the reduction in essential metabolites needed or carotenoids biosynthesis (Alia and Kassem, 2002).

Concerning the effect of IAA treatments on phenols, results in Table 8 show that application of IAA specially at the concentration of 25 and 50 ppm at start of flowering increased total phenols in cotton leaves, as compared with the control in 2004 season. This effect may be due to the increase in biosynthesis of such compounds from other related compounds such as carbohydrate and amino acids. In this connection, Alia and Kassem (2002) found that certain monophenols enhanced abscission in cotton, and they found that there is a role of phenols in abscission prosccison process. Phenolic compounds were found to affect the activity of IAA oxidase, where polyphenols inhibit the action of IAA oxidase while monophenols enhance its activity.

G. Fiber properties:

Results in Table 9 indicate that planting date significantly affected micronaire value. This was expected since with late planting, the growing season is reduced. Gipson and Joham (1968) reported that micronaire was significantly reduced as temperature lowered from 25 to 5°C, and fiber length was decreased by temperatures above 21 or below 15°C. Significant differences existed among planting dates (Table 9). It ccould be noticed an actual decrease with delay in planting date for micronaire reading, fiber strength and fiber elongation %, while 2.5 % span length fiber differences among the two planting dates were not significant. This reduction in fiber fineness may be ascribed to the decrease in the deposition of cellulose lamellas of the

secondary wall of cotton fibers at the later planting date due to the decrease in the whole age of bolls and shortening of the effective boll maturation period to the extent that many fibers did not mature. The results in the same table indicate that all the fiber properties were not significantly affected by IAA application and their interactions with planting dates. These results are in good accordance with those obtained by El-Sayed (1992).

CONCLUSION

Generally, from the two previous experiments, it could be concluded that Indol Acetic Acid gave the highest yield, yield components, seed quality characters and chemical composition of cotton leaves, when it was applied at early sowing date by soaking seeds in solution of 25 ppm of IAA.

REFERENCES

1. A. O. A. C. 1965. Official Methods of Analysis of Official-Agricultural Chemists Washington, DC., U.S.A.
2. A. O. A. C. 1975. Official Methods of Analysis of Official-Agricultural Chemists 12th ed. USA.
3. Abdel-Aal, M. H. 1981. Physiological and chemical studies on the effect of some growth regulators on the shedding in cotton plants. Ph. D. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.
4. Abdel-Aal, S. A. I. 1998. Response of Giza 86 cotton cultivar to sowing date and pix (Mepiquat chloride) application. J. Agric. Sci., Mansoura Univ., 27 (12): 4187 - 4195.
5. Ali, S. A. and A. E. El-Sayed. 2001. Effect of sowing dates and nitrogen levels on growth, earliness and yield of Egyptian cotton Giza 88. Agric. Res. Rev., 79 (1): 221-232.
6. Alia, A. M. and M. M. A. Kassem. 2002. Effect of ABT No. 7 compound on physiological, chemical constituents, yield and yield components of Giza 83 cotton variety, Menufiya. J. Agric. Res. 27: 1301 - 1312.
7. Blesa, A. C., G. Maannel and Encarmacion Sanchez. 1967. The effect of pre-sowing treatments of cotton seeds with Indol Acetic Acid on root growth. Anedafol Agrobiol 26 (5/6): 1059 - 1067 (CF. Biol., Abst., Vol. 51: 5192, 1970).
8. Chapman, H. D. and F. P. Parker. 1981. Methods of analysis of soil, plants and water. Univ. California, August 1981, second printing.
9. El-Kashlan, M. K., E. T. Eid and E. A. Girgis. 1990. Effect of sowing dates on cotton plant treated with Mepiquat. Chloride at two times of application. Agric. Res. Rev., Egypt, 68 (6): 1239 - 1248.

10. El-Sayed, E. A. 1992. Effect of transplanting on growth and yield of cotton. M.Sc. Thesis, Fac. Agric., Minufiya Univ., Egypt.
11. Gipson, J. R. and H. E. Joham. 1968. Influence of night temperature on growth and development of cotton (*Gossypium hirsutum* L.). 2- Fiber properties. Agron. J., 60: 296 - 298.
12. Hammouda, M. M. 1984. Effect of planting dates, nitrogen rate and its time of application on yield earliness of Egyptian cotton. Ph. D. Thesis, Fac. Agric., Al-Azhar Univ., Egypt.
13. Mathur, S. N. 1963. Influence of the application of ureas, scrose and certain growth substance on cotton plant. Ind. J. Plant Physiol., 6 (2): 123 - 128.
14. Nadagoudar, B. S. and M. S. Patil. 1971. Effect of hormones one root and shoot growth in cotton. Mysore Jour. Agric. Sci., 5 (3): 337 - 339 (C.F. Field Crop Abst., Vol. 26: 2349, 1973).
15. Raghavan, V. 1964. Interaction of growth substances in grown and organ initiation in the embryos of capsella. Plant Physiology, 39: 816 - 821.
16. Snedecor, G. W. and W. G. Cochran. 1981. Statistical analysis Methods. Seventh Edition, Iowa State Univ., Ames-Iowa, U.S.A.
17. Young, E. F., R. M. Taylor Jr. and H. D. Peterase. 1980. Days degree unit and time in relation to vegetative development and fruiting for three cultivars of cotton. Crop Sci., 20: 320 - 375.

تأثير استخدام اندول حامض الخليك تحت مواعيد زراعة مختلفة على النمو والمحصول لصنف القطن جيزه ٨٨

عزت عبدالسلام السيد ، محمد المنشاوى المنشاوى

معهد بحوث القطن ، مركز البحوث الزراعية ، الجيزه .

استخدمت طريقتان لدراسة تأثير إضافة اندول حامض الخليك (نقع بذور القطن أورش النباتات عند بدايه التزهير) بتركيزين مختلفين (٢٥ و ٣٠ جزء فى المليون) بالاضافة الىتركيز صفر (الرش بالماء) وذلك تحت ميعادين للزراعة (٢٥ مارس ، ٢٥ أبريل) وذلك على النمو والمحصول لصنف القطن جيزه ٨٨ ، وتم النقع لبذور القطن باندول حامض الخليك لمدة ١٢ ساعة قبل زراعتها. وأجريت لذلك تجربتان حقليتان بمحطة البحوث الزراعية بسخا خلال الموسمين ٢٠٠٣/٢٠٠٤ وكانت أهم النتائج المتحصل عليها:

١. أثرت مواعيد الزراعة معنويا على كل الصفات المدروسة حيث أدت الزراعة فى ٢٥ مارس إلى النقص معنويا لكل من طول النبات النهائى بينما أدت إلى زيادة عدد سلاميات الساق الرئيسى وموقع أول فرع ثمرى عدد الأيام لتفتح أول زهرة وأول لوزة ونسبة التبكير وعدد اللوز المتفتح ووزن اللوزة ومحصول القطن للنبات والفدان ووزن ١٠٠ بذرة وقراءه الميكونير (النعومة).

٢. أدت طرق إضافة أندول حامض الخليك وتركيزاته المختلفة إلى زيادة كل الصفات المدروسة ماعدا موقع أول فرع ثمرى على الساق الرئيسى ، وكانت أفضل النتائج من معاملة نقع البذور (لمدة ١٢ ساعة) فى محلول أندول حامض الخليك بتركيز ٢٥ جزء فى المليون قبل زراعتها.

٣. وجد أن معاملة النباتات بأندول حامض الخليك بتركيز منخفض (٢٥ جزء فى المليون سواء رشا للنباتات أو نقع البذور قبل الزراعة لمدة ١٢ ساعة أدى إلى زيادة النسبة المئوية للزيوت والبروتين فى البذرة وكذلك أدى إلى ارتفاع نسبة الكلوروفيل الكلى فى الأوراق والحصول على اعلا مستويات فى السكريات المختزلة والسكريات الذائبة الكلية والسكريات غير المختزلة ووجد ان هناك تأثير عكسى لمكونات الاوراق فى الكاروتينات.

٤. كان للتفاعل بين طرق وتركيز اندول حامض الخليك ومواعيد الزراعة تأثيرا معنويا على الطول النبات النهائى وعدد اللوز المتفتح على النبات ووزن اللوزة ومحصول النبات فى موسم ٢٠٠٣ فقط.

وللحصول على أفضل النتائج يوصى تحت ظروف الدراسة بزراعة القطن مبكرا (٢٥ مارس) ونقع بذورها قبل الزراعة بتركيزات منخفضة من أندول حامض الخليك (٢٥ جزء فى المليون).