RESULTS AND DISCUSSION

EXPERIMENT I

GROWTH CHARACTERS

1. PLANT HEIGHT

Data of cotton plant height at time of picking, as affected by nitrogen application, nitrogen forms, and seed soaking in growth regulators, are shown in tables (3) and (4). Cotton plant height was significantly affected by nitrogen levels in 1976 and 1978 seasons, whereas in 1977 season was not affected. In 1976 season, the highest plants were obtained by 60 and 90 kg N/faddan. The differences between the averages of 0 and 30 kg N/faddan and between 60 and 90 kg N/faddan treatments were not significant.

In 1978 season, the highest average was obtained by 60 kg N/faddan. In both seasons, form of nitrogen had no effect on plant height.

Combined analysis of the three seasons, confirmed that the highest plants were obtained by 60 kg N/faddan, regardless of the form of nitrogen. The results also indicate that nitrogen generally resulted in increasing plant height, which is in good agreement with the results obtained by Bederker et al. (1957), Rao (1958), Scarsbrook et al. (1959), Dastur and Dabir (1962),

El-Hattab and Aly (1962), Shalaby and Khalil (1963), Perkins and Douglas (1965), Chaudhry (1969), Nour El-Din et al. (1970) Basinski et al. (1971) Abdallah (1976), Hefni et al (1978), Kherallah (1979), Vershney (1979), El-Habbak (1980), Shahine (1980), and Wahdan (1981), and in contrast with those obtained by El-Debaby et al. (1977). Results in table (3) indicate that seed soaking in growth regular solutions, had significant effect on plant height only in 1976 season, whereas IAA treatment significantly resulted in increasing plant height.

Combined analysis of the three seasons indicated that the growth regulators treatments had no significant effect on plant height. This result is in agreement with the result obtained by Aly (1975), and in contrast with those obtained by Babaev (1966), Singh and Singh (1972), and Devotta and Chowdappans (1977).

The effect of the interaction of the nitrogen application and the growth regulators treatments, on the plant height, was highly significant in 1976 and 1978 seasons, whereas in 1976 season, the highest average was obtained by 90 kg N/feddan in the form of urea, with seed soaking in water, and the lowest average was obtained by 0 kg N/faddan, with seed soaking in water.

In 1978 season, the highest average was obtained by 60 kg N/faddan in the form of ammonium nitrate, with soaking in IBA, and the lowest average was obtained by 0 kg N/ffaddan , with seed soaking in succinic acid solution.

Combined analysis of the three season revealed that the highest average was obtained by 60 kg N/faddan in the form of ammonium nitrate, with IBA, whereas the lowest average was obtained by 0 kg N/ faddan with succinic acid.

TABLE (3)
THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON FINAL PLANT HEIGHT IN CM.

A / B	No	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
1976								
WATER	108.1	109.2	115.5	122.6	108.7	119.5	116.7	114.3
IAA	116.5	113.1	114.4	120.6	119.2	116.9	122.1	117.5
IBA	111.5	111.9	115.9	118.7	116.8	121.7	113.1	115.7
Succinic	109.7	116.1	121.6	112.6	106.3	115.2	116.2	114.0
MEAN	111.5	112.6	116.9	118.6	112.8	118.3	117.0	115.4
LSD : A	5 % 3.35	B 5% 2.67			AB 5 % 12.23			
	1 % 4.59	1% ---			1 % 16.24			
1977								
WATER	147.8	160.3	148.1	145.2	150.9	143.5	146.0	148.8
IAA	135.3	143.9	150.1	141.3	148.6	145.8	144.2	144.2
IBA	141.9	138.9	145.2	150.0	152.0	147.8	143.6	145.6
Succinic	137.4	147.6	146.6	147.9	144.8	150.8	147.0	146.0
MEAN	140.6	147.7	147.5	146.1	149.1	147.0	145.2	146.2
LSD : A	5 % ---	B 5 % 19			AB 5 % ---			
	1 % ---	1 % ---			1 % ---			
1978								
WATER	111.3	128.0	140.3	125.6	120.8	142.7	127.4	128.0
IAA	110.6	129.4	142.4	132.5	125.7	132.6	125.7	128.4
IBA	105.3	123.9	144.8	126.5	142.4	147.5	135.6	132.2
Succinic	103.6	129.5	145.7	130.2	133.1	140.8	132.1	130.7
Mean	107.7	127.7	143.3	128.7	130.5	140.9	130.2	129.8
LSD : A	5 % 5.86	B 5% ---			AB 5 % 16.70			
	1 % 8.03	1% ---			1 % 22.07			

TABLE (4)

COMBINED ANALYSIS OF THE THREE SEASONS OF FINAL PLANT HEIGHT IN CM.

		UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	122.4	132.5	134.6	131.1	126.8	135.2	130.0	130.4
IAA	120.8	128.8	135.6	131.5	131.2	131.8	130.6	130.0
IBA	119.6	124.9	135.3	131.7	137.1	139.0	130.8	131.2
Succinic	116.9	131.1	138.0	130.2	128.1	135.6	131.8	130.2
MEAN	119.9	129.3	135.9	131.1	130.8	135.4	130.8	130.5
LSD	A 5 % 9.41		B 5 % ----		AB 5 % 9.27			
	1 %12.51		1 % ----		1 % ----			

2. DRY MATTER PER PLANT

Data of dry matter per plant as affected by nitrogen levels, nitrogen forms, and seed soaking in growth regulators solutions, in 1978 season, are shown in table(5)

Dry matter significantly increased by increasing nitrogen rates, regardless of its form, up to 90 kg N/faddan. This was quite expected, as nitrogen is an essential element in building up the plants dry matter, not only proteins, but also carbohydrates, as many energy rich compounds which regulate photosynthesis, contain nitrogen atoms in their structure. On the other hand, all enzymes are proteins. This result is similar to results obtained by El- Shawarby et al.(1962), Hamdi et al.(1962) Dastur and Dabir(1962) , Clark (1964) Chaudhry(1969) , Eid(1969) , Basinski et al. (1971), Srisook et al.(1973), Abdallah (1976), Hassan(1976) , Kherallah (1979,) El- Habbak(1980), and Shahine(1980).

It is observed that there was no significant difference between 30 and 60 kg N/faddan, which is in agreement with result obtained by El-Debaby et al (1977).

This result is also in contrast with that mentioned by Wahdan (1981).

Results in table (5) indicate that dry matter per plant increased by soaking the seeds in IAA and IBA solutions, which may be attributed to increased root growth of the seedling (Babaev 1976) , and increased RNA content in the seedlings(Babaev et al .1971).

That soaking the seeds in IAA and IBA solutions increased dry matter per plant, was confirmed by the findings of Nadagoudar and Patil(1971), who found that soaking the seeds in IAA and IBA solutions resulted in increasing growth of shoots at 35 days from sowing. In contrast, Aly (1975), showed that dry weight at 35 days from sowing was not affected when the seeds were soaked in IAA solution.

Table(5) indicates that soaking the seeds in succinic acid solution gave insignificant decrease in dry matter per plant, which disagrees with results obtained by Singh and Singh (1972) , who found an increase in dry matter due to succinic acid treatment.

The results indicate that the interaction between nitrogen fertilizer and growth regulators was not significant, for the dry weight per plant.

TABLE (5)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON DRY MATTER PER PLANT IN GRAM

A / B	NO	UREA		AMMONIUM NITRATE			MEAN
		N30	N60	N90	N30	N60	N90	
WATER	61.03	93.95	97.14	107.81	89.77	94.29	102.75	92.39
IAA	68.59	101.07	108.28	120.52	100.34	105.25	117.24	103.13
IBA	66.60	100.95	105.29	117.07	97.43	102.21	111.51	100.15
Succinic	58.22	93.92	92.69	102.29	85.30	90.01	94.07	88.07
MEAN	63.61	97.47	100.85	111.92	93.21	97.94	106.54	95.94

LSD						
	A 5 %	7.72	B 5 %	4.42	AB 5 %	-----
	1 %	10.58	1 %	5.85	1 %	-----

3. NET ASSIMILATION RATE

Data of NAR in 1978 season are shown in table (6) It is clear that NAR was not significantly affected by nitrogen levels, growth regulators, and their interaction, during vegetative, flowering, and bolling stages.

These results agree with results obtained by Crowther (1934), Hassan (1976), Kherallah (1979) and El - Habbak (1980).

TABLE (6)
THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON NET ASSIMILATION RATE IN G/CM^2/DAY

A / B	N 0	N 30	N 60	N 90	MEAN
NEGETATIVE STAGE					
WATER	9378	9477	8193	8003	8763
IAA	9934	10361	7771	8906	9243
IBA	8850	9210	8206	8015	8570
Succunic	9053	95999	8221	8389	8816
MEAN	9304	9662	8098	8328	8848
LSD A 5 % ---		B 5 % ---		AB 5 % ---	
1 % ---		1 % ---		1 % ---	
FLOWERING STAGE					
WATER	598	1263	1776	1908	1386.
IAA	1229	1428	2395	2602	1914
IBA	892	1530	1867	2023	1578
Succinic	632	1347	1631	1708	1330
MEAN	838	1392	1917	2060	1552
LSD A 5 % ---		B 5 % ---		AB 5 % ---	
1 % ---		1 % ---		1 % ---	
BOLLING STAGE					
WATER	604	1423	922	787	934
IAA	660	1689	1144	16.08	1275
IBA	542	1371	925	1041	970
Succinic	548	1413	1007	870	960
MEAN	589	1474	1000	1077	1935
LSD A 5 % ---		B 5 % ---		AB 5 % ---	
1 % ---		1 % ---		1 % ---	

4. RELATIVE GROWTH RATE

Effects of nitrogen levels and seed soaking in growth regulator solutions on RGR are given in table(7). The treatments exerted no significant effect on RGR, during vegetative, flowering, and bolling stages, which is in harmony with those obtained by kherallah (1979), El- Habbak (1980), and disagrees with Crowther (1934), Hassan (1976), and Hussein et al .(1979 a).

It is worthy to mention here, that Hunsigi (1973) have pointed out that RGR was a poor indicator of yield differences.

TABLE (7)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON RELATIVE GROWTH RATE IN G/G/DAY x 10^{-7}

A / B	N 0	N 30	N 60	N 90	MEAN
VEGETATIVE STAGE					
WATER	1009781	1035344	1042063	1087875	1043766
IAA	1010808	1048750	1072594	1107531	1059921
IBA	1015562	1055750	1095094	1130344	1074188
Succinic	1000656	1050875	1077094	1113688	1060578
MEAN	1009202	1047680	1071711	1109860	1059613
LSD : A 5 % ---			B 5 % ---		AB 5 % ---
1 % ---			1 % ---		1 % ---
FLOWERING STAGE					
WATER	26783	56333	85133	88267	64129
IAA	45850	75100	96916	102317	80046
IBA	42033	69283	93166	94217	74675
Succinic	28616	57417	77617	81166	61204
MEAN	35821	64533	88208	91492	70014
LSD : A 5 % ---			B 5 % ---		AB 5 % ---
1 % ---			1 % ---		1 % ---
BOLLING STAGE					
WATER	20800	49117	33483	26050	32363
IAA	21083	49483	33967	44000	37133
IBA	20583	51033	35683	40333	36908
Succinic	18933	70450	37283	29065	38933
MEAN	20350	55021	35104	34862	36334
LSD : A 5 % ---			B 5 % ---		AB 5 % ---
1 % ---			1 % ---		1 % ---

5. RELATIVE FRUITFULLNESS

Table(8) shows that RF value was significantly affected by nitrogen levels, whereas the highest value was obtained by 30 kg N/faddan, and the lowest one by 90 kg N/ faddan.

This result is in contrast with that reported by Hassan(1976).

Nitrogen forms had no significant effect on RF values. Seed soaking in succinic acid solution significantly resulted in increasing RF, while IAA and IBA, significantly resulted in decreasing it.

The effect of the interaction between nitrogen treatments and growth regulators treatments, on RF , was not significant.

TABLE (8)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON RELATIVE FRUITFULLNESS 1978

A / B	N 0	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	9.50	12.46	11.68	7.99	13.22	9.02	7.12	10.44
IAA	7.68	11.33	9.30	6.73	10.71	8.05	6.08	8.55
IBA	6.84	10.89	8.79	6.89	12.37	9.44	6.60	8.83
Succinic	9.51	13.13	12.53	8.64	13.66	10.44	8.41	10.90
MEAN	8.38	11.95	10.58	7.56	12.49	9.24	7.05	9.61
LSD	A 5 %	1.33		B 5 %	0.76		AB 5 %	---
	1 %	1.82		1 %	1.00		1 %	---

Y I E L D C O M P O N E N T S

1. NUMBER OF SYMPODIA PER PLANT

Tables (9) and (10) show the data of sympodia number per plant, as affected by treatments.

Nitrogen levels significantly affected the sympodia number per plant, in 1976, 1977, and 1978 seasons, whereas the highest sympodia number was obtained by 30 kg N/faddan, regardless of nitrogen form, through the three seasons.

Combined analysis of the three seasons confirmed this result.

That nitrogen resulted in increasing the number of sympodia per plant, agree with the results obtained by Rao (1958) El-Hattab and Aly (1962), Iftikhar (1969), Nour El-Din et al. (1970), Abdallah (1976), and Shahine (1980), and disagree with those obtained by Hussein et al. (1979b) Kherallah (1979), and Wahdan (1981).

Tables (8) and (9) indicate that soaking the seeds in growth regulator solutions significantly affected sympodia number per plant. Succinic acid significantly gave the highest means in 1976 and 1977 seasons, which was confirmed by combined analysis of the three seasons data.

Combined analysis also indicated that the number of sympodia per plant decreased significantly by IAA and IBA treatments.

The interaction between nitrogen application and growth regulators significantly affected the sympodia number per plant in the three seasons, but no specific trend could be drawn.

Combined analysis indicates that the interaction significantly affected the sympodia number per plant, whereas the highest number was obtained by 30 kg N/faddan with seed soaking in succinic acid, regar dless of the form of nitrogen, and the lowest number was obtained by 0 kg N/faddan with seed soaking in either water or IAA.

TABLE (9)
THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON NUMBER OF SYMPODIA PER PLANT

A / B	NO	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
WATER	7.2	8.1	7.7	7.4	8.9	8.3	7.3	7.8
IAA	7.0	7.8	7.3	7.5	9.2	7.4	7.7	7.7
IBA	7.2	6.4	7.3	7.4	6.8	8.1	7.6	7.3
Succinic	7.5	9.2	7.9	7.7	8.1	8.3	8.6	8.2
MEAN	7.2	7.9	7.6	7.5	8.3	8.0	7.8	7.8
LSD	A 5 % 0.42 1 % 0.58			B 5 % 0.33 1 % 0.44			AB 5 % 1.51 1 % 2.00	
1977								
WATER	5.1	7.4	6.6	6.2	7.2	8.4	5.1	6.6
IAA	6.2	8.2	5.3	5.5	7.1	5.4	5.2	6.1
IBA	6.4	7.1	6.8	5.7	8.0	5.1	5.6	6.4
Succinic	7.3	7.5	6.7	5.3	9.1	6.3	6.0	6.9
MEAN	6.3	7.6	6.4	5.7	7.9	6.3	5.5	6.5
LSD	A 5 % 0.39 1 % 0.53			B 5 % 0.22 1 % 0.29			AB 5 % 1.01 1 % 1.34	
1978								
WATER	5.0	8.8	8.5	6.7	9.0	6.7	5.6	7.2
IAA	4.2	8.5	8.1	6.5	8.7	6.8	5.7	6.9
IBA	4.0	8.4	7.1	6.5	8.6	6.9	6.0	6.8
Succinic	4.2	9.0	8.4	6.9	8.7	6.6	6.0	7.1
MEAN	4.4	8.7	8.0	6.7	8.8	6.8	5.8	7.0
LSD	A 5 % 0.41 1 % 0.57			B 5 % 0.24 1 % 0.32			AB 5 % 1.09 1 % ----	

TABLE (10)

COMBINED ANALYSIS OF THE THREE SEASONS OF NUMBER OF SYMPODIA

PODIA PER PLANT

A / B	N 0	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	5.8	8.1	7.6	6.8	8.4	7.8	6.0	7.2
IAA	5.8	8.2	6.9	6.5	8.3	6.5	6.2	6.9
IBA	5.9	7.3	7.1	6.5	7.8	6.7	6.4	6.8
Succinic	6.3	8.6	7.7	6.6	8.6	7.1	6.9	7.4
MEAN	6.0	8.1	7.3	6.6	8.3	7.0	6.4	7.1

LSD . A 5 % 0.22 B 5 % 0.15 AB 5 % 0.69

1 % 0.30 1 % 0.20 1 % 0.91

2. NUMBER OF OPEN BOLLS PER PLANT

Data of number of open bolls per plant are shown in table (11).

Nitrogen levels exerted highly significant effects on bolls number per plant over the three seasons. In 1976 season, the nitrogen application resulted in increasing the number of bolls per plant as compared with the control.

The differences between 30,60 and 90 kg N/faddan treatments were not significant.

In 1977 and 1978 seasons, the highest number of bolls per plant was obtained by 30 kg N/faddan, regardless of nitrogen form. These results are in agreement with results obtained by Rao(1958), Moursi et al. (1961 a) Dastur and Dabir (1962) El-Hattab and Aly (1962), Clark (1964), Heweidi (1965) , Chaudhry (1969), Nour El-Din et al. (1970), Abdallah (1976), Hassan (1976), Hefni et al. (1978), Kherallah (1979), and El-Habbak (1980), and in contrast with results reported by Hamdi et al. (1964), El-Debaby et al. (1977), and Shahine (1980).

Regarding growth regulators, IBA caused a significant decrease in boll number in 1978 season, whereas IAA and succinic acid did not affect the boll number. This result

agrees with result obtained by Aly (1975), who reported that seed soaking in IAA solution did not affect the boll number per plant, and disagree with result reported by Singh and Singh (1972), who reported that seed soaking in succinic acid solution resulted in increasing boll set

The nitrogen x growth regulators interaction significantly affected the number of bolls per plant in 1977 season. The highest number was obtained by 30 kg N/faddan as ammonium nitrate with seed soaking in succinic acid and the lowest number was obtained by 90 kg N/faddan as urea with seed soaking in IAA.

Combined analysis of data was not performed as the errors of the three seasons were not homogeneous.

TABLE (11)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON NUMBER OF OPEN BOLLS PER PLANT

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
WATER	7.4	9.4	11.0	9.9	9.6	9.1	10.4	9.5
IAA	7.4	9.7	10.7	10.3	10.4	11.6	10.1	10.0
IBA	10.4	10.9	10.2	12.5	9.9	10.4	10.1	10.6
Succinic	8.3	9.6	10.5	10.1	10.7	10.1	10.1	10.1
MEAN	8.4	9.9	10.6	10.7	10.2	10.6	10.2	10.1
LSD . A 5 % 0.86				B 5 % ----			AB 5 % ----	
1 % 1.18				1 % ----			1 % ----	
1977								
WATER	6.3	7.9	6.1	7.0	8.3	8.5	6.1	7.2
IAA	8.0	8.3	6.6	5.3	8.7	5.7	6.9	7.1
IBA	6.8	6.8	6.7	5.8	9.2	6.7	6.0	6.9
Succinic	7.1	7.7	7.4	6.3	9.3	8.6	7.1	7.6
MEAN	7.0	7.7	6.7	6.1	8.9	7.4	6.5	7.2
LSD . A 5 % 0.84				B 5 % 0.46			AB 5 % 2.11	
1 % 1.15				1 % ----			1 % 2.81	
1978								
WATER	5.3	10.4	10.2	8.0	10.7	7.9	6.9	8.5
IAA	4.9	10.7	9.5	7.6	10.2	7.8	6.8	8.2
IBA	4.3	9.9	8.5	7.6	10.3	8.9	6.9	8.0
Succinic	4.9	11.0	10.2	8.1	10.4	8.6	7.3	8.6
MEAN	4.8	10.5	9.6	7.8	10.4	8.3	7.0	8.3
LSD : A 5 % 0.68				B 5 % 0.33			AB 5 % ----	
1 % 0.93				1 % 0.44			1 % ----	

3. BOLL WEIGHT

The means of boll weight in gram are given in tables (12) and (13) . Effect of nitrogen on boll weight was in significant in 1976 and 1977 seasons. In 1978 season, 60 kg N/ faddan in the form of ammonium nitrate resulted in significantly lower boll weight than control. Combined analysis revealed that nitrogen had no significant effect on the boll weight. It could be concluded that nitrogen application, generally, did not affect boll weight. This is in agreement with results obtained by bederker et al.(1957), Eid(1969), Abdallah (1976), Ahmad (1977), Kherallah (1979), Varshney (1979), El- Habbak (1980), and Shahine (1980), and in contrast with results reported by Scarsbrook et al (1959), Moursi et al.(1959), Moursi et al.(1961b) El- Hattab et al.(1962) Mackenzie and Van Shaik (1963), Amer et al.(1964),Bennett et al.(1967), Chaudhry(1969), Nour El-Din et al.(1970), Srisook et al.(1973), Hassan (1976), Hefni et al.(1978) Sawan (1978), and Wahdan (1981).

Effect of seed soaking in growth regulators solutions, on Boll weight, was not significant in 1976, 1977 and 1978 season, which was confirmed by combined analysis.Similar results were obtained by Aly(1975), who found that soaking the cotton seeds in IAA solution before sowing, had no

significant effect on boll weight. On the other hand, the results disagree with those obtained by Singh and Singh (1972) , who found that soaking the seeds in succinic acid solution resulted in increasing boll weight.

The nitrogen x growth regulators interaction was insignificant in 1976), 1977, and 1978 seasons, which was confirmed by combined analysis of the three seasons data.

TABLE (12)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON BOLL WEIGHT IN GRAM

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
TER	2.33	2.33	2.22	2.32	2.33	2.25	2.42	2.31
A	2.47	2.48	2.34	2.46	2.31	2.36	2.52	2.42
A	2.28	2.32	2.28	2.01	2.37	2.17	2.43	2.27
ccinic	2.30	2.46	2.13	2.50	2.41	2.16	2.21	2.31
MEAN	2.35	2.40	2.24	2.32	2.36	2.24	2.40	2.33
LSD: A 5 % ----			B 5 % ----				AB 5 % ----	
1 % ----			1 % ----				1 % ----	
1977								
ER	2.44	2.77	2.75	2.33	2.30	2.48	2.48	2.52
	2.69	2.58	2.60	2.67	2.25	2.62	2.51	2.56
	2.37	2.68	2.65	2.86	2.40	2.45	2.77	2.60
cinic	2.54	2.34	2.55	2.54	2.51	2.54	2.52	2.51
EAN	2.51	2.59	2.64	2.60	2.37	2.52	2.60	2.55
SD: A 5 % ----			B 5 % ----				AB 5 % ----	
1 % ----			1 % ----				1 % ----	
1978								
ER	2.75	2.84	2.90	2.57	2.65	2.46	2.37	2.65
	2.70	2.82	2.85	2.59	2.90	2.75	2.18	2.68
inic	2.56	2.94	2.83	2.51	2.80	2.86	2.20	2.67
	2.58	2.75	2.78	2.60	2.62	2.85	2.29	2.64
AN	2.65	2.84	2.84	2.57	2.74	2.73	2.26	2.66
D: A 5 % 0.27			B 5 % ----				AB 5 % ----	
1 % 0.37			1 % ----				1 % ----	

TABLE (13)

COMBINED ANALYSIS OF THE THREE SEASONS OF BOLL WEIGHT IN GRAM

A / B	N 0	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	2.51	2.65	2.62	2.41	2.43	2.40	2.46	2.50
IAA	2.62	2.63	2.60	2.57	2.49	2.58	2.40	2.56
IBA	2.40	2.65	2.59	2.46	2.52	2.49	2.47	2.51
Succinic	2.47	2.52	2.49	2.55	2.51	2.52	2.34	2.49
MEAN	2.50	2.61	2.58	2.50	2.49	2.50	2.42	2.51

LSD						
	A 5 % ----		B 5 % ----		AB 5 % ----	
	1 % ----		1 % ----		1 % ----	

4. SEED COTTON YIELD PER PLANT

Tables (14) and (15) show data of seed cotton per plant as effected by nitrogen and growth regulators.

Nitrogen application exerted highly significant effects on seed cotton per plant. In 1976 season, nitrogen application resulted in increasing seed cotton yield per plant, while the differences between 30,60 and 90 kg N/faddan, were not significant. Form of the applied nitrogen had no significant effect on plant yield.

In 1977 season, the highest seed cotton yield per plant resulted from 30 kg N/faddan, regardless of nitrogen form. The same result was obtained in 1978 season, with the exception that the higher levels of ammonium nitrate yielded significantly lower average as compared with that obtained from the higher levels of urea. Combined analysis of the three seasons confirmed that the highest seed cotton per plant was obtained by 30 kg N/faddan treatment, and that form of applied nitrogen had insignificant effect on seed cotton per plant. These results agree with those obtained by Moursi et al. (1961a) Chaudhry (1969), Hassan (1969) Ahmad (1977), Abdallah (1979), Kherallah (1979), Varshney (1979), Shahine (1980), and Wahdan (1981). On the other hand Dawood (1980)found that yield of plant was not significantly

affected by nitrogen application.

Tables(14)and(15) indicate that presowing seed soaking in growth regulators solutions, significantly affected seed cotton per plant only in 1976 season, whereas IAA ,IBA, and succinic acid solutions gave higher yields per plant, compared with control. When combined analysis of the three seasons was performed, all growth regulators gave significantly higher seed cotton per plant.The significance of the effect of IAA on seed cotton per plant, is in contrast with the results reported by Aly(1975).

The nitrogen x growth regulators interaction was highly significant in the three successive seasons,which was confirmed by combined analysis.

In(1976) season,highest average resulted from 60 kg N/faddan as ammonium nitrate with IAA , and lowest average by 0 kg N/faddan with soaking in water. In(1977) the highest average was obtained by 30 kg N/faddan as ammonium nitrate with soaking in succinic acid, and the lowest average by 90 kg N/faddan as urea with soaking in IAA.In 1978 season the highest average resulted from 30 kg N/faddan as urea with soaking in succinic acid, and the lowest average from o kg N/faddan and soaking in IBA solution. Combined analysis revealed that the highest seed

TABLE (14)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON SEED COTTON PER PLANT IN GRAM

A	N 0	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
				1976				
?ER	17.11	21.54	24.04	22.75	22.03	20.07	25.02	21.79
ı	18.22	23.43	24.53	24.92	23.73	26.52	25.39	23.82
ı	23.62	25.23	23.22	25.09	23.35	22.30	24.41	23.89
›cinic	18.91	23.47	22.12	25.10	25.54	24.04	21.78	22.99
IEAN	19.47	23.42	23.48	24.47	23.66	23.23	24.15	23.12
LSD : A 5 % 1.26				B 5 % 1.19			AB 5 % 5.44	
1 % 1.73				1 % 1.58			1 % 7.23	
				1977				
ER	15.05	21.67	16.82	16.25	19.00	20.78	15.86	17.92
	21.03	21.01	16.84	14.15	19.50	15.08	17.20	17.83
	15.86	18.11	17.50	16.69	22.10	16.59	16.62	17.64
oinic	17.55	17.86	18.60	15.64	23.36	21.62	17.93	18.94
N	17.37	19.66	17.44	15.68	20.99	18.52	16.90	18.08
LSD : A 5 % 1.37				B 5 % ----			AB 5 % 4.63	
1 % 1.88				1 % ----			1 % 6.15	
				1978				
ER	14.35	22.59	29.59	20.46	28.22	19.15	16.17	21.50
	13.34	30.16	26.95	19.72	29.65	21.69	14.85	22.34
	10.89	29.04	23.94	18.93	28.76	25.40	15.21	21.74
inic	12.76	30.18	28.39	21.02	27.26	24.51	16.62	22.96
	12.84	27.99	27.22	20.03	28.47	22.69	15.71	22.14
LSD A 5 % 2.53				B 5 % ----			AB 5 % 4.37	
1 % 3.47				1 % ----			1 % 5.80	

TABLE (15)

COMBINED ANALYSIS OF THE THREE SEASONS OF SEED COTTON PER PLANT IN GRAM

A / B	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	15.50	21.93	23.48	19.82	23.08	20.00	19.02	20.40
IAA	17.53	24.87	22.77	19.60	24.29	21.10	19.15	21.33
IBA	16.79	24.13	21.55	20.24	24.74	21.43	18.75	21.09
Succinic	16.41	23.84	23.04	20.59	25.39	23.39	18.78	21.63
MEAN	16.56	23.69	22.71	20.06	24.38	21.48	18.93	21.11

LSD	A 5 % 1.00	B 5 % 0.60	AB 5 % 2.75
	1 % 1.33	1 % -----	1 % 3.61

5. NUMBER OF PLANTS PER FADDAN

Table (16) shows the plant number per feddan at the harvest time, as affected by the nitrogen application and the growth regulators treatments.

It is clear that nitrogen application had significant effect on the number of plants per feddan, in 1977 and 1978 seasons, whereas there was gradual increase in the number of plants due to the successive increments of nitrogen. In both seasons, the highest number of plants per faddan at the time of harvest, was obtained by 90 kg N/faddan regardless of the form of nitrogen, which may be attributed to improved nutritional status of plants.

These results agree with results obtained by Shalaby and Khalil (1963), Hamdi et al. (1964), and Hamdi et al. (1965), and disagree with results obtained by Shalaby and Shalaby (1976), and El-Debaby et al. (1977). This disagreement in results may be attributed to differences in environmental and soil conditions.

Seed soaking in growth regulators solutions significantly affected the number of plants per faddan only in 1977 season, whereas soaking in IAA resulted in increasing the number of plants, while soaking in IBA and succinic acid resulted in decreasing it.

The later result is in agreement with that obtained by Singh and Singh (1972) , who found that seed soaking in succinic acid solution resulted in decreasing the number of plants per acre.

The interaction between nitrogen application and growth regulators gave a highly significant effect on number of plants per faddan in 1977 season. IAA with 90 kg N/faddan as urea gave the highest number of plants, while IBA with 0 kg N/faddan gave the lowest number of plants per faddan.

Because the errors of the statistical analysis of the individual experiments were not homogeneous, combined analysis was not performed.

TABLE (16)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON NUMBER OF PLANTS PER FADDAN IN THOUSAND

A / B	N O	UREA N 30	UREA N 60	UREA N 90	IMMONIUM NITRATE N 30	IMMONIUM NITRATE N 60	IMMONIUM NITRATE N 90	MEAN
1976								
ATER	43.5	43.1	36.4	44.8	43.4	48.8	39.8	42.8
AA	41.8	39.3	37.5	42.2	43.1	38.7	44.3	41.0
3A	36.7	41.3	47.1	38.1	41.3	41.3	38.9	40.7
ıccinic	48.7	40.3	43.7	43.2	37.0	39.5	46.4	42.7
MEAN	42.7	41.0	41.2	42.1	41.2	42.1	42.4	41.8
LSD:	A 5 % ----			B 5 % ----			AB 5 % ----	
	1 % ----			1 % ----			1 % ----	
1977								
TER	43.0	43.9	45.2	47.8	44.7	45.0	45.0	45.2
A	46.3	46.5	46.7	49.2	43.6	45.6	47.2	46.4
A	36.4	39.0	44.3	42.7	42.3	44.7	48.0	42.5
ccinic	42.0	42.3	43.8	44.9	42.4	43.0	45.4	43.4
MEAN	41.9	42.9	45.0	46.2	43.3	44.6	46.9	44.4
LSD·	A 5 % 1.74			B 5 % 1.01			AB 5 % 4.64	
	1 % 2.38			1 % 1.34			1 % 6.16	
1978								
'ER	53.0	54.6	54.2	56.4	53.5	54.9	56.0	54.7
	52.5	52.9	54.0	55.9	53.2	53.8	55.3	53.9
	52.5	53.0	53.8	56.0	53.0	54.7	55.1	54.0
cinic	52.7	53.5	54.3	56.1	53.0	54.6	55.7	54.3
EAN	52.7	53.5	54.1	56.1	53.2	54.5	55.5	54.2
SD·	A 5 % 0.70			B 5 % ----			AB 5 % ----	
	1 % 0.96			1 % ----			1 % ----	

6. EARLINESS

Data of earliness as affected by nitrogen application and soaking the seeds in growth regulators, are shown in tables(17) and (18).

Data in table(17) show that nitrogen significantly affected earliness in 1976, 1977 and 1978 seasons. In 1976 season, earliness decreased by increasing gradually the nitrogen levels. In 1977 season, 30 kg N/faddan, significantly resulted in increasing earliness, whereas the higher levels resulted in decreasing earliness.

In 1978 season, there was a gradual decrease in earliness by increasing the nitrogen levels.

Urea increased earliness, as compared with ammonium nitrate, at the level of 90 kg N/faddan in 1977 and 1978 seasons, while ammonium nitrate gave higher earliness than urea, at the 30 kg N/faddan level, in 1978 season.

Combined analysis of the three seasons indicates that 30 kg N/faddan resulted in insignificant increase in earliness, while the higher nitrogen levels, significantly resulted in decreasing it, probably because of increased vegetative growth, as indicated by dry matter production, and by relative fruitfullness values.

These results are similar to those obtained by Rao(1958), Mackenzie and Van Shaik (1963),Kherallah (1979) , and in good agreement with results reported by Chaudhry (1969) , and Hussein et al.(1979). The results are in contrast with those obtained by Dastur and Dabir (1962), on one hand, and Perkins and Douglas (1965), Abdallah (1976), Dawood (1980), and Shahine(1980) , on the other hand.

Seed soaking in growth regulator solutions significantly affected earliness, only in 1977 seasons. IAA gave the highest average of earliness, whereas IBA and succinic acid had insignificant effect.

However when combined analysis was per formed IBA significantly resulted in decreasing the earliness whereas IAA and succinic acid exerted no significant effects on earliness.

The effect of the interaction of nitrogen and growth regulators, on earliness, was significant in 1977 and 1978 seasons.

In 1977 season, the highest earliness was obtained by 30 kg / faddan as urea, with IBA, and the lowest earliness was obtained by 90 kg N/faddan as ammonium nitrate with water.

In 1978 season, the highest earliness was obtained by 0 kg N/faddan with succinic acid, and the lowest earliness was obtained by 90 kg N/faddan as ammonium nitrate, with IBA. Combined analysis emphasized the significance of this interaction, whereas the highest mean was obtained by 30 kg N/faddan in the form of ammonium nitrate, with succinic acid, and the lowest mean was obtained by 90 kg N/faddan as ammonium nitrate with IBA.

TABLE (17)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON EARLINESS

A	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
				1976				
ER	56.68	51.56	50.12	45.36	51.27	47.01	43.92	49.42
	51.56	46.35	46.66	42.88	47.90	48.77	43.53	46.81
	53.11	50.78	44.94	43.80	53.54	45.83	39.84	47.41
cinic	53.71	51.30	46.14	44.58	52.76	48.65	42.97	48.59
EAN	53.77	50.00	46.97	44.16	51.37	47.57	42.57	48.59
SD : A 5 % 2.37				B 5 % ----			AB 5 % ----	
1 % 3.25				1 % ----			1 % ----	
				1977				
ER	50.70	46.08	55.11	49.92	58.94	54.26	40.65	50.81
	51.06	60.86	55.20	52.62	64.65	60.78	58.39	57.65
	52.26	65.85	55.32	50.25	47.75	44.44	43.99	51.41
inic	47.63	61.01	49.83	51.04	56.86	55.67	48.61	52.95
AN	50.41	58.45	53.87	50.96	57.05	53.79	47.91	53.21
D . A 5 % 2.94				B 5 % 2.46			AB 5 % 11.36	
1 % 4.03				1 % 3.25			1 % 15.09	
				1978				
R	52.46	45.00	51.15	44.25	50.66	43.67	40.99	46.88
	50.42	46.50	44.61	44.74	50.81	39.99	40.39	45.35
	44.89	48.15	43.36	40.12	49.76	49.39	39.58	45.03
inic	52.68	44.86	45.52	44.00	52.21	43.13	47.73	46.30
AN	50.11	46.13	46.16	43.28	50.86	44.04	40.67	45.89
) A 5 % 3.34				B 5 % ----			AB 5 % 8.96	
1 % 4.58				1 % ----			1 % ----	

TABLE (18)

COMBINED ANALYSIS OF THE THREE SEASONS OF EARLINESS

B	A N O	AMMONIUM NITRATE						MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	53.28	47.55	52.13	46.51	53.62	48.31	41.85	49.04
IAA	51.01	51.24	48.82	46.75	54.45	49.85	47.44	49.94
IBA	50.09	54.93	47.87	44.72	50.35	46.55	41.14	47.95
Succinic	51.34	52.39	47.16	4.6.54	53.94	49.15	44.44	49.28
MEAN	51.43	51.53	49.00	46.13	53.09	48.47	43.72	49.05

LSD	A 5 %	1.60	B 5 %	1.25	AB 5 %	5.74
	1 %	2.13	1 %	----	1 %	7.54

7. LINT PERCENTAGE

Data of lint percentage as affected by nitrogen, growth regulators, and their interaction, are shown in table (19).

The effect of nitrogen on lint percentage was significant only in 1977 season, whereas increasing nitrogen resulted in gradual decrease in lint percentage up to 30 kg N/faddan, which was significantly higher, compared with the control. This result is generally in agreement with those obtained by Scarsbrook et al. (1959), Amer et al.(1964) Grimes et al. (1969), Nour El-Din et al. (1970), Singh et al. (1973), Shalaby et al. (1977), Hussein et al.(1979 b) Kherallah (1979), Shahine (1980), and Wahdan (1981) and in contrast with results obtained by Iftikhar et al.(1969), and Srisook et al (1973).

Table (19) indicates that forms of nitrogen did not affect lint percentages.

From table (19) it is also clear that nitrogen treatments had no significant effects on lint percentages in 1976 and 1978 seasons. These results are in agreement with results reported by Bederker et al. (1957), Perkins and Douglas (1965), Abdallah (1976), Hassan (1976),

Hefni et al.(1978), Varshney(1979), Dawood (1980), and El-Habbak(1980).

The effect of soaking the seeds in solutions of growth regulators, on lint percentage was highly significant in 1976, 1977, and 1978 seasons. In 1976 season, the lint percentage significantly increased due to IAA and IBA treatments.

In 1977 season, seed soaking in IBA solution resulted in significantly increasing the lint percentage.

In 1978 season, IBA caused significant, though not large, reduction in lint percentage.

These results do not agree with the result observed by Singh and Singh(1972), who found that soaking the cotton seeds in succinic acid solution resulted in decreasing the lint percentage.

The interaction between nitrogen application and soaking the seeds in growth regulators gave significant effect on lint percentage only in 1978 season.The highest percentage was obtained by 0 kg N/faddan with seed soaking in water and the lowest lint percentage was obtained by 60 kgN/faddan in the form of ammonium nitrate with soaking the seeds in water.

Combined analysis was not performed , as the errors were not homogeneous.

TABLE (19)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON LINT PERCENTAGE

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
				1976				
'ATER	38.8	38.5	37.7	37.8	38.3	37.7	36.9	37.9
.AA	38.8	38.4	38.2	38.3	38.9	38.6	38.6	38.5
BA	39.4	39.5	39.1	38.9	39.4	39.0	38.7	39.1
uccinic	38.3	38.1	38.4	37.4	38.1	38.5	37.7	38.1
MEAN	38.8	38.6	38.3	38.1	38.7	38.4	38.0	38.4
LSD A 5 % ----			B 5 % 0.47			AB 5 % ----		
1 % ----			1 % 0.62			1 % ----		
				1977				
ATER	38.7	38.0	36.1	36.4	37.8	36.4	37.2	37.2
AA	37.1	37.2	37.3	36.7	38.0	36.9	35.6	37.0
BA	38.9	38.8	38.8	37.8	38.6	38.0	38.3	38.4
uccinic	38.3	38.1	37.0	35.9	38.0	37.7	37.1	37.4
MEAN	38.2	38.2	37.3	36.7	38.1	37.3	37.0	37.5
LSD: A 5 % 0.99			B 5 % 0.79			AB 5 % -----		
1 % ----			1 % 1.04			1 % -----		
				1978				
TER	41.1	40.2	40.1	39.9	39.3	38.2	40.0	39.8
A	39.9	39.5	39.2	40.0	40.0	40.3	40.2	39.9
A	39.4	39.5	39.8	39.4	39.8	39.8	39.1	39.5
ccinic	39.8	39.8	39.4	40.2	40.6	39.2	38.9	39.7
EAN	40.0	39.7	39.6	39.9	40.0	39.4	39.6	39.7
SD: A 5 % ----			B 5 % 0.22			AB 5 % 1.00		
1 % ----			1 % 0.29			1 % 1.32		

8. SEED INDEX

Table(20) shows seed index values , as affected by nitrogen treatments, growth regulator treatments, and their interaction.

Nitrogen application did not affect seed index in 1976 and 1977 seasons. In 1978 season, seed index was significantly affected, whereas increasing nitrogen levels, significantly resulted in increasing seed index which may be attributed to increased translocation and increased storage capacity.

This result is in accordance with those mentioned by Moursi et al.(1961a) El - Hattab et al .(1962) Mackenzie and Van Shaik (1963) , Amer et al.(1964), Bennet et al .(1967), Chaudhry (1969), Eid(1959), Grimes et al.(1969), Nour El-Din et al.(1970),Hassan (1976), Shalaby et al.(1977), Kherallah (1979), and Hefni and El-Kholany (1981), and in contrast with those obtained by Hussein et al.(1979b).

On the other hand , the insignificance of the effect of nitrogen levels on seed index in 1977 and 1978 seasons, is in accordance with results reported by Bederker et al .(1957) , Abdallah (1976) , Varshney (1979), Dawood (1980), El- Habbak (1980) , and Shahine (1980).

Soaking the seeds in growth regulator solutions affected seed index in 1977 and 1978 seasons. Table (20) indicates that in 1977 season, IAA resulted in decreasing the seed index, while IBA and succinic acid were not effective. In 1978 season, IAA, IBA, and succinic acid significantly resulted in decreasing the seed index. This is in contrast with the result obtained by Aly(1975) , who found that seed soaking in IAA solution did not affect seed index.

The interaction between nitrogen and growth regulators was significant only in 1978 season, whereas the higher values were obtained by 60 kg N/faddan in the form of ammonium nitrate with seed soaking in water , and 90 kg N/faddan in the form of ammonium nitrate with seed soaking in succinic acid solution, and the lowest value was obtained by 0 kg N/faddan with soaking the seeds in IAA solution.

TABLE (20)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON SEED INDEX

A / B	N 0	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
WATER	9.3	9.4	9.3	9.8	9.7	9.1	9.8	9.5
IAA	9.7	9.3	9.5	9.6	9.4	9.2	9.9	9.5
IBA	9.8	9.3	9.4	9.4	9.1	9.5	9.1	9.4
SUccinic	9.4	9.4	9.2	9.7	9.0	9.5	8.5	9.2
MEAN	9.6	9.4	9.3	9.6	9.3	9.3	9.3	9.4
LSD : A 5 % ----				B 5 % ----			AB 5 % ----	
1 % ----				1 % ----			1 % ----	
1977								
WATER	9.3	9.6	9.3	9.3	8.8	9.5	9.3	9.3
IAA	9.4	8.6	8.8	8.8	8.5	8.1	9.2	8.8
IBA	9.5	9.2	9.4	9.6	9.5	9.5	9.4	9.4
Succinic	9.2	8.9	9.2	9.3	9.2	9.3	8.7	9.1
MEAN	9.3	9.1	9.2	9.2	9.0	9.1	9.2	9.2
LSD : A 5 % ----				B 5 % 0.29			AB 5 % ----	
1 % ----				1 % 0.38			1 % ----	
1978								
WATER	10.3	10.9	11.2	11.0	11.0	11.7	11.0	11.0
IAA	10.2	11.1	10.9	11.2	11.8	10.6	11.0	10.8
IBA	10.3	10.4	10.9	11.2	10.6	10.8	11.5	10.8
Succinic	10.5	10.3	10.8	10.7	10.4	11.4	11.7	10.8
MEAN	10.3	10.6	11.0	11.0	10.7	11.1	11.3	10.9
LSD : A 5 % 0.40				B 5 % 0.13			AB 5% 0.59	
1 % 0.55				1 % 0.17			1% 0.79	

9. SEED OIL PERCENTAGE

Results of the seed oil percentage as affected by nitrogen application and soaking the seeds in growth regulators, and their interactions, are shown in table (21).

In 1977 season, nitrogen exerted no significant effect on seed oil percentage.

In 1978 season, nitrogen application significantly resulted in decreasing seed oil precentage up to 90 kg N/faddan, which may be related to the increased seed index, which inturn may be due to increased flux of nitrogen assimilates translocated into ripening seeds. It is well established that seed protein and seed oil are negatively correlated.

This result is in agreement with those obtained by Wadleigh(1944), Nelson(1949), Eid(1969), Abdallah (1976) Suriyapan et al.(1978) , and Hefni and El-Kholamy(1981) and disagrees with the results reported by Chaudhry(1969) and Kamal et al.(1974).

Nitrogen forms had no significant effect on seed oil percentage.

Soaking the cotton seeds in growth regulators solutions, IAA , IBA , and succinic acid, caused significant decreases in seed oil percentage in both seasons.

The effect of the interaction between nitrogen application and soaking the seeds in growth regulators solutions, on seed oil percentage, was significant in 1978 season. The highest oil percentage was obtained by 0 kg N/faddan , with seed soaking in water and the lowest oil percentage was obtained by 30 kg N/ faddan in the form of ammonium nitrate, with seed soaking in IAA solution.

TABLE (21)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON SEED OIL PERCENTAGE

A / B	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
1977								
WATER	23.13	23.39	21.88	22.82	21.60	22.52	21.78	22.44
IAA	20.61	17.65	22.00	22.47	19.84	18.29	20.29	20.16
IBA	18.70	21.02	22.07	20.61	20.67	23.99	21.95	21.29
Succinic	20.98	22.53	20.03	21.87	20.49	20.74	20.44	21.01
MEAN	20.85	21.15	21.49	21.94	20.65	21.39	21.12	21.23
LSD A 5 % ----		B 5 % 1.13			AB 5 % ----			
1 % ----		1 % 1.50			1 % ----			
1978								
WATER	20.95	19.76	20.14	19.86	20.10	20.02	20.04	20.12
IAA	19.57	18.72	18.32	18.44	17.93	18.19	18.68	18.55
IBA	20.38	19.67	18.66	19.00	19.24	19.27	19.34	19.37
Succinic	20.32	18.70	19.48	18.50	18.72	18.86	18.14	18.96
MEAN	20.31	19.22	19.15	18.95	19.00	19.08	19.05	19.25
LSD A 5 % 0.51		B 5 % 0.25			AB 5 % 1.16			
1 % 0.71		1 % 0.34			1 % ----			

Y I E L D

1. SEED COTTON YIELD

Data of seed cotton yield in kg N/faddan, as affected by nitrogen application and seed soaking in solutions of growth regulators solutions and their interactions, are shown in tables (22) and (23).

Nitrogen fertilization significantly affected the seed cotton yields in the three seasons.

In 1976 season, there was no significant differences between the means of 30 and 60 kg N/faddan, and between 60 and 90 kg/N/faddan in the form of urea, as well as between means of 30,60 and 90 kg N/faddan in the form of ammonium nitrate.

In 1977 and 1978 seasons, 30 kg N/faddan, either in a form of urea or ammonium nitrate, caused increases in seed cotton yields by 15.6 and 23.2% and 134.5 and 123.3 % in 1977 and 1978 seasons respectively whereas the higher levels resulted in decreasing the seed cotton yield. Combined analysis confirmed the results of 1977 and 1978 seasons, indicating that 30 kg N/faddan gave the highest seed cotton yield. It is very obvious that seed cotton yield per faddan as in tables (14 and (22), is a

function of seed cotton per plant. These results are in good agreement with those reported by Bederker et al (1957)), El-Hattab and Aly'(1962)), Shalaby and Khalil (1963), Amer et al.(1964), Hamdi et al.(1964) Hamdi et al (1965), Chaudhry(1969), Eid (1969), Iftikhar et al.(1969) Nour El-Din et al.(1970), Singh et al.(1973) Abdallah (1976), Hefni et al.(1978), Suriyapan et al.(1978),Hussein et al.(1979 b)Kherallah(1979), Varshney et al.(1979), Shahine (1980) and Wahdan (1981), and in contrast with results obtained by Shalaby and Shalaby(1976), El-Debaby et al .(1977) Dawood (1980) and El- Habbak(1980). This contrast in results, is attributed to environmental differences, differences in soil type and fertility, and differences in location.

In regard to nitrogen forms, there were no significant differences between the means of the seed cotton yields in 1976 season, whereas in 1977 season, 90 kg N/ faddan in the form of ammonium nitrate outyielded 90 kg N/faddan in the form of urea by 9.6%.

In 1978 season, highly significant differences were found between the averages of seed cotton yields resulting from the different forms of nitrogen, whereas 60 and 90 kg N/faddan as urea, out yielded 60 and 90 kg N/faddan as ammonium nitrate by 19.c and 28.8% respectively which

was confirmed by combined analysis of the three seasons.

It is concluded that the optimum level of nitrogen application was 30 kg N/faddan either in a form of urea or in a form of ammonium nitrate. This result is in agreement with the conclusions of paden(1937), Skinner(1944), Grosson (1950) Chavda et al.(1963) , Amer and Abo-Amin(1969),Tiwari and Bisen (1972) , and Shahine (1980).

The effect of the growth regulators solutions on seed cotton yield per faddan, was insignificant in 1976 season.

In 1977 and 1978 seasons, IAA and succinic acid had insignificant effect on seed cotton yield, but IBA treatment resulted in decreasing it by 7.2 and 4.5% respectively.

The combined analysis of the three seasons revealed that IAA, IBA, and succinic acid, had insignificant effects on seed cotton yield per faddan, as compared with the control treatment.

The effect of the interaction of nitrogen and growth regulators on seed cotton yield per faddan was significant in 1976, 1977 and 1978 seasons. The highest seed cotton yield in 1976 season was obtained by 90 kg N/faddan in the form of ammonium nitrate with seed soaking in IAA.

REVIEW OF LITERATURE

1. GROWTH CHARACTERS

Effect of nitrogen application :

Bederker et al. (1957) found that application of nitrogen resulted in increasing plant height. Similar results were obtained by Scarsbrook et al. (1959), Dastur and Dabir (1962), El Hattab and Aly (1962), Shalaby and Khalil (1963), Perkins and Douglas (1965), Chaudhry (1969), Nour El Din et al.(1970), Basinski et al.(1971), Abdallah (1976), Hassan (1976), Hefni et al. (1978), Kherallah (1979), Varshney (1979), El-Habbak (1980), Shahine (1980); and Wahdan (1981).

On the other hand, El Debaby et al.(1977) reported that plant height was not affected by nitrogen rates.

In regard to dry matter per plant, El-Shawarby et al.(1962). Hamdi et al.(1962), Dastur and Dabir (1962) Clarck (1964) Chaudhry (1969), Eid (1969), Basinski et al. (1971), Srisook et al.(1973), Abdallah (1976) Hassan (1976), Kherallah (1979), El-Habbak (1980), and Shahine (1980), showed that increasing nitrogen rate resulted in increasing dry matter per plant.

El-Debaby et al.(1977), and Wahdan (1981) found no significant effect of nitrogen on dry matter per cotton plant.

Crowther (1934) reported that nitrogen levels had insignificant effect on net assimilation rate (NAR), at different growth stages. Similar results were obtained by Hassan (1976), Kherallah (1979), and El-Habbak (1980).

Crowther (1934) mentioned that nitrogen levels affected relative growth rate (RGR).

Hassan (1976) emphasized that nitrogen caused a significant increase in RGR only at early growth stage, i.e. at 35 - 50 days from emergence.

Hussein et al. (1979a) concluded that RGR increased by increasing nitrogen levels.

Kherallah (1979) found no significant effect of nitrogen rates on RGR at all growth stages. Similar result was obtained by El-Habbak (1980).

Hassan (1976) found that relative fruitfullness (RF) was not affected by nitrogen rates.

Effect of growth regulators:

Babaev(1966) mentioned that small concentrations of succinic acid stimulated growth of stems and roots. He added that there was no increase in weights of stems. Nadagoudar and Patil(1971) indicated that imbeding cotton seeds for 36h in indole acetic acid(IAA) and indole butyric acid(IBA) solutions, 100 - 200 ppm, caused an increase in growth of roots and shoots at 35 days after sowing, the effect being greater on roots than on shoots.

Singh and Singh(1972) found that treating the seeds with 0.01% succinic acid for 12 h before sowing, resulted in taller plants and greater dry matter production.

Aly(1975), found that soaking cotton seeds before sowing in IAA solutions up to 30 ppm had no significant effect on plant height at 112 day age, while IAA solutions up to 15 ppm had no significant effect on dry weight at 35 day age.

Devotta and Chowdappans(1977) soaked cotton seeds for 6-12 h in succinic acid solutions up to 2% and found that a 0.25% solution insignificantly affected plant height.

TABLE (22)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON SEED COTTON YIELD IN KG PER FADDAN

A	N 0	UREA		AMMONIUM NITRATE				MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
				1976				
ER	735.59	902.55	872.97	1013.21	943.42	977.33	993.95	919.86
	757.68	919.08	916.56	1052.45	1017.22	1020.69	1125.07	972.68
	861.46	1034.21	1081.71	950.55	963.00	946.16	946.99	963.15
cinic	920.86	934.00	959.28	1084.14	943.88	942.46	1009.34	970.57
AN	818.90	947.46	957.63	1025.09	966.88	961.16	1018.84	956.57
SD	A 5 % 71.98			B 5 % ------		AB 5 % 40.02		
	1 % 98.61			1 % ------		1 % -----		
				1977				
ER	646.26	951.65	760.92	776.61	847.45	935.72	738.92	808.22
	974.16	977.20	782.97	695.57	849.47	688.17	810.98	825.50
	577.10	707.47	779.35	710.80	932.93	747.26	797.86	750.40
cinic	736.57	755.37	813.60	701.22	984.35	927.33	813.96	818.91
AN	733.52	847.92	784.21	721.05	903.55	824.62	790.43	800.76
SD	A 5 % 65.55			B 5 % 45.77		AB 5 % 209.73		
	1 % 89.79			1 % 60.49		1 % 277.20		
				1978				
R	761.33	1614.30	1604.10	1152.69	1509.56	1052.00	904.80	1288.40
	703.36	1593.53	1455.22	1102.97	1577.12	1168.14	820.50	1202.97
	571.10	1538.14	1287.69	1060.45	1524.67	1389.62	838.23	1172.84
inic	675.55	1611.22	1541.59	1180.10	1443.74	1338.45	962.02	1245.24
N	677.84	1589.30	1472.15	1124.05	1513.77	1237.05	872.39	1212.36
D	A 5 % 129.23			B 5 % 51.41		AB 5 % 235.61		
	1 % 177.02			1 % -----		1 % 311.41		

TABLE (23)

COMBINED ANALYSIS OF THE THREE SEASONS OF SEED COTTON YIELD KG/FADDAN

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
ATER	714.39	1156.17	1079.33	980.84	1100.14	988.35	879.22	985.49
LA	811.73	1163.27	1051.58	950.33	1147.94	959.00	918.85	1000.39
A	669.89	1093.27	1049.58	907.27	1140.20	1013.68	861.03	962.13
ocinic	777.66	1100.20	1104.82	988.49	1123.99	1069.41	916.44	1011.57
EAN	743.42	1128.23	1071.33	956.73	1128.07	1007.61	893.89	989.90

LSD	A 5 % 51.34	B 5 % 28.54	AB 5 % 130.79
	1 % 68.28	1 % 37.51	1 % ------

2. LINT YIELD

The effects of nitrogen application and growth regulators on lint yield per faddan, are shown in tables (24) and(25) .

From table (24) it is clear that nitrogen exerted highly significant effects on lint yield, in the three seasons.

In 1976 season, nitrogen application resulted in increasing lint yield, while there was no significant differences between 30,60, and 90 kg N/faddan, regardless of the form of nitrogen. In 1977 season, 30 kg N/faddan significantly gave the highest lint yield, 15.1 - 23.3% over the control , regardless of the form of nitrogen, except at the level of 90 kg N/faddan, whereas ammonium nitrate outyielded urea by 10.9%.

In 1978 season, 30 kg N/faddan yielded the highest lint, 122.0 - 131.5% over the control, regardless of the form of nitrogen.

At the levels of 60 and 90 kg N/faddan, the form of urea significantly gave higher lint yield, than that of ammonium nitrate by 19.7 - 28.8 %.

Combined analysis indicated that 30 kg N/faddan gave the highest lint yield regardless of nitrogen form, whereas on the higher levels of nitrogen, urea gave higher lint yield than that obtained by ammonium nitrate.

That nitrogen caused increase in lint yield, is in agreement with the results reported by Scarsbrook et.al. (1959), Mackenzie and Van Shaik (1963), Perkins and Douglas (1965), Bennett et al.(1967), and Srisook et al.(1973).

The growth regulators treatments significantly affected lint yeild in 1976 and 1978 seasons. In 1976 season, IAA and IBA caused significant increases in lint yield, by 7.5 and 8.0%, respectively, In 1978 season. IBA treatment resulted in significantly decreasing lint yield by 4.9%

Combined analysis revealed that the growth regulators treatments did not affect lint yield.

The effect of interaction of nitrogen and growth regulators was significant in 1977 and 1978 seasons. In 1977 season, the highest lint yeild was obtained by 30 kg N/faddan in the form of ammonium nitrate with succinic acid, and the lowest lint yield was obtained by 0 kg N/faddan with IBA solution. In 1978, season, the highest lint yield was obtained

by 30 kg N/faddan in the form of urea , with water, and the lowest lint yield was obtained by 0 kg N/ faddan with IBA treatment.

When combined analysis was performed, this interaction was insignificant.

TABLE (24)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON LINT YIELD IN KG PER FADDAN

A	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
				1976				
ER	285.60	347.12	328.80	383.07	361.46	368.72	367.28	348.86
	294.28	353.15	350.54	403.98	395.40	393.60	434.23	357.02
	339.13	408.92	423.12	369.26	379.10	351.95	366.64	376.87
cinic	352.78	355.83	367.96	406.31	360.34	362.40	380.24	369.41
EAN	317.94	366.26	367.60	390.66	374.07	369.16	387.10	367.54
SD :	A 5 % 30.00			B 5 % 21.54			AB 5 % ----	
	1 % 41.10			1 % -----			1 % ----	
				1977				
ER	250.08	361.24	274.57	282.70	320.06	340.19	275.13	300.57
	360.73	363.60	292.75	254.97	323.29	255.08	289.71	305.73
	224.20	273.53	300.94	268.88	360.15	284.12	305.54	288.19
cinic	282.08	287.26	301.40	251.02	373.93	349.57	302.60	306.84
EAN	279.27	321.41	292.41	264.39	344.36	307.24	293.24	300.33
SD	A 5 % 24.90			B 5 % ----			AB 5 % 86.78	
	1 % 34.10			1 % ----			1 %114.70	
				1978				
ER	312.98	648.79	642.28	459.68	592.37	400.80	362.07	488.42
	281.52	630.02	570.65	440.88	638.39	470.10	342.04	481.94
	225.17	606.51	512.80	417.97	606.71	553.17	327.77	464.30
cinic	271.58	641.21	607.68	474.46	585.45	524.80	360.17	495.05
EAN	272.81	631.63	583.35	448.24	605.73	487.22	348.01	482.43
SD	A 5 % 50.93			B 5 % 19.47			AB 5 % 88.58	
	1 % 69.76			1 % -----			1 %117.08	

TABLE (25)

COMBINED ANALYSIS OF THE THREE SEASONS OF LINT YIELD KG/FADDAN

A N O / B		UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	282.89	452.38	415.22	375.15	424.63	369.90	334.83	379.29
AA	312.18	448.92	404.65	366.61	452.93	372.93	355.33	387.57
BA	262.83	429.65	412.29	352.64	448.65	396.41	333.32	376.46
Succinic	302.15	428.10	425.68	377.26	439.91	412.26	347.67	390.43
MEAN	290.01	439.76	414.46	367.77	441.39	387.88	342.79	383.44

LSD A 5 %	20.35	B 5 %	11.38
1 %	27.07	1 %	14.96

AB 5 % -----
1 % -----

3. COTTON SEED YIELD

Data of cotton seed yield, as affected by nitrogen appliction , seed soaking in growth regulators, and their interactions, are shown in tables(26) and (27).

Seed cotton yield was significantly affected by the nitrogen application treatments.

In 1979 season, the highest seed yield was produced by 90 kg N/faddan, 26.1-26.6% over the control regardless of form of nitrogen. The differences between means of cotton seed due to 30 and 60 kg N/faddan were not significant.

In 1977 and 1978 season, the highest cotton seed yield was obtained by 30 kg N/faddan, the increase being 15.9-23.1% and 12.2- 136.4% respectively. Forms of of nitrogen had nothing to do with seed yield.

Combined analysis of the three seasons confirmed that 30 kg N/ faddan resulted in increasing cotton seed yield by 51.4 - 51.8% regardless of the form of nitrogen. seed soaking in growth regulators had no significant effect on seed yield , as compared with the control treatment, in 1976 and 1978 seasons. In 1977 season, seed soaking in IBA solution, caused significant reduction

in seed yield, by 9.0%.

Combined analysis of the three seasons revealed that seed soaking in IBA solution significantly resulted in reducing the cotton seed by 3.4%.

The effect of interaction between nitrogen and growth regulators on the cotton seed yield, was significant in the three seasons. In 1976 season, the highest cotton seed yield was obtained by 90 kg N/faddan in the form of ammonium nitrate, with IAA, and the lowest seed yield was obtained by 0 kg N/faddan, with water.

In 1977 season, the highest seed yield was obtained by 30 kg N/faddan in the form of urea, with IAA, and the lowest seed yield was obtained by 0 kg N/faddan with IBA.

In 1978 season, the highest cotton seed yield was due to 30 kg N/faddan in the form of urea, with succinic acid, and the lowest cotton seed yield was due to 0 kg N/faddan, with IBA.

When combined analysis was performed, the highest seed yield was found to be due to 30 kg N/faddan as urea, with IAA, and the lowest seed yield was due to 0 kg N/faddan with IBA. Cimbined analysis indicates that the best combination was 30 kg N/faddan, in either form of nitrogen, with seed soaking in IAA solution.

TABEL (26)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON COTTON SEED YIELD IN KG PER FADDAN

A / B	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
1976								
WATER	449.99	555.43	544.17	630.14	581.96	608.62	626.67	571.00
IAA	463.40	565.93	566.02	648.46	621.82	627.09	690.84	597.65
IBA	522.33	625.29	658.60	581.30	583.91	552.21	580.35	586.28
Succinic	568.09	578.17	591.32	677.82	583.55	580.07	629.10	601.16
MEAN	500.95	581.21	590.02	634.43	592.81	592.00	631.74	589.02
LSD /: A 5 %	42.71	B 5 % -----			AB 5 %	141.97		
1 %	58.51	1 % -----			1 %	------		
1977								
WATER	396.18	599.41	486.35	493.91	527.39	595.53	463.80	507.65
IAA	613.43	613.60	490.22	440.61	526.17	433.10	521.27	519.77
IBA	352.90	433.93	478.42	441.93	572.78	463.15	492.32	462.20
Succinic	454.49	468.11	512.20	450.20	610.42	577.76	511.36	512.08
MEAN	454.25	526.51	491.80	456.66	559.19	517.38	497.19	500.43
LSD : A 5 %	42.49	B 5 % 28.83			AB 5 %	131.37		
1 %	58.21	1 % 38.34			1 %	173.64		
1978								
WATER	448.35	965.51	961.82	693.01	917.20	651.20	542.73	739.97
IAA	421.84	963.45	884.58	662.09	938.73	698.04	478.45	721.02
IBA	345.93	931.63	774.88	642.48	917.97	836.45	510.46	708.54
Succinic	403.97	970.02	933.92	705.65	858.29	813.65	565.85	750.19
MEAN	405.02	957.65	888.80	675.81	908.04	749.83	524.37	729.93
LSD : A 5 %	79.55	B 5 % 31.59			AB 5 %	143.73		
1 %	108.97	1 % -----			1 %	189.98		

TABLE (27)

OMBINED ANALYSIS OF THE THREE SEASONS OF COTTON SEED YIELD KG/FADDAN

A / B	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
ATER	431.51	703.78	664.11	605.69	675.52	618.45	544.40	606.21
AA	499.56	714.33	646.94	583.72	695.57	586.08	563.52	612.82
BA	407.05	663.62	637.30	555.24	691.55	617.27	527.71	585.68
uccinic	475.52	72.10	679.15	611.22	684.09	657.16	568.77	621.14
MEAN	453.41	688.46	656.88	588.97	686.68	619.74	551.10	606.46

LSD	A 5 % 31.65	B 5 % 17.71	AB 5 % 79.52
	1 % 42.09	1 % 23.55	1 %104.51

4. OIL YIELD

Oil yield means, as affected by nitrogen fertilizers, growth regulators, and their interactions, are shown in tables (28) and (29).

In 1977 season, 30 kg N/faddan significantly gave the highest oil yield, 19.4 - 21.5% over the control, whereas nitrogen forms had no effect on it. In 1978 season, the highest oil yield was also produced by 30 kg N/faddan, being 111.2 - 129.3% over the control either in the form of urea or ammonium nitrate. However, with the higher levels of nitrogen, the urea form, outyielded the ammonium nitrate from by 15.5 - 21.1%.

It is obvious that oil yield per feddan is a reflection of seed cotton yield per feddan.

Table (29) shows the results of combined analysis, which indicate that the highest oil yield was obtained by 30 kg N/faddan, being 70.3 - 63.0% over the control. Only at the level of 60 kg N/faddan, the form of urea outyielded the form of ammonium nitrate by 9.3%.

These results are in good agreement with Kamal et al. (1974), and Hefni and El-Kholany (1981), who found similar results.

The effect of seed soaking in growth regulators solutions, on oil yield, was significant in 1977 and 1978 seasons. In 1977 season, IAA and IBA significantly resulted in reducing the oil yield by 8.7 and 15.1% respectively, whereas succinic acid gave insignificant decrease.

In 1978 season, oil yield per faddan was significantly decreased due to IAA and IBA treatments, by 10.3 and 7.9% respectively. Combined analysis indicates, as in table (29), that seed soaking in IAA, IBA, and succinic acid solutions, resulted in significant reductions in oil yield, by 9.6, 11.1 and 5.0%, respectively.

The effect of the interaction between nitrogen and growth regulators, on oil yield, was highly significant in 1977 and 1978 seasons. In both 1977 and 1978 seasons, the highest oil yield was obtained by 30 kg N/faddan in the form of urea, with seed soaking in water, and the lowest oil yield was obtained by 0 kg N/faddan with seed soaking in IBA solution. This result was confirmed by combined analysis.

TABLE (28)

HE EFFECT OF NITROGEN AND GROWTH REGULATORS ON OIL YIELD KG/PER FADDAN

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
				1977				
ATER	89.79	140.34	110.67	113.06	115.09	135.57	103.66	115.45
AA	126.75	108.05	108.94	100.29	102.31	83.51	103.32	105.46
BA	66.09	95.66	110.50	91.35	118.57	96.06	107.91	98.02
uccinic	94.37	106.50	102.48	99.08	122.61	118.58	106.79	107.27
MEAN	94.37	112.64	108.15	100.95	114.65	108.43	106.67	106.55
LSD : A 5 % 10.78 1 % -----				B 5 % 9.09 1 %12.09			AB 5 % 41.64 1 % 55.38	
				1978				
TER	90.41	192.80	192.52	138.83	183.00	129.74	107.17	147.78
A	77.62	179.15	161.49	118.85	170.38	127.93	92.93	132.62
A	69.87	186.18	145.34	118.21	175.35	161.77	96.12	136.12
ccinic	87.16	187.43	179.55	130.32	157.98	154.48	103.30	142.89
MEAN	81.27	186.39	169.72	126.55	171.68	143.48	99.88	139.85
LSD : A 5 % 20.96 1 % 29.39				B 5 % 7.66 1 %10.18			AB 5 % 35.09 1 % 46.67	

TABLE (29)

BINED ANALYSIS OF THE TWO SEASONS OF OIL YIELD KG / FADDAN

A	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
ER	90.10	166.57	151.60	125.95	149.05	132.66	105.42	131.62
	102.19	143.60	135.22	109.57	136.35	105.72	100.63	119.04
	67.98	140.92	127.92	104.78	146.96	128.92	102.02	117.07
cinic	91.01	146.97	141.02	114.70	140.30	136.53	105.05	125.08
AN	87.82	149.52	138.94	113.75	143.17	125.96	103.28	123.20

) A 5 % 11.16	B 5 % 5.88	AB 5 % 26.96
1 % 15.13	1 % 7.77	1 % 35.63

L I N T P R O P E R T I E S

1. LINT LENGTH

Means of lint length as affected by nitrogen fertilization, growth regulators treatments, and their interactions, are shown in tables (30) and 31).

Lint length was significantly affected by nitrogen in 1977 season.

The higher nitrogen levels gave higher lint length , as in table (30).

Combined analysis of the three seasons confirmed the same result. This result agree with those obtained by Moursi et al .(1961b) El- Hattab and Ali (1962), Bennett et al. (1967) in Alabama Hearn (1976) , Sabino and Silva(1976), and Shahine (1980), and in contrast with Perkins and Douglas (1965) , who mentioned that lint length increased by application of 30 lb N/acre and remained constant with additional nitrogen increments, ans also in contrast with the result reported by Chiplunkar and Verma(1966) who mentioned that nitrogen application resulted in decreasing lint length.

The insignificance of the effect of nitrogen on lint length in 1976 and 1978 seasons, is in agreement with

results reported by Reynold and killough(1933), El-Sorady (1963), Heweidi (1965), Murray et al.(1965), Bennett et al (1967) , in California, Chaudhry(1969), Khattak et al . (1976), Koli and Morrill(1976), Shafshak et al. (1976), Shalaby et al.(1977), Hefni et al.(1978) , Kherallah(1979) and Wahadan (1978). The results are also in contrast with that obtained by Jackson and Tilt (1968),who reported that there was no consistent effect of nitrogen levels on lint length.

Combined analysis revealed that urea gave slightly longer lint than ammonium nitrate, but the differences were not significant. This result is similar to the results mentioned by El-Sorady(1963), and Shahine (1980).

The growth regulators treatments, had significant effect on lint length in 1977 and 1978 seasons, whereas soaking the seeds in IAA and IBA solutions resulted in reducing the lint length.

Combined analysis confirmed this result, which do not agree with the result obtained by Aly (1975) who found that seed soaking in IAA did not affect lint properties.

TABLE (30)

IE EFFECT OF NITROGEN AND GROWTH REGULATORS ON LINT LENGTH IN MM

A	N O	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
1976								
TER	32.5	32.5	33.1	32.4	32.5	32.5	32.5	32.6
A	32.4	32.2	32.5	32.4	32.2	32.1	32.1	32.3
A	33.0	32.5	32.5	32.1	32.5	32.3	32.1	32.4
ccinic	32.8	32.6	32.9	32.9	32.7	32.5	32.5	32.7
MEAN	32.7	32.5	32.8	32.5	32.5	32.4	32.3	32.5
LSD : A 5 % ----				B 5 % ----			AB 5 % ----	
1 % ----				1 % ----			1 % ----	
1977								
ER	31.6	32.7	32.3	33.3	31.7	32.8	32.8	32.5
	31.5	31.0	32.0	32.8	31.4	32.5	31.7	31.8
	31.2	32.6	32.3	32.9	31.0	32,4	32.4	32.1
cinic	32.0	32.6	32.3	33.1	32.1	33.0	32.5	32.5
EAN	31.6	32.2	32.2	33.0	31.6	32.7	32.4	32.2
SD : A 5 % 0.27				B 5 % 0.21			AB 5 % 0.95	
1 % 0.37				1 % 0.27			1 % 1.26	
1978								
ER	34.3	34.2	34.4	34.1	34.0	34.1	34.9	34.3
	33.4	34.0	34.2	34.0	34.0	34.1	33.7	33.9
	34.1	33.8	34.3	33.9	33.7	33.9	33.9	33.9
cinic	34.2	34.0	34.3	35.0	34.1	34.2	34.2	34.3
EAN	34.0	34.0	34.3	34.3	34.0	34.1	34.2	34.1
SD : A 5 % ----				B 5 % 0.18			AB 5 % 0.85	
1 % ----				1 % 0.25			1 % 1.12	

TABLE (31)

COMBINED ANALYSIS OF THE THREE SEASONS OF LINT LENGTH IN MM

A / B	N 0	UREA			AMMONIUM NITRATE			MEAN
		N 30	N 60	N 90	N 30	N 60	N 90	
WATER	32.8	33.1	33.3	33.3	32.7	33.1	33.4	33.1
AA	32.4	32.4	32.9	33.1	32.5	32.9	32.5	32.7
BA	32.8	33.0	33.0	33.0	32.4	32.9	32.8	32.8
uccinic	33.0	33.1	33.2	33.7	33.0	33.2	33.1	33.2
MEAN	32.8	32.9	33.1	33.3	32.7	33.0	33.0	33.0

LSD : A 5 % 0.20 B 5 % 0.14 AB 5% ----

1 % 0.27 1 % 0.19 1% ----

2. LINT STRENGTH

Results of the lint strength means, as affected by nitrogen application, growth regulators, and their interactions, are shown in table (32).

Nitrogen application had no significant effect on lint length in 1976, 1977 , and 1978 seasons, which is in harmony with the results obtained by El - Sorady (1963) , Perkins and Douglas (1965) , Bennett et al.(1967), Chaudhry (1969) , Abdallah (1976) , Shafshak et al.(1976) Shalaby et al.(1977), Hefni et al. (1978), Hussein et al (1979b) Kherallah (1979), and Wahdan (1981), and in contrast with those obtained by pope (1935) , Nayak(1937) Gulati and Ahmad (1946) Moursi et al. (1961b)Rizk(1974) Khattak et al. (1976) Sabino and Silva (1976), and Shahine (1980).

The growth regulators treatments, exerted significant effects on lint strength, only in 1978 season, where as soaking the seeds in IAA, IBA and succinic acid solutions, resulted in decreasing the lint strength.

Aly(1975) reported that seed soaking in IAA solution, did not affect the lint strength.

The effect of the nitrogen application and the growth regulators interaction on the lint strength,was highly

significant in 1978 season, whereas the higher averages of lint strength were obtained by 30 kg N/faddan as urea with succinic acid, and 60 kg N/faddan as ammonium nitrate, with either water or IAA solution. The lowest lint strength was obtained by 90 kg N/faddan as ammonium nitrate with seed soaking in IBA solution.

TABLE (32)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON LINT STRENGTH PRESSLEY INDEX

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
WATER	9.2	9.0	9.1	8.8	9.8	9.5	8.9	9.2
IAA	9.2	9.0	8.8	8.9	9.2	9.5	8.8	9.1
IBA	9.2	9.0	9.6	9.0	8.7	9.1	9.0	9.1
Succinic	9.1	8.8	9.6	9.1	9.2	9.0	8.7	9.1
MEAN	9.2	9.0	9.3	9.0	9.2	9.3	8.9	9.1
LSD : A 5 % ----				B 5 % ----			AB 5 % ---	
1 % ----				1 % ----			1 % ---	
1977								
WATER	9.2	9.1	9.2	9.3	9.3	9.2	9.2	9.2
IAA	9.1	9.0	9.1	9.1	9.2	9.1	9.2	9.1
IBA	9.1	9.1	9.2	9.1	9.2	9.2	9.2	9.2
Succinic	9.0	9.1	9.1	9.1	9.2	9.0	9.3	9.1
MEAN	9.1	9.1	9.2	9.2	9.2	9.1	9.2	9.2
LSD : A 5 % ----				B 5 % ----			AB 5 % ---	
1 % ----				1 % ----			1 % ---	
1978								
WATER	9.2	9.5	9.3	8.8	9.8	10.0	9.8	9.5
IAA	8.9	8.7	8.7	8.8	9.2	10.0	9.6	9.1
IBA	8.8	8.6	9.0	8.9	9.0	8.7	8.4	8.8
Succinic	9.0	10.0	9.2	8.9	8.9	9.0	8.8	9.1
MEAN	9.0	9.2	9.1	8.8	9.2	9.4	9.1	9.1
LSD : A 5 % -----				B 5 % 0.19			AB 5% 0.87	
1 % -----				1 % 0.25			1% 1.16	

3. LINT FINENESS

Tables(33) and (34) show the means of lint fineness as affected by nitrogen treatments and growth regulators and their interaction.

Nitrogen application significantly affected the lint fineness, in 1976 season.

The 30 and 60 kg N/faddan treatments in the form of urea, resulted in increasing the lint finaness. Combined analysis of the three season indicates that the effect of nitrogen was insignificant, which agrees with the results obtained by El-Sorady (1963) Wankhede (1970), and Shahine (1980).

Lint fineness was significantly affected by soaking the cotton seeds in solutions of growth regulators, in 1976 and 1978 seasons. In 1976 season, succinic acid treatment resulted in increasing the lint fineness, whereas in 1978 season, the same treatment resulted in significantly decreasing the lint fineness. However, combined analysis of the three seasons indicated that seed soaking in IAA, IBA, and succinic acid solutions, did not affect lint fineness.

This result is in agreement with the result obtained by Aly (1975), who reported that seed soaking in IAA

solutions did not affect lint fineness.

The interaction of nitrogen fertilizers and growth regulators was significant in 1978 season. The highest lint fineness was obtained by 60 kg N/faddan as ammonium nitrate, with seed soaking In IBA solution, and the lowest lint fineness was obtained by 90 kg N/faddan as ammonium nitrate, with seed soaking in succinic acid.

The combined analysis revealed that the interaction between nitrogen and growth regulators was significant, with the highest lint fineness resulting from 60 kg N/faddan as ammonium nitrate with seed soaking in IAA, and the lowest lint fineness was obtained by 30 kg N/faddan as urea, with seed soaking in water, and 90 kg N/faddan as ammonium nitrate, with seed soaking in IAA.

TABLE (33)

THE EFFECT OF NITROGEN AND GROWTH REGULATORS ON LINT FINENESS IN MICRONAIRE

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
1976								
WATER	4.1	3.9	3.9	4.2	4.2	4.1	4.2	4.1
IAA	4.1	4.0	3.9	4.0	4.0	3.8	4.1	4.0
IBA	4.0	4.0	3.6	4.1	4.0	4.1	4.0	4.0
Succinic	3.8	3.7	3.4	4.0	3.6	4.0	3.9	3.8
MEAN	4.0	3.9	3.7	4.1	4.0	4.0	4.1	4.0
LSD : A 5 % 0.21		B 5 % 0.12			AB 5 % ----			
1 % ----		1 % 0.16			1 % ----			
1377								
WATER	3.8	4.1	3.9	3.5	3.7	3.6	3.8	3.8
IAA	3.8	3.4	3.8	3.5	3.7	3.5	3.9	3.7
IBA	4.0	3.9	4.0	3.4	3.6	3.6	3.7	3.7
Succinic	3.7	3.8	3.7	3.9	4.1	3.6	3.5	3.8
MEAN	3.8	3.8	3.9	3.6	3.8	3.6	3.7	3.7
LSD A 5 % ----		B 5 % ----			AB 5 % ----			
1 % ----		1 % ----			1 % ----			
1978								
WATER	4.3	4.6	4.6	4.2	4.5	4.5	4.3	4.4
IAA	4.3	4.4	4.3	4.4	4.6	4.2	4.5	4.4
IBA	4.2	4.4	4.5	4.4	4.4	4.1	4.5	4.4
Succinic	4.8	4.1	4.5	4.2	4.5	4.7	4.9	4.5
MEAN	4.4	4.4	4.5	4.3	4.5	4.4	4.6	4.4
LSD : A 5 % ----		B 5 % 0.09			AB 5 % 0.42			
1 % ----		1 % 0.12			1 % 0.56			

TABLE (34)

COMBINED ANALYSIS OF THE THREE SEASONS OF LINT FINENESS IN MICRONAIRE

A / B	N O	UREA N 30	UREA N 60	UREA N 90	AMMONIUM NITRATE N 30	AMMONIUM NITRATE N 60	AMMONIUM NITRATE N 90	MEAN
WATER	4.1	4.2	4.1	4.0	4.1	4.1	4.1	4.1
IAA	4.1	3.9	4.0	4.0	4.1	3.8	4.2	4.0
IBA	4.1	4.1	4.0	4.0	4.0	3.9	4.1	4.0
Succinic	4.1	3.9	3.9	4.0	4.1	4.1	4.1	4.0
MEAN	4.1	4.0	4.0	4.0	4.1	4.0	4.1	4.0
LSD	A 5 % ----			B 5 % ----			AB 5 % 0.33	
	1 % ----			1 % ----			1 % ----	

CHEMICAL CONTENTS OF LEAVES

Table(35) shows the effect of nitrogen levels on the chemical contents of leaves of cotton plant at 75 days age.

It is evident that increasing the nitrogen level resulted in increasing the concentrations of nitrogen, phosphorus, iron, and zinc. However, only the zinc was significantly affected.

It can be concluded that nitrogen, phosphorus, calcium, magnesium, iron, manganese , reducing sugars, and total phenols concentrations, were not significantly affected by increasing the nitrogen levels.

The fact that concentration of nitrogen of leaves was not affected by nitrogen application, is in contrast with the results obtained by Hamdi et al.(1962), Clark (1964), Eid(1969) , Nour El - Din et al .(1970), Vivekanandan et al (1970), Basinski et al .(1971), Abdallah(1976), Ahmad (1977), Hassan (1978), Shahine (1980) and Wahdan (1981).

The fact that phosphorus concentration in leaves was not affected by nitrogen application, is in good agreement with the results of Vivekanandan et al . (1970), and

Shahine (1980), and in contrast with those obtained by Hamdi et al. (1962), Eid (1969) Abdallah (1976) , and Wahdan (1981).

Concentrations of calcium and magnesium were not affected by nitrogen rates. This is in harmony with the result reported by Vivekanandan et al (1970).

Reducing sugars concentration was not affected by nitrogen application. This is quite in contrast with the results mentioned by Eaton and Rigler (1945), Eaton and Ergle (1953) , Arslanova (1958), yarovenko et al . (1973) , Ahmad (1977) , and Hassan (1978).

Table(36) shows the effect of presowing seed soaking in growth regulators solutions on the chemical contents of the cotton plants after 25 days from sowing.

It is evident that IBA treatment resulted in increasing the nitrogen concentration in seedlings.

Phosphorus was not affected by the treatments under study.

Concentration of calcium significantly increased by IAA and succinic acid treatments.

Magnesium significantly decreased by the succinic acid treatment.

Iron significantly increased by IBA and succinic acid treatments.

Zinc and manganese were not affected by the growth regulators treatments.

Table(37) shows the effect of the growth regulators on the chemical contents in leaves of cotton plants 75 days old.

It is clear that the concentrations of nitrogen, phosphorus, calcium, magnesium, zinc, manganese , reducing sugars, and total phenols, were not affected by the growth regulators treatments.

On the other hand, concentration of iron significantly increased by the IBA treatment .

TABLE (35)

THE EFFECT OF NITROGEN LEVEL KG/FADDAN ON CHEMICAL CONTENTS OF LEAVES AT 75 DAYS AGE

CHEMICAL CONTENTS	TREATMENT				LSD	
	0	30	60	90	5 %	1 %
N %	3.0	3.5	3.5	4.0	---	---
P %	0.39	0.40	0.43	0.43	---	---
Ca %	0.43	0.40	0.26	0.30	---	---
Mg %	0.066	0.066	0.046	0.048	---	---
Fe ppm	412	480	613	850	---	---
Zn pmm	69	280	387	480	393.41	---
Mn ppm	83	75	65	70	---	---
REDUCING SUGERS %	3.5	4.0	4.3	3.7	---	---
TOTAL PHENOLS %	10.35	11.58	12.15	10.88	---	---

TABLE (36)

THE EFFECT OF GROWTH REGULATORS ON CHEMICAL CONTENTS OF SEEDLINGS AT 25 DAYS AGE

CHEMICAL CONTENTS		TREATMENT				LSD	
		WATER	IAA	IBA	SUCCINIC	5 %	1 %
N	%	2.4	1.5	4.3	3.3	1.19	---
P	%	0.51	0.44	0.58	0.50	-----	---
Ca	%	0.18	0.35	0.23	0.45	0.12	---
Mg	%	0.082	0.072	0.077	0.026	0.037	---
Fe	ppm	500	650	850	750	215.42	---
Zn	ppm	96	48	64	48	-----	---
Mn	ppm	50	50	60	50	-----	---

TABLE (37)

THE EFFECT OF GROWTH REGULATORS ON CHEMICAL CONTENTS OF LEAVES AT 75 DAYS AGE

CHEMICAL CONTENTS	TREATMENT				LSD	
	WATER	IAA	IBA	SUCCINIC	5 %	1 %
N %	3.1	3.5	3.9	3.5	---	---
P %	0.42	0.38	0.44	0.39	---	---
Ca %	0.26	0.45	0.48	0.22	---	---
Mg %	0.56	0.82	0.52	0.36	---	---
Fe ppm	510	400	990	460	392.30	---
Zn ppm	370	335	280	235	---	---
Mn ppm	75	75	85	55	---	---
REDUCING SUGERS %	3.6	4.2	4.5	3.2	---	---
TOTAL PHENOLS %	12.10	10.90	9.76	12.20	---	---

EXPERIMENT II

GROWTH CHARACTERS

1. PLANT HEIGHT

Data of the final cotton plant height, as affected by foliar spraying with solutiongs of copper sulphate, zinc sulphate, ammonium molybdate, and their combinations, are shown in table (38).

The final plant heigh was not affected by these treatments in 1977 season, while in 1978 season, it was significantly affected, whereas copper, copper + zinc, molybdenum, and zinc+ molybdenum treatments, resulted in significant increase in plant height.

Combined analysis of the two seasons confirmed that copper, copper + zinc, and copper + molybdenum treatments, resulted in significant increase in plant height .

It was found by Singh et al.(1970) , that foliar sprays of copper, zinc , and molybdenum resulted in increasing plant height, while Farghal (1973) stated that the foliar application of molybdenum resulted in increasing plant height.

TABLE (38)

THE EFFECT OF MICRONUTRIENT SPRAYS ON FINAL PLANT HEIGHT IN CM

	1977	1978	COMBINED
WATER	155.9	145.3	150.6
Cu	157.3	164.7	161.0
Zn	156.4	147.7	152.1
Mo	157.9	153.0	155.5
Cu + Zn	166.4	165.0	165.7
Cu + Mo	162.4	156.7	159.6
Zn + Mo	148.3	162.7	155.5
Cu + Zn + Mo	157.9	152.0	155.0
MEAN	157.8	155.9	156.9
LSD 5 % ---		7.72	6.14
1 % ---		10.51	8.17

2. DRY MATTER

Table (39) shows the effect of foliar sprays of copper, zinc, molybdenum, and their combinations, on the final dry weight of the cotton plants.

In 1977 season, there were no significant differences between the treatments and the control.

In 1978 season, foliar application of copper, zinc, molybdenum , copper + zinc, and copper + molybdenum , resulted in significantly increasing the dry weigts , while copper + zinc + molybdenum treatment, caused a significant decrease in dry weight.

Combined analysis of the two seasons confirmed the significant increases in final dry weights due to molybdenum, and copper + molybdenum treatments, and also the significant decrease due to copper + zinc + molybdenum treatment.

The role of molybdenum in increasing the dry weight was explained by Luckwill (1978), who pointed out that the activity of nitrate reductase in plant, depends on presence of molybdenum. He added that this enzyme affect the rate of nitrate assimilation into organic forms, and that under certain conditions, may control the rate of dry weight increase.

Farghal (1973) reported significant increases in dry matter due to foliar application of copper, zinc, and molybdenum.

TABLE (39)

THE EFFECT OF MICRONUTRIENT SPRAYS ON FINAL DRY WEIGHT IN GRAM PER PLANT

	1977	1978	COMBINED
WATER	76.44	104.03	90.24
Cu	66.87	114.85	90.86
Zn	80.14	114.11	97.13
Mo	75.65	135.18	105.42
Cu + Zn	69.78	122.97	96.38
Cu + Mo	89.63	111.55	100.59
Zn + Mo	64.83	107.75	86.29
Cu + Zn + Mo	60.28	94.77	77.53
MEAN	72.95	113.19	93.06
LSD 5 %	17.28	7.31	9.02
1 %	23.51	9.95	11.99

TABLE (40)

THE EFFECT OF MICRONUTRIENT SPRAYS ON NET ASSIMILATION RATE G/CM^2/DAY

	VEGETATIVE STAGE	FLOWERING STAGE	BOLLING STAGE
WATER	0.0007902	0.0001814	0.0001752
Cu	0.0009389	0.0003064	0.0001625
Zn	0.0015555	0.0004769	0.0003872
Mo	0.0006610	0.0004730	0.0003517
Cu + Zn	0.0009160	0.0006585	0.0004351
Zn + Mo	0.0007716	0.0004239	0.0001903
Cu + Zn + Mo	0.0008519	0.0003730	0.0000970
MEAN	0.0009599	0.0004157	0.0002473
LSD 5 %	0.0000248	---	---
1 %	0.0000367	---	---

4. RELATIVE GROWTH RATE

Table (41) shows the averages of RGR as affected by foliar application of copper, zinc, molybdenum, and their combinations.

Significant effects occured only during the vegetative stage, whereas copper, zinc, molybdenum, copper + zinc, and copper + zinc + molybednum, caused significant increase in RGR. This may be explained by the fact that the micronutrients regulate the enzymatic systems.

TABLE (41)

THE EFFECT OF MICRONUTRIENT SPRAYS ON RELATIVE GROWTH RATE G / G / DAY

	VEGETATIVE STAGE	FLOWERING STAGE	BOLLING STAGE
WATER	0.0839625	0.0083698	0.0036250
Cu	0.1003906	0.0153600	0.0059950
Zn	0.1107281	0.0176417	0.0088200
Mo	0.1018719	0.0199033	0.0091116
Cu + Zn	0.1146687	0.0188816	0.0056050
Cu + Mo	0.0904750	0.0205533	0.0104550
Zn + Mo	0.0974937	0.0188767	0.0051200
Cu + Zn + Mo	0.1113594	0.0143683	0.0030967
MEAN	0.1013687	0.0167443	0.0064785
LSD 5 %	0.0162808	---	---
1 %	---	---	---

5. RELATIVE FRUITFULLNESS

Means of RF values as affected by the foliar sprays of copper, zinc, molybdenum, and their combinations, are shown in table (42).

In 1977 season, RF significantly increased by spraying molybdenum, copper + zinc, zinc + molybdenum , and copper + zinc + molybdenum, and significantly decreased by copper + molybdenum spray.

In 1978 season, RF increased by copper + zinc + molybdenum spray, whereas it decreased by zinc, molybdenum , and copper + molybdenum sprays. This contrast between results of 1977 and 1978 seasons, may be attributed to the seasonal variation in temperature, as indicated from table (2).

Combined analysis of the two seasons confirmed the significant increases in RF, due to foliar sprays of copper + zinc, and copper + zinc+molybdenum, and the significant decreases due to foliar sprays of zinc, and copper + molybdenum.

TABLE (42)

THE EFFECT OF MICRONUTRIENT SPRAYS ON RELATIVE FRUITFULLNESS

	1977	1978	MEAN
WATER	7.13	14.80	10.97
Cu	8.55	13.68	11.12
Zn	6.32	12.50	9.41
Mo	9.92	11.27	10.60
Cu + Zn	11.67	13.86	12.77
Cu + Mo	4.70	13.14	8.92
Zn + Mo	9.28	14.66	11.97
Cu + Zn + Mo	9.53	16.47	13.00
MEAN	8.39	13.80	11.10
LSD 5 %	1.70	1.49	1.09
1 %	2.31	2.03	1.45

Y I E L D C O M P O N E N T S

1. NUMBER OF SYMPODIA PER PLANT

Means of number of sympodia per plant as affected by the foliar application of copper, zinc, molybdenum, and their combinations are given in Table(43).

The number of sympodia per plant significantly increased in 1977 season, by spraying with copper+ molybdenum, whereas spraying with zinc + molybdenum ; and copper + zinc + molybdenum, resulted in decreasing significantly the number of sympodia.

In 1978 season, spraying with copper+ zinc resulted in decreasing significantly the number of sympodia per plant.

Combined analysis revealed that these treatments had no significant effect on the number of sympodia per plant.

These results agree with the results of Parghal (1973) who reported that the foliar spraying with copper ,zinc , or molybdenum did not affect the number of sympodia per plant.

TABLE (43)

HE EFFECT OF MICRONUTRIENT SPRAYS ON NUMBER OF SYMPODIA PER PLANT

	1977	1978	COMBINED
WATER	4.8	8.3	6.6
Cu	4.7	8.4	6.6
Zn	4.8	8.5	6.7
Mo	4.6	8.4	6.5
Cu + Zn	5.2	7.5	6.4
Cu + Mo	5.9	8.5	7.2
Zn + Mo	3.7	8.2	6.0
+ Zn + Mo	3.8	8.3	6.1
MEAN	4.6	8.3	6.5
D 5 %	0.56	0.59	---
1 %	0.76	-----	---

2. NUMBER OF OPEN BOLLS PER PLANT

Table(44) shows the averages of boll number per plant as affected by foliar spraying with copper, zinc molybdenum, and their combinations.

In 1977 season, boll number significantly increased by copper + zinc and copper + molybdenum, whereas a significant decrease was obtained when plants received zinc + molybdenum

In 1978 season, the number of open bolls per plant significantly increased when plants received copper+ molybdenum, and decreased significantly by applying molybdenum.

When combined analysis was per formed, it was evident that copper + zinc, and copper + molybdenum resulted in increasing significantly the number of open bolls per plant, while molybdenum, and zinc + molybdenum caused significant decreases in the number of open bolls per plant. This increase in the bolls number per plant, due to copper + zinc, and copper + molybdenum treatments, may be attributed to improved nutritional status of the cotton plant.

Burkalow (1969) reported an increase in the number of bolls per plant by spraying with zinc, while Farghal (1973) obtained significant increases in the number of bolls per plant by spraying with copper, zinc, and molybdenum.

TABLE (44)

THE EFFECT OF MICRONUTRIENT SPRAYS ON NUMBER OF BOLLS PER PLANT

	1977	1978	COMBINED
WATER	5.2	13.3	9.3
Cu	5.0	13.4	9.2
Zn	5.3	13.6	9.5
Mo	4.8	12.6	8.7
Cu + Zn	6.6	13.6	10.1
Cu + Mo	7.3	14.9	11.1
Zn + Mo	3.9	12.9	8.4
Cu + Zn + Mo	5.4	13.9	9.7
MEAN	5.4	13.5	9.5
LSD 5 % —	0.47	0.69	0.40
1 % —	0.64	0.94	0.53

3. BOLL WEIGHT

Averages of boll weight as affected by the foliar spraying with copper, zinc, molybdenum, and their combinations, are shown in table (45). Boll weight was not affected by any of the foliar spray treatments, in both 1977 and 1978 seasons. This result was confirmed by combined analysis of the two seasons.

These results do not agree with the results reported by Burkalov (1969), Singh et al. (1970) and Tailakov and Ataev (1973).

TABLE (45)

THE EFFECT OF MICRONUTRIENT SPRAYS ON BOLL WEIGHT IN GRAM

	1977	1978	COMBINED
WATER	2.65	2.76	2.71
Cu	2.60	2.82	2.71
Zn	2.76	2.86	2.81
Mo	2.61	2.83	2.72
Cu + Zn	2.59	2.88	2.74
Cu + Mo	2.32	2.77	2.55
Zn + Mo	2.58	2.87	2.73
Cu + Zn + Mo	2.65	2.80	2.73
MEAN	2.60	2.82	2.71
LSD	----	----	----
	----	----	----

5. SEED COTTON PER PLANT

Averages of seed cotton per plant as affected by the foliar sprays of copper, zinc , molybdenum, and their combinations, are shown in table (46).

In 1977 season, copper + zinc, and copper +molybdenum treatments resulted in increasing signigicantly the seed cotton per plant, while spraying with zinc + molybdenum resulted ir significant decrease in seed cotton per plant.

In 1978 season, seed cotton per plant significantly increased due to copper + molybdenum treatment.

Combined analysis was not per formed as the statistical errors were not homogeninus.

TABLE (46)

THE EFFECT OF MICRONUTRIENT SPRAYS ON SEED COTTON PER PLANT IN GRAM

	1977	1978	MEAN
WATER	13.78	36.56	25.17
Cu	12.91	37.70	25.31
Zn	14.64	38.89	26.77
Mo	12.39	35.73	24.06
Cu + Zn	17.14	39.22	28.18
Cu + Mo	17.03	41.12	29.08
Zn + Mo	10.02	37.07	23.55
Cu + Zn + Mo	14.30	38.92	26.61
MEAN	14.03	38.15	26.09
LSD 5 %	1.43	2.68	———
1 %	1.94	----	———

5. NUMBER OF PLANTS PER FADDAN

Table(47) shows the averages of number of plants per faddan, as affected by spraying with copper, zinc, molybdenum, and their combinations.

In 1977 season, the number of plants per faddan, significantly decreased when the plants received molybdenum, copper + zinc, and copper + molybdenum.

In 1978 season, the spraying treatments had no significant effect on the plants number per faddan.

When combined analysis was performed , it was clear that foliar application of molybdenum, copper + zinc, copper+ molybdenum, and zinc + molybdenum, resulted in significant decreases in the number of plants per faddan at the time of cotton picking.

TABLE (47)

THE EFFECT OF MICRONUTRIENT SPRAYS ON THE NUMBER OF PLANTS PER FADDAN IN THOUSAND

	1977	1978	COMBINED
WATER	57.5	45.0	51.3
Cu	55.5	42.8	49.2
Zn	55.5	43.4	49.5
Mo	44.9	43.2	44.1
Cu + Zn	49.7	42.9	46.3
Cu + Mo	50.4	41.9	46.2
Zn + Mo	53.7	41.2	47.5
Cu + Zn + Mo	56.0	42.5	49.3
MEAN	52.9	42.9	47.9
LSD 5 %	5.9	---	3.20
1 %	8.03	---	4.26

6. EARLINESS

Averages of earliness as affected by the foliar spraying with copper, zinc, molybdenum, and their combinations, are shown in table (48).

In 1977 season, the foliar sprays of molybdenum and zinc + molybdenum, resulted in significantly increasing the earliness.

In 1978 season, there was no significant differences between any of the treatments and the control.

Combined analysis of the data of the two seasons, revealed that molybdenum, and zinc + molybdenum treatments, resulted in significant increases in earliness, whereas copper, and copper + molybdenum treatments caused significant decreases in earliness.

Farghal (1973) reported that copper, zinc, and molybdenum, promoted earliness.

TABLE (48)

THE EFFECT OF MICRONUTRIENT SPRAYS ON EARLINESS

	1977	1978	COMBINED
WATER	48.97	49.77	49.37
Cu	47.14	47.28	47.21
Zn	49.34	52.08	50.71
Mo	52.12	50.88	51.50
Cu + Zn	48.15	48.83	48.49
Cu + Mo	46.20	47.03	46.62
Zn + Mo	53.42	51.49	52.46
Cu + Zn + Mo	49.06	49.60	49.33
MEAN	49.30	49.62	49.46
LSD 5 % ——	2.83	2.78	1.91
1 % ——	3.87	3.79	2.55

7. LINT PERCENTAGE

Means of lint percentage as affected by the foliar application of copper, zinc, molybdenum, and their combinations, are shown in table (4.9).

In 1977 season, lint percentage decreased due to copper + molybdenumn and zinc + molybdenum treatments.

In 1978 season, the treatments under study had no significant effect on lint percentage, which was confirmed by combined analysis.

These results are in contrast with the results obtained by Tailakov and Ataev (1973), who reported increases in lint percentage due to foliar spraying with copper, and zinc.

TABLE (49)

THE EFFECT OF MICRONUTRIET SPRAYS ON LINT PERCENTAGE

	1977	1978	COMBINED
WATER	39.36	39.28	39.32
Cu	38.12	39.16	38.64
Zn	39.93	39.60	39.77
Mo	39.37	39.53	39.45
Cu + Zn	39.35	39.55	39.45
Cu + Mo	37.68	39.56	38.62
Zn + Mo	37.13	38.90	38.02
Cu + Zn + Mo	37.96	39.08	38.52
MEAN	38.61	39.33	38.97
LSD 5 %	1.58	-----	-----
1 %	----	-----	-----

8. SEED INDEX

The effects of foliar spraying with copper, zinc, molybdenum, and their combinations on seed index , are given in table (50) .

Seed index increased significantly in 1977 season by foliar application of copper + zinc, and zinc + molybdenum.

In 1978 season , the treatments did not affect the seed index, which was confirmed by the combined analysis of the two seasons.

Hefni and El-Kholany (1981) reported a significant increase in seed index, by foliar application of zinc chelate.

TABLE (50)

THE EFFECT OF MICRONURIENT SPRAYS ON SEED INDEX

	1977	1978	COMBINED
WATER	9.10	11.08	10.09
Cu	9.53	10.93	10.23
Zn	9.68	11.15	10.42
Mo	9.63	11.09	10.36
Cu + Zn	9.85	11.20	10.53
Cu + Mo	9.40	11.19	10.30
Zn + Mo	9.80	11.18	10.49
Cu + Zn + Mo	9.53	11.00	10.27
MEAN	9.57	11.10	10.34
LSD 5 %	0.64	-----	-----
1 %	----	-----	-----

9. SEED OIL PERCENTAGE

Averages of seed oil percentage as affected by the foliar spraying with copper, zinc, molybdenum, and their combinations, are given in table (51).

In 1977 season, seed oil percentage, significantly decreased by foliar sprays of copper, copper + zinc , copper + molybdenum, zinc + molybdenum, and copper +zinc + molybdenum.

In 1978 season, seed oil percentage increased by spraying with molybdenum, and decreased by spraying with zinc, which is in agreement with Hefni and El-Kholany (1981) , who reported a decrease in seed oil percentage due to foliar spray of zinc.

Combined analysis of the two seasons confirmed these results, that only the molybdenum spray resulted in increasing the seed oil percentage, whereas the other treatments decreased it.