RESULTS AND DISCUSSION

1. Number of days to flowering

1. I - Effect of the varieties :

Data presented in Table 2 indicate that the varieties differed significantly in the number of days from planting to flowering . In 1981 , Sorem 80 reached flowering (after 57.0 days) earlier than Giza 1 and Mayak by 23.6 and 6.1 days , respectively . In the second season , similar trend was recorded . The differences between varieties in flowering date are due to different genetic make up . Similar results were reported by Fick and Swallers (1975), Haikal (1976) , El-Mohandes (1979), Attia (1980) , El-Ahmer et al.(1980) and Abou-Khadrah et al. (1981) .

1.II- Effect of P_ levels :

Results of Table 2 demonstrated that P fertilization had no significant effect on flowering date . Similar results were found by El-Ahmer et al. (1980).

I.III- Effect of N- levels :

Nitrogen fertilization had no significant effect on the days elapsed from planting to flowering (Table 2) . However N-fertilization slightly delayed flowering , this might be attributed to

Table (2) : The average values of number of days to 50% flowering as affected by varieties , P and N fertilization in 1981 and 1982, seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	80.5	63.0	57.0	66.8	83.0	64.8	58.0	68.6
	30	80.5	63.0	57.0	66.8	83.5	65.0	58.5	69.0
	60	81.0	63.5	57.3	67.3	83.0	65.0	59.0	69.0
	Mean	80.7	63.2	57.1	67.0	83.2	64.9	58.5	68.9
15	0	80.5	62.8	56.8	66.7	82.5	64.5	58.0	68.3
	30	80.5	63.0	56.8	66.8	83.0	64.8	58.0	68.6
	60	80.8	63.0	57.3	67.0	83.0	65.0	58.5	68.8
	Mean	80.6	62.9	56.9	66.8	82.8	64.8	58.2	68.6
30	0	80.5	62.8	56.8	66.7	82.8	64.3	57.8	68.3
	30	80.5	63.3	57.0	66.9	83.0	65.0	57.8	68.6
	60	80.8	63.3	57.3	67.1	83.0	65.0	58.0	68.7
	Mean	80.6	63.1	57.0	66.9	82.9	64.8	57.8	68.5
Overall Mean for N-levels	0	80.5	62.8	56.8	66.7	82.8	64.5	57.9	68.4
	30	80.5	63.1	56.9	66.8	83.2	64.9	58.1	68.7
	60	80.8	63.3	57.3	67.1	83.0	65.0	58.5	68.8
Varieties mean		80.6	63.1	57.0		83.0	64.8	58.2	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.58	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
1982	0.54	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.

2. Number of days to physiological maturity

2.I Effect of the varieties :

Varieties differed significantly in number of days from planting to physiological maturity (Table 3) . Data showed that Sorem 80 was the shortest growing season (82.3 days) and Giza 1 was the longest growing season (112.8 days) , whereas , Mayak was intermediate (93.8 days) . Varietal differences in physiological maturity were found by Fick and Swallers (1975), Haikal (1976), and El-Mohands (1979) .

2.II Effect of P-levels :

Phosphorus fertilizer did not significantly affect physiological maturity (Table 3). Singhi and Pacheria (1981) reported similar results .

2.III Effect of N-levels :

Data presented in Table 3. indicate that N-fertilization significantly increased the number of days from planting to physiological maturity . In 1981 nitrogen application significantly delayed physiological maturity by 0.9 and 0.8 day with 30 and 60 kg N/fed, respectively without significant differences between N-levels . In 1982 , the retardation of physiological maturity was 0.2 and 0.5 day with the two levels of nitrogen , the retardation of matrurity

was significant with 60 kg N/fed. only . The retardation of physiological maturity by nitrogen fertilizer due to its encouragement of vegetative growth or delayed chlorophyll degardation . These results are in harmony with those reported by Tripathi and Kalra (1981).

2.IV- Effect of interaction :

The data in Table 3 revealed no significant effect of the different interactions between V , P and N on the number of days from planting to physiological maturity .

Table (3) : The average values of number of days to physiological maturity as affected by varieties, P and N fertilization in 1981 and 1982 seasons .

Kg P_2O_5/ fed.	Kg N/ fed.	1981 Varieties				1982 Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	111.5	93.5	81.5	95.5	113.8	94.0	82.5	96.8
	30	112.0	94.0	82.5	96.2	114.0	94.0	82.5	96.8
	60	112.0	94.3	82.0	96.1	114.3	94.8	83.0	97.0
	Mean	111.8	93.9	82.0	95.9	114.0	94.3	82.7	97.0
15	0	111.0	93.0	81.5	95.2	113.5	94.3	82.3	96.7
	30	112.0	93.8	82.5	96.1	114.0	94.0	82.5	96.8
	60	112.3	94.0	82.3	96.2	114.5	94.5	82.5	97.2
	Mean	111.8	93.6	82.1	95.8	114.0	94.3	82.4	96.9
30	0	110.8	93.0	81.0	94.9	113.5	93.5	82.0	96.3
	30	111.8	93.3	82.8	95.9	114.0	93.5	82.5	96.7
	60	112.0	93.0	82.0	95.7	114.0	94.0	82.5	96.8
	Mean	111.5	93.1	81.9	95.5	113.8	93.7	82.3	96.6
Overall Mean for N-levels	0	111.1	93.2	81.3	95.2	113.6	93.9	82.3	96.6
	30	111.9	93.7	82.6	96.1	114.0	93.8	82.5	96.8
	60	112.1	93.8	82.1	96.0	114.3	94.4	82.7	97.1
Varieties mean		111.7	93.5	82.0		113.9	94.1	82.5	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.75	N.S.	0.57	N.S.	N.S.	N.S.	N.S.
1982	0.19	N.S.	0.22	N.S.	N.S.	N.S.	N.S.

3. Number of leaves/ plant

3.I- Effect of the varieties :

It is clear from the data of Table 4. that varieties differed significantly in the number of leaves per plant . Giza 1 produced more number of leaves / plant than the other two varieties (30.2 leaf). Mayak and Sorem 80 approximatly have similar numbers (26.2 and 25.7 leaf respectively) . The differences in the number of leaves per plant among varieties were found by Shabana (1974) and El-Mohandes (1979).

3.II- Effect of P-levels :

The number of leaves per plant was not influenced by phosphorus fertilization (Table 4).

3.III- Effect of N-levels :

Data in Table 4. indicate that N-fertilization significantly reduced the number of leaves per plant . Addition of 30 or 60 kg N/fed significantly reduced the number of leaves per plant by 1.5 and 1.6 leaf , respectively in 1981 , whereas in 1982 the reduction was 1.2 and 1.8 leaf , respectively . The differences between average number of leaves/plant were not significant when received 30 or 60 kg N/fed.

Table (4) : The average values of number of leaves/plant as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981 Varieties				1982 Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	30.1	26.2	25.7	27.3	31.8	28.0	26.9	28.8
	30	29.0	25.1	24.9	26.3	30.9	26.9	26.7	28.2
	60	29.2	24.7	24.5	26.1	29.1	26.2	26.3	27.2
	Mean	29.4	25.3	25.0	26.6	30.6	27.0	26.6	28.1
15	0	30.3	26.7	26.2	27.7	32.1	28.2	27.9	29.4
	30	28.8	24.9	24.5	26.1	30.8	27.1	26.0	28.0
	60	29.0	24.3	24.7	26.0	30.5	26.2	25.9	27.5
	Mean	29.3	25.3	25.1	26.6	31.1	27.1	26.6	28.3
30	0	30.0	27.2	26.6	27.9	32.0	28.0	26.8	28.9
	30	29.3	25.3	24.0	26.2	30.3	26.1	25.9	27.4
	60	29.2	25.1	23.8	26.0	30.3	25.5	25.6	27.1
	Mean	29.5	25.9	24.8	26.7	30.8	26.5	26.1	27.8
Overall Mean for N-levels	0	30.1	26.7	26.2	27.7	32.0	28.0	27.2	29.1
	30	29.0	25.1	24.5	26.2	30.7	26.7	26.2	27.9
	60	29.1	24.7	24.3	26.1	29.9	25.9	25.9	27.3
Varieties mean		29.4	25.5	25.0		30.9	26.9	26.4	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.82	N.S.	0.63	N.S.	N.S.	N.S.	N.S.
1982	0.89	N.S.	0.62	N.S.	N.S.	N.S.	N.S.

4 . Leaf area / plant

4.I- Effect of the varieties :

The varieties differed significantly in leaf area/plant in both seasons (Table 5) . It is clear from the results obtained that Giza 1 surpassed Mayak and Sorem 80 , whereas Mayak Surpassed Sorem 80 . The same trend was found in 1982 season . Varietal differences in leaf area per plant were reported by Ahmed (1977) , El-Mohandes (1979) , Abou-Khadrah et al.(1981) and Diab (1981).

4.II- Effect of P - levels :

Data in Table 5. show that phosphorus fertilizer significantly increased the leaf area/plant in both seasons . Addition of 15 kg P_2O_5 /fed. significantly increased the leaf area/plant by 2.2 and 5.1 dm^2 , further addition of 15 kg P_2O_5/fed. caused a significant increase of 2.4 and 7.1 dm^2 in 1981 and 1982 , respectively . Similar results were reported by Varghese et al.(1976).

$.III- Effect of N-levels :

The nitrogen fertilizer significantly increased leaf area/plant in both seasons (Table 5). The nitrogen fertilizer at rates of 30 and 60 kg/fed. increased leaf area per plant by 18.1 and 22.1 dm^2 in 1981 and by 18.8 and 23.1 dm^2 in 1982 . Nitrogen enhancement of leaf area may be due to its effect on chlorophyll synthesis in the plants . These

Table (5) : The average values of leaf area/plant dm^2 as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981 Varieties				1982 Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	43.2	34.9	30.1	36.0	40.3	32.8	29.8	34.3
	30	70.9	47.0	41.5	53.1	67.0	42.8	40.3	50.0
	60	73.2	49.0	44.8	55.7	71.8	46.5	44.3	54.2
	Mean	62.4	43.6	38.8	48.3	59.7	40.7	38.1	46.1
15	0	44.4	35.2	31.4	37.0	43.5	33.3	31.0	35.9
	30	73.8	49.6	42.3	55.2	81.8	44.5	42.8	56.3
	60	77.4	53.8	47.1	59.4	83.3	54.0	46.5	61.3
	Mean	65.2	46.2	40.3	50.5	69.5	43.9	40.1	51.2
30	0	43.6	35.1	30.7	36.5	48.8	35.3	31.3	38.4
	30	74.1	49.2	43.0	55.4	79.0	53.5	43.5	58.7
	60	76.1	55.5	49.0	60.2	82.3	56.0	49.0	62.4
	Mean	64.6	46.6	40.9	50.7	70.0	48.3	41.3	53.2
Overall Mean for N-levels	0	43.7	35.0	30.7	36.5	44.2	33.8	30.7	36.2
	30	72.9	48.6	42.2	54.6	75.9	46.9	42.2	55.0
	60	75.6	52.8	47.0	58.4	79.1	52.2	46.6	59.3
Varieties mean		64.1	45.5	40.0		66.4	44.3	39.8	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.93	1.01	1.25	N.S.	2.16	N.S.	N.S.
1982	2.90	1.61	1.70	2.79	2.95	N.S.	N.S.

5. Stem diameter

5.I - Effect of the varieties :

The varieties differed significantly in stem diameter in both seasons (Table 6). It is clear that Giza 1 had a thicker stem than both varieties . The thiner varieties were Sorem 80 in 1981 and Mayak in 1982. Such varietal differences in stem diameter were reported by several Plant Scintests among them Shabana (1974), Haikal (1976) , El-Mohandes (1979) , Attia (1980) , El-Ahmer et al.(1980), Abou-Khadrah et al.(1981) and Diab (1981) .

5.II- Effect of P-levels :

The stem diameter did not response to phosphorus fertilization (Table 6) , this might be due to the high percent of available soil phosphorus in the soil (Table 1). Diab(1981) and Soliman et al. (1981) found similar results .

%.III- Effect of N-levels :

The data in Table 6. show that nitrogen application caused a significant increase in the stem diameter in both seasons . Application of 30 kg N/fed increased the stem diameter by 18.9 % and 59.0 % in 1981 and 1982 , respectively . Addition more 30 kg N/fed over the first 30 kg N/fed resulted in increasing stem diameter by 7.0% and 11.9 % in 1981 and 1982 seasons , respectively . The stimulating effect of nitrogen fertilizer on stem diameter was not the same

in the two seasons as its stimulation was not pronounced in the second season . This could be attributed to higher available of nitrogen in the experimental site in 1981 season (Table 1). These results are in agreement with those obtained by Massey (1971) , Ahmed(1977), Shabana (1978) , Daulay and Singh (1980) and El-Ahmer et al.(1980).

%.IV- Effect of the interaction :

Data in Table 6 show that the stem diameter was significantly affected by phosphorus x nitrogen interaction in both seasons. The thickest stem was recorded for applying 30 kg P_2O_5 + 60 kg N/fed. in 1981 season , while in 1982 for applying 15 kg P_2O_5 + 60 kg N/fed. The interactions of V x P , V x N and V x P x N were not significant.

6. Plant height

6.I- Effect of the varieties :

Varieties differed significantly in plant height in both seasons (Table 7) . Giza 1 had taller plants followed by Mayak and Sorem 80. The averages of plant height were 207.6 and 188.6 cm for Giza 1 , 174.7 and 144.1 cm for Mayak and 149.1 and 108.9 cm for Sorem 80 in 1981 and 1982 seasons , respectively . The results mentioned above as it was expected showed that Giza 1 is a tall variety and Mayak is and intermediate type, whereas Sorem 80 is a short one . Differences in plant height among varieties were reported by Shabana (1974) , Haikal (1976) , Ahmed (1977), El-Ahmer et al.(1980) and Abou-Khadrah et al .(1981).

6.II- Effect of P-levels :

Data presented in Table 7. indicate that phosphorus application significantly increased the plant height in both seasons. Addition of 15 and 30 kg P_2O_5 /fed. increased the plant height by 4.7 and 10.7 cm in 1981 , whereas in 1982 the increases were 9.7 and 10.9cm respectively. The increase in plant height by phosphorus application might be due to the effect of phosphorus on nitrogen metabolism. Diab(1981) found that P fertilizer increased plant height , while El-Ahmer et al.(1980) found that phosphorus fertilization had no significant effect on plant height, the disagreement between the results could be attributed to the differences in the environmental conditions .

6.III- Effect of N-levels :

Data in Table 7 indicate that the plant height was significantly increased by N- application in both seasons . Application of 30 and 60 kg N/fed. increased the plant height by 12.2 and 19.3% in 1981 and 17.3 and 21.5 % in 1982 . These results are in parallel with those reported by Ahmed (1977), Shabana (1978), El-Mohandes (1979) and El-Ahmer et al.(1980).

6.IV- Effect of the interaction :

The interaction between varieties and nitrogen was significant in both seasons (Table 7). Application of nitrogen fertilizer had desirable effect on plant height for all varieties, but Mayak was the most responsable variety in 1981 and Sorem 80 in 1982. Significant interactions between phosphorus and nitrogen were recorded in both seasons (Table 7). The tallest plants were recorded for applying 30 kg P_2O_5 and 60 kg N/fed. in both seasons . The shortest plants were recorded for the control (0 P_2O_5 and 0 N) . The other interactions in the experiments (V x P and V x P x N) were not significant .

Table (8) : The average values of head diameter, cm. as affected by varieties, P and N fertilization in 1981 and 1982 seasons .

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	15.0	13.3	13.3	13.8	11.8	9.5	10.5	10.6
	30	16.8	15.5	15.8	16.0	17.3	13.3	14.8	15.1
	60	17.3	16.0	17.3	16.8	17.5	13.5	15.5	15.5
	Mean	16.3	14.9	15.4	15.6	15.5	12.1	13.6	13.7
15	0	14.0	13.0	12.5	13.2	12.0	10.0	10.8	10.9
	30	18.8	16.8	17.5	17.7	19.0	16.0	17.5	17.5
	60	19.5	17.8	18.3	18.5	19.8	17.0	18.0	18.3
	Mean	17.4	15.8	16.1	16.4	16.9	14.3	15.4	15.6
30	0	13.8	12.5	12.0	12.8	11.3	9.0	10.0	10.1
	30	18.8	16.5	17.3	17.5	19.0	15.0	17.5	17.2
	60	20.0	18.3	18.3	18.8	20.8	17.8	19.0	19.2
	Mean	17.5	15.8	15.8	16.4	17.0	13.9	15.5	15.5
Overall Mean for N-levels	0	14.3	12.9	12.6	13.3	11.7	9.5	10.4	10.5
	30	18.1	16.3	16.8	17.1	18.4	14.8	16.6	16.6
	60	18.9	17.3	17.9	18.1	19.3	16.1	17.5	17.6
Varieties mean		17.1	15.5	15.8		16.5	13.4	14.8	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.58	0.40	0.49	N.S.	N.S.	0.84	N.S.
1982	0.45	0.31	0.27	N.S.	0.46	0.46	N.S.

8. 100-seed weight

8.I- Effect of the varieties :

The results in Table 9. indicate that Giza 1 and Sorem 80 surpassed Mayak in the seed weight. The differences between Giza 1 and Sorem 80 in the seed weight were not significant in both seasons . The heaviest 100-seed weight was (6.8 g) , recorded for Sorem 80 and Giza 1 in 1981, whereas it was (6.6 g) for Giza 1 in 1982. Likewise Haikal (1976) , Ahmed (1977), El-Mohandes (1979), Attia (1980), and El-Ahmer et al. (1980) found variation in seed weight among different genotypes.

8.II- Effect of P-levels :

The phosphorus fertilizer had no significant effect on 100-seed weight in both seasons (Table 9). This could be due to the available phosphorus in the experimental sites was sufficient for seed filling . Other plant sientest came to the same findings Monotti (1975), El-Ahmer et al(1980) Singhi and Pacheria (1981) and Soliman et al.(1981) . However Diab(1981) found a significant increase in the weight of 100-seed by phosphorus application . This could be attributed to the differences in the environmental conditions such as the temperature and the humidity during the period of seed filling .

8.III- Effect of N-levels :

Data in Table 9. showed that nitrogen fertilizer significantly increased 100-seed weight in both seasons. The highest seed weight was obtained by applying 60 kg N/fed. in both seasons . The difference between applying 30 kg N/fed. and 60 kg N/fed. was significant in 1982, whereas in 1981 it did not reach the level of significance . It was observed that the

average of two seasons , the nitrogen fertilizer resulted in increasing the 100-seed weight by 27.4 % and 31.1% when received 30 and 60 kg N/fed, respectively. These increases may be due to the increase in the plant photosynthetic area . Similar results were found by Massey (1971) , Morris (1975) , Nur (1975) , Ahmed (1977), Shabana (1978), El-Mohandes (1979 and 1984) , El-Ahmer et al.(1980), Jadhav and Jadhav (1980) and Diab (1981) . Whereas Monotti (1975) reported that N fertilizer did not affect the 100-seed weight . These results disagree with the results of the present investigation probably due to the different genotypes used or the difference in the environmental conditions such as soil fertility and the temperature and the humidity during the period of seed filling .

8. IV- Effect of the interaction :

Data in Table 9. show that 100-seed weight was significantly affected by phosphorus x nitrogen interaction in 1981 season . The highest 100-seed weight was recorded for applying 30 kg P_2O_5 and 60 kg N/fed. Whereas the interactions between varieties x P and V x N as well as V x P x N were not significant .

Table (9) : The average values of 100-seed weight g. as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	6.0	5.6	6.1	5.9	5.5	4.9	5.4	5.3
	30	7.2	6.8	7.1	7.0	7.0	5.9	6.8	6.6
	60	7.3	6.9	7.4	7.2	7.2	6.3	7.1	6.9
	Mean	6.9	6.4	6.8	6.7	6.6	5.7	6.4	6.2
15	0	5.9	5.3	5.9	5.7	5.3	4.8	5.3	5.1
	30	7.3	6.9	7.2	7.1	7.4	6.0	7.0	6.8
	60	7.3	6.9	7.3	7.2	7.4	6.4	7.5	7.1
	Mean	6.8	6.3	6.8	6.7	6.7	5.7	6.6	6.3
30	0	5.6	5.5	5.8	5.6	5.2	4.7	5.3	5.1
	30	7.3	6.8	7.3	7.1	7.3	6.2	7.1	6.9
	60	7.4	6.9	7.6	7.3	7.4	6.5	7.2	7.1
	Mean	6.8	6.4	6.9	6.7	6.7	5.8	6.5	6.3
Overall Mean for N-levels	0	5.8	5.5	5.9	5.7	5.3	4.8	5.3	5.1
	30	7.2	6.8	7.2	7.1	7.2	6.0	7.0	6.7
	60	7.3	6.9	7.4	7.2	7.4	6.4	7.3	7.0
Varieties mean		6.8	6.4	6.8		6.6	5.7	6.5	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxV	VxPxN
1981	0.29	N.S.	0.12	N.S.	N.S.	0.21	N.S.
1982	0.17	N.S.	0.29	N.S.	N.S.	N.S.	N.S.

9. Seed yield per plant

9. I- Effect of the varieties :

The varieties differed significantly in seed yield per head (Table 10) . The highest seed yield per head was recorded for Giza 1 in both seasons . The average of two seasons for seed yield per head of Giza 1 was higher than those obtained from Mayak and Sorem 80 by 17.7 and 26.1%, respectively . This result because Giza 1 variety exceeds the other varieties in sourse capasity , larger heads , heaviest 100-seed weight and may be produced more seeds/head. Mayak significantly exceeds Sorem 80 in seed yield per head by 7 % for the average of the two seasons . This could be due to its higher fertility which led to production of less empty seeds/head , as Sorem 80 surpassed Mayak in 100-seed weight and head diameter . Similar results were reported by Shabana (1974) , Haikal (1970), Ahmed (1977), El-Mohandes (1979), El-Ahmer et al.(1980), Abou-Khadrah et al .(1981) and Diab (1981).

9.II- Effect of P-levels :

The effect of P-fertilizer on seed yield per head was insignificant in both seasons (Table 10) . These results are in harmony with those obtained by Monotti (1975) and El-Ahmer et al.(1980).

Whereas Diab (1981) reported that phosphorus fertilizer increased seed yield per head . The disagreement between the results may be due to the difference in the soil fertility of the two sites of the experiments .

9.III- Effect of N- levels :

Nitrogen fertilizer significantly resulted in increasing the weight of seeds per head in both seasons (Table 10). Applyied 30 kg N/fed.

increased seed yield per head by 34.8 % and 49.8 % in 1981 and 1982 seasons respectively , further application of 30 kg N/fed. increased seed yield per head by 4.8% and 5% in 1981 and 1982 seasons, respectively . The stimulation effect of nitrogen fertilizer on the seed yield per head may be due to its effect on increasing the sourse capasity which increased the leaf area , stem diameter and this in turn increased metabolic components synthesices in the plant , consequently increased the amount of metabolites translocated to the head. Besides nitrogen increased grain filling period . Adding 30 or 60 kg N/fed caused an increase in the head diammeter and seed weight and this might lead to increase the seed yield per plant . These results confirm with those obtained by Massey (1971) , Ahmed (1977) , El-Mohandes (1979 and 1984) , El-Ahmer et al. (1980) , Diab (1981) and Nour El-Din et al.(1983) . Whereas Monotti (1975) and Moursi et al (1983) stated that nitrogen fertilizer did not affect seed yield/head . The dissimilarities among the results may be due to the different germoplasm used and to or the environmental conditions .

9.IV- Effect of the interaction :

The seed yield per head was influenced by the interaction between varieties x nitrogen in 1982. (Table 10) . The highest seed yield/ head was obtained from Giza 1 when received 60 kg N/fed.

The interactions between varieties x P and P x N as well as V x P x N had no significant effect on seed yield per head .

Table (10) : The average values of seed yield/plant, g. as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981 Varieties				1982 Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	44.0	39.0	37.0	40.0	37.3	31.0	27.3	31.8
	30	57.8	50.5	48.8	52.3	54.5	44.5	41.0	46.7
	60	59.8	53.5	51.5	54.9	57.0	46.3	42.8	48.7
	Mean	53.8	47.7	45.8	49.1	49.6	40.6	37.0	42.4
15	0	43.3	38.5	36.5	39.4	37.5	30.5	29.5	32.5
	30	58.0	51.5	48.0	52.5	55.5	45.5	42.0	47.7
	60	59.0	54.5	53.5	55.7	58.5	48.5	43.5	50.2
	Mean	53.4	48.2	46.0	49.2	50.5	41.5	38.3	43.4
30	0	42.5	37.8	34.8	38.3	36.3	29.3	26.0	30.5
	30	59.5	53.0	49.0	53.8	57.3	45.0	41.0	47.8
	60	60.8	54.0	52.3	55.7	59.5	47.0	44.5	50.3
	Mean	54.3	48.3	45.3	49.3	51.0	40.4	37.2	42.9
Overall Mean for N-levels	0	43.3	38.4	36.1	39.3	37.0	30.3	27.6	31.6
	30	58.4	51.7	48.6	52.9	55.6	45.0	41.3	47.4
	60	59.8	54.0	52.4	55.4	58.3	47.3	43.6	49.7
Varieties mean		53.8	48.0	45.7		50.4	40.8	37.5	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	1.06	N.S.	1.24	N.S.	N.S.	N.S.	N.S.
1982	2.34	N.S.	1.05	N.S.	1.82	N.S.	N.S.

10. Seed husk percent

10.I- Effect of the varieties :

Data given in Table 11. showed that the differences among the averages of the seed husk percentwere significant in both seasons. The highest seed husk percent was recorded for Giza 1, which surpassed the other two varieties by 57.9 % and 53.7 % , for Mayak and Sorem 80 varieties , respectively . These results agreed with those reported by Shabana (1974) , Haikal (1976), Ahmed (1977), El-Mohandes (1979) , Attia (1980) , Abou-Khadrah et al.(1981) and Diab (1981).

1-.II- Effect of P-levels :

Phosphorus application had no significant effect on seed husk percent in two seasons(Table 11). The averages of husk percent were 30.9% and 31.1% in 1981 and 31.3% and 31.2% in 1982 when received 15 and 30 kg P_2O_5/fed., respectively as compared with 31.0% and 31.4 % for control treatnent in both seasons . These results are in agreement with those obtained by Monotti (1975) and Singhi and Pacheria (1981).

10.III- Effect of N-levels :

The nitrogen fertilizer significantly resulted in increasing the seed husk percent during the two seasons (Table 11). As over all the averages of the character under study in the two seasons , the nitrogen treatments caused an increase in the seed husk percent by 0.7 % and 2.0% when received the rates of 30 and 60 kg N/fed. Similar results

were obtained by Ahmed (1977). On the other hand El-Mohandes (1979) reported that seed husk percent was not affected by N application . The disagree with the present results might be due to the different genotypes used and or to the environmental conditions

10.IV- Effect of the interactions:

There were no signifucant interaction effects between the studied factors on seed husk percent (Table 11) . The lowest average value of the seed husk percent was 25.7 % recorded for the variety Mayak when received 0 kg P_2O_5 and 30 kg N/fed or 30 kg P_2O_5 and 0 kg N/fed . The highest average value of the seed husk percent was 41.6 % recorded for Giza 1 when received 0 kg P_2O_5 and 60 kg N/fed.

Table (11) : The average values of seed husk percent as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	40.5	25.8	26.2	30.9	41.4	25.5	26.3	31.1
	30	41.0	25.7	26.1	30.9	40.5	26.2	27.4	31.4
	60	41.6	26.1	26.2	31.3	41.7	26.5	27.5	31.9
	Mean	41.0	25.9	26.2	31.0	41.2	26.1	27.1	31.4
15	0	40.4	25.9	26.3	30.9	40.7	25.5	26.2	30.8
	30	40.7	25.8	26.0	30.8	40.4	26.2	27.3	31.3
	60	41.0	25.9	26.3	31.1	41.2	26.5	27.7	31.8
	Mean	40.7	25.8	26.2	30.9	40.8	26.0	27.1	31.3
30	0	40.7	25.7	26.4	30.9	41.0	25.3	26.2	30.8
	30	41.1	25.9	26.2	31.0	40.7	26.0	26.9	31.2
	60	41.1	26.3	26.3	31.2	41.1	26.2	28.0	31.7
	Mean	41.0	26.0	26.3	31.1	40.9	25.8	27.0	31.2
Overall Mean for N-levels	0	40.6	25.8	26.3	30.9	41.0	25.4	26.2	30.9
	30	40.9	25.8	26.1	30.9	40.5	26.1	27.2	31.3
	60	41.2	26.1	26.3	31.2	41.3	26.4	27.7	31.8
Varieties mean		40.9	25.9	26.2		41.0	26.0	27.0	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.21	N.S.	0.25	N.S.	N.S.	N.S.	N.S.
1982	0.31	N.S.	0.43	N.S.	N.S.	N.S.	N.S.

11. Seed oil content

11.I- Effect of the varieties :

The seed oil content was significantly affected due to the varieties in the two seasons (Table 12). The highest seed oil content was recorded for Sorem 80 followed by Mayak but the difference between the average of Sorem 80 and Mayak was significant in 1981 only . Marked differences in seed oil content between sunflower varieties were also reported by Haikal (1976), Ahmed (1977), El-Mohandes (1979) , Attia (1980) , El-Ahmer et al. (1980) , Abou -Khadrah et al.(1981) and Diab (1981).

11.II- Effect of P-levels :

The phosphorus fertilizer tended to increase the seed oil content when applied at rates of 15 or 30 kg P_2O_5/fed. as compared with the control (Table 12). The differences in seed oil content between applied 15 and 30 kg P_2O_5/fed. were not significant . These results are in complete agreement with those obtained by Belkin and Karastan (1968), Dimancea and Budoi (1970), Varennikova (1972) , Khattak et al. (1973), Vicentini and Anelli (1973), Tomov (1976) and Blamey and Chapman (1981) . However Girase et al.(1975), Diab (1981) and Baraberis et al. (1982), reported that P fertilizer had no effect on sunflower oil percentage . The dissimilarites between the results may be due to the different germoplasm used and or to the environmental conditions of the experimental sites such as the soil fertility, the temperature and the humidity during the period of seed filling and oil formation .

11.III- Effect of N-levels :

The data presented in Table 12 indicate that the seed oil content significantly decreased by applying 30 or 60 kg N/fed. as compared with the control, whereas the difference between 30 and 60 kg N/fed. was not significant. In 1982 the decrease in the oil percentage as affected by nitrogen fertilizer was significant when received 60 kg N/fed. and not significant with 30 kg N/fed. as compared with the control . The decrease in the seed oil content by nitrogen fertilizer may be due to the increase in seed protein content at the expense of oil concentration . Similar results reported by Belkin and Karastan (1968), Singh et al.(1973), Vicentini and Anelli (1973) , Zubriski and Zimmerman (1974) , Girase et al(1975), Monotti (1975), Tomov (1976)b,Ahmed (1977), Blamey and Chapman (1981) , Mohammad and Rao (1981) and El-Mohandes (1984). Whereas Nur(1975), Shabana (1978) , El-Ahmer et al. (1980), Diab (1981) and Barberis et al . (1982) reported that N-fertilizer had no significant effect on seed oil content of sunflower . The disagreement between the results may be due to the different genotypes used or the environmenta conditions .

11.IV- Effect of the interaction :

There was no significant interaction between the studied factors on the seed oil content (Table 12). The highest oil percentage was recorded for the variety Sorem 80 when received 30 kg P_2O_5 + 0 kg N/fed. in 1981 and 30 kg P_2O_5 + 30 kg N/fed in 1982 . The lowest oil percentage was recorded for Giza 1 when received 15 kg P_2O_5 + 60 kg N/fed. in 1981 and 30 kg P_2O_5 + 60 kg N/fed. in 1982 .

Table (12) : The average values of seed oil content as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	25.6	39.7	41.0	35.4	25.2	38.0	40.0	34.4
	30	25.3	39.1	40.0	34.8	25.1	37.4	39.1	33.8
	60	25.2	38.8	39.8	34.6	24.8	36.7	38.9	33.5
	Mean	25.4	39.2	40.3	34.9	25.0	37.4	39.3	33.9
15	0	25.7	40.1	41.2	35.6	25.9	39.3	40.1	35.1
	30	25.4	39.9	41.0	35.4	24.9	39.1	40.3	34.8
	60	25.1	39.4	40.4	35.0	24.9	38.8	39.9	34.5
	Mean	25.4	39.8	40.8	35.4	25.2	39.0	40.1	34.8
30	0	25.8	40.0	41.3	35.7	25.6	39.8	40.4	35.3
	30	25.7	39.8	40.7	35.4	24.8	39.5	41.2	35.2
	60	25.4	39.3	40.6	35.1	24.3	38.6	40.6	34.5
	Mean	25.6	39.7	40.9	35.4	24.9	39.3	40.7	35.0
Overall Mean for N-levels	0	25.7	39.9	41.1	35.6	25.6	39.0	40.2	34.9
	30	25.5	39.6	40.6	35.2	24.9	38.6	40.2	34.6
	60	25.2	39.2	40.3	34.9	24.6	38.0	39.8	34.2
Varieties mean		25.5	39.6	40.7		25.0	38.6	40.0	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	0.38	0.26	0.33	N.S.	N.S.	N.S.	N.S.
1982	0.87	0.77	0.42	N.S.	N.S.	N.S.	N.S.

12. Seed yield per feddan

12.I- Effect of the varieties :

The data illustrated in Table 13. show that the sunflower varieties significantly differed in the seed yield per feddan . Giza 1 produced the highest seed yield per feddan than Mayak and Sorem 80 in both seasons , whereas Mayak significantly surpassed Sorem 80 only in 1981 season . The superiority of Giza 1 over Mayak and Sorem 80 due to its high seed yield per plant . Differences between sunflower varieties in the seed yield were reported by many Plant Scientests among them Haikal (1976), Ahmed (1977), El-Mohandes (1979), Attia (1980), Abou-Khadrah et al.(1981) and Diab (1981).

12.II- Effect of P-levels :

The phosphorus fertilizer significantly increased the seed yield per feddan (Table 13). Addition of 15 kg P_2O_5/fed. resulted in increasing the seed yield by 9.14 and 5.3% in 1981 and 1982 seasons, respectively . Further application of 15 kg P_2O_5/fed. did not cause any significant increase over the first level of phosphorus applyied, but it reduced it significantly than applying 15 kg P_2O_5/fed. in 1981 season, whereas, the reduction was not significant in 1982 season . The reduction in seed yield by higher level of P may be due to the excess of P over the amount required by the crop and attributed to the hastening of the maturation processes and consequently reduction of vegetative growth(Russell, 1973). Similar results were reported by Belkin and Karastan (1968), Dimancea and Budoi (1970), Tsurkan (1972),

Singh et al. (1973), Singh and Kaushal (1975) , Blamey and Chapman (1981) , Tripathi and Kalra (1981), and Baraberis et al.(1982). Other investigators reported that P fertilizer did not affect seed yield of sunflower , Girase et al.(1975), Monotti (1975), Diab(1981) and Singhi and Pacheria (1981) .

12.III- Effect of N-levels :

The nitrogen fertilizer significantly increased the seed yield per feddan (Table 13). Applying 30 kg N/fed. significantly increased the seed yield by 47.9% and 45.4 % in 1981 and 1982 seasons, respectively. Adding more 30 kg N/fed. over the first 30 kg kgN/fed. caused significant increases by 8.3 % and 4.0 % in 1981 and 1982, respectively. The significant increase in the seed yield per feddan resulted from the increase in seed yield/head, head diameter and seed weight . The same results were obtained by many investigators, among them , Massey (1971), Zubriski and Zimmerman (1974), Ahmed(1977), Shabana (1978) , El-Mohandes (1979, 1984), Blamey and Chapman (1981) , Diab (1981) , Moursi et al.(1983) and Nour El-Din et al.(1983) who found that nitrogen fertilizer increased the seed yield of sunflower .

12.IV- Effect of the interaction :

The effect of interaction between varieties and nitrogen on the yield of seeds per feddan was significant in both seasons (Table 13). The highest seed yield was obtained from Giza 1 by applying 60 kg N/fed. The interaction effect between phosphorus and nitrogen fertilizer on the seed yield was significant . The highest seed yield was recorded by applying 15 kg P_2O_5 + 60 kg N/fed in 1981 and 30 kg P_2O_5 + 60 kg N/fed. in 1982 .

Table (13) : The average values of seed yield per feddan, kg. as affected by varieties, P and N fertilization in 1981 and 1982 seasons.

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	835	693	652	727	690	590	600	627
	30	1211	899	847	985	1051	719	701	824
	60	1252	963	903	1039	1103	759	735	866
	Mean	1099	852	801	917	948	689	679	772
15	0	824	658	630	704	700	602	522	608
	30	1243	1074	971	1096	1167	768	760	898
	60	1370	1181	1052	1201	1238	790	767	932
	Mean	1146	971	884	1000	1035	720	683	813
30	0	798	643	613	685	648	562	505	572
	30	1205	1006	932	1048	1176	773	762	904
	60	1326	1146	973	1148	1179	813	809	934
	Mean	1110	932	839	960	1001	716	692	803
Overall Mean for N-levels	0	819	665	631	705	679	584	543	602
	30	1220	993	917	1043	1131	753	741	875
	60	1316	1097	976	1130	1173	787	770	910
Varieties mean		1118	918	841		995	708	685	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	53.4	30.6	27.1	N.S.	47.3	47.3	N.S.
1982	34.1	25.4	34.1	N.S.	58.6	58.6	N.S.

13. Oil yield per feddan

13.I- Effect of the varieties :

The sunflower varieties significantly differed in their oil yield (Table 14). Mayak produced the highest oil yield followed by Sorem 80 and Giza 1 in 1981 , whereas in 1982 , the highest oil yield was recorded for Sorem 80 without significant increase than Mayak . The results indicate that varieties with high oil percent such Mayak and Sorem 80 gave more oil yield than Giza 1 which contained lower oil percent. The increase in seed yield in Giza 1 did not compensate for oil yield. We can drew from these results that Giza 1 can be used for cultivation in the area where sunflower seeds used directly for human consumption , while Mayak and Sorem 80 where the economic yield will use for oil production . Varietal differences in oil yield were reported by Haikal (1976), Ahmed (1977), El-Mohandes (1979), Abou-Khadrah et al. (1981) and Diab (1981).

13.II- Effect of P-levels :

The phosphorus application significantly increased the oil yield per feddan in both seasons (Table 14). Applying 15 kg P_2O_5 /fed. increased the oil yield by 10.3 % and 7.1 % in 1981 and 1982 seasons, respectively . The high rate of P fertilization slightly reduced the oil yield than that obtained from the lower level followed the same pattern as in the seed yield . Similar results were reported by Vicentini and Anelli (1973) , Tomov (1976) and Blamey and Chapman (1981) . Diab (1981) found that P fertilizer had no significant effect

on sunflower oil yield .. We can conclude that applying 15 kg P_2O_5/fed is more suitable to produce high oil yield .

13.III- Effect of N-levels :

The nitrogen application caused significant increases in the oil yield per feddan in both seasons (Table 14). The highest oil yield was obtained by applying 60 kg N/fed. The differences between the averages of oil yield/fed. which were obtained from the high and low N-levels were significant in one year out of two . As an average of the two growing seasons nitrogen fertilization increased the oil yield by 43.1 % and 50.2 % when received the rates of 30 and 60 kg/ fed., respectively . The increase in oil yield due to nitrogen fertilization resulted from the increase in seed yield . Similar results were reported by Zubriski and Zimmerman (1974) , Monotti (1975) , Tomov (1976) , Ahmed (1977), Curotti et al.(1977), Shabana (1978), El-Mohandes(1979 and 1984), Blamey and Chapman (1981) , Diab (1981) and Mohammad and Rao (1981) .

On contrary Vicentini and Anelli (1973) reported that sunflower oil yield decreased by N application .

13.IV- Effect of the interaction :

The interaction effect between varieties and nitrogen fertilizer was significant only in 1982 season (Table 14). The highest oil yield was obtained from Sorem 80, fertilized by 60 kg N/fed.

The interaction effect between P and N on the oil yield was significant in the two seasons , followed the same pattern as in seed yield, the highest oil yield was obtained by applying 15 kg P_2O_5 + 60 kg N/fed in 1981 while in the second season by applying 30 kg P_2O_5 + 60 kg N/fed.

Table (14) : The avarage values of oil yield, kg/fed. as affected by varieties P and N fertilization in 1981 and 1982 seasons .

Kg P_2O_5/ fed.	Kg N/ fed.	1981				1982			
		Varieties				Varieties			
		Giza 1	Mayak	Sorem 80	Mean	Giza 1	Mayak	Sorem 80	Mean
0	0	214	275	270	253	174	225	240	213
	30	307	352	339	332	262	269	274	268
	60	315	374	360	350	272	278	287	279
	Mean	279	333	323	312	236	257	267	253
15	0	212	264	259	245	182	237	209	209
	30	315	429	393	379	291	300	306	299
	60	344	453	425	407	308	306	306	307
	Mean	290	382	359	344	260	281	274	271
30	0	206	257	252	239	166	224	204	198
	30	309	400	380	363	291	305	315	304
	60	338	451	395	395	286	311	329	309
	Mean	285	369	342	332	248	280	283	270
Overall Mean for N-levels	0	211	266	261	246	174	229	218	207
	30	311	394	370	358	281	291	298	290
	60	332	426	394	384	289	298	307	298
Varieties mean		285	362	342		248	273	274	

L.S.D. 0.05	Varieties	P-levels	N-levels	VxP	VxN	PxN	VxPxN
1981	8.4	11.7	14.2	N.S.	N.S.	24.6	N.S.
1982	11.6	9.2	9.1	N.S.	15.7	15.7	N.S.

SUMMARY

Two experiments were conducted in the new reclaimed soil of Noubaria Agricultural Research Station, Noubaria , Mariot , Behera Governorate during 1981 and 1982 seasons . The aim of these experiments was to find out the optimum doses of phosphorus and nitrogen fertilizers on yield performance of three sunflower (Helianthus annuus L.) varieties , i.e. Giza 1 , Mayak and Sorem 80 .

The experimental layout was split-split-plot design with four replications where the varieties were asigned in the main plots , followed by phosphorus fertilizer with three levels, i.e. 0 , 15 and 30 kg P_2O_5 / fed., while nitrogen fertilizer were arranged the sub sub plots with three levels of 0 , 30 and 60 kg N/fed. The measured characters were number of days to 50 % flowering , number of days to physiological maturity , number of leaves per plant , leaf area per plant, stem diameter , plant height , head diameter , 100-seed weight, seed yield per head , seed husk percentage , seed oil content, seed yield per feddan and oil yield per feddan . The results obtained will be summerized as follows :

I - Effect of the varieties :

1. Sorem 80 was the earlist variety to reach flowering , whereas Giza 1 was the latest one and Mayak was intermediate.

2. Sorem 80 was the earliest variety to reach physiological maturity followed by Mayak, while Giza 1 was the latest one.
3. Giza 1 had more number of leaves than Mayak and Sorem 80 .
4. Leaf area per plant of Giza 1 variety was significantly exceeds that of Mayak and Sorem 80 , while that of Mayak exceeds of Sorem 80 .
5. The thickest variety was Giza 1 followed by Mayak and the thinest one was Sorem 80 .
6. Giza 1 variety was significantly taller than Mayak and Sorem 80 and Mayak had taller plants than Sorem 80 .
7. Giza 1 significantly exceeds both Mayak and Sorem 80 in head diameter , Sorem 80 produced larger heads than Mayak in both seasons but the difference was significant only in 1982 .
8. Generally Giza 1 had the heaviest 100-seed weight followed closely without significant difference by Sorem 80 and both exceeds that of Mayak .
9. Giza 1 variety significantly exceeds Mayak and Sorem 80 in seed yield per head . Whereas seed yield per head of Mayak variety significantly exceeds that of Sorem 80 .
10. Varieties differed significantly in seed husk percent where Giza 1 had the highest percent followed by Mayak and the lowest percent was for Sorem 80 .
11. Sorem 80 had the highest oil percent followed closely by Mayak whereas Giza 1 had low oil percent .
12. Seed yield per feddan varied considerably among the used varieties. Giza 1 produced the highest seed yield and significantly exceeds

the other two varieties . Mayak significantly produced more seed yield than Sorem 80 .

13. Oil yield per feddan was highest for Sorem 80 and lowest for Giza 1 while it was intermediate for Mayak .

II- Effect of phosphorus fertilizer :

1 - Phosphorus fertilizer had no significant influence on number of days from planting to flowering , number of days from planting to physiological maturity , number of leaves per plant, stem diameter , 100-seed weight , seed yield per plant and seed husk percent for the varieties under study in both seasons.

2 - Phosphorus fertilizer significantly increased the leaf area / plant whereas the difference between applying 15 and 30 kg P_2O_5 /fed. was significant only in 1982, season .

3 - Phosphorus fertilizer significantly increased the plant height, the difference between applyind 15 and 30 kg P_2O_5/fed was significant only in 1981 season .

4 - Phosphorus fertilizer significantly increased head diameter and seed oil content, with non significant difference between 15 kg P_2O_5 /fed and 30 kg P_2O_5/fed levels in both seasons .

5 - Phosphorus fertilizer at 15 kg P_2O_5/fed. significantly increased seed yield per feddan and oil yield per feddan , whereas applied 30 kg P_2O_5/fed reduced it than the 15 kg P_2O_5 level significantly in 1981 season and the reduction did not reach the level of significance in 1982 season .

III- Effect of nitrogen fertilizer :

1 - Nitrogen fertilizer had no influence on the number of days from planting to flowering .

2 - Maturation significantly was retarded by nitrogen fertilization.

3 - Nitrogen fertilizer significantly decreased the number of leaves per plant .

4 - Leaf area/plant , stem diameter , plant height , head diameter, seed yield/plant and seed yield per feddan significantly increased with increasing nitrogen fertilizer rates .

5 - Nitrogen fertilizer at 30 kg N/fed. significantly increased 100-seed weight , wheras applied 60 kg N/fed. increased it more than the 30 kg N/fed. level significantly only in 1982 season .

6 - Nitrogen fertilizer at 30 kg N/fed. had no significant effect on seed husk percent , whereas applied 60 kg N/fed. significantly increased it , in both seasons .

7 - Nitrogen fertilizer at 30 kg N/fed significantly decreased seed oil content only in 1981 season , whereas applied 60 kg N/fed. decreased it significantly , in both seasons .

8 - Nitrogen fertilizer significantly increased oil yield per feddan, whereas the difference between 30 kg N/fed and 60 kg N/fed. levels was significant only in 1981 season .

IV- Effect of the interaction :

1 - The interaction between all the studied factors had no significant effect on number of days to flowering , No. of days to physiological maturity , No. of leaves/plant , seed husk percent and seed oil content .