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EFFECT OF DIFFERENT LEVELS OF NITROGEN AND POTASSIUM ON SUNFLOWER PRODUCTION

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Abstract

Two field trials were carried out at Giza Governorate during 1990 and 1991 seasons to study the effect of four levels of nitrogen i. e. 30, 45, 60, and 75kg N/fed. and three levels of potassium, i.e. 0, 24 and 48kg K_2O/fed . on sunflower yield and its components as well as oil yield. Results indicated that nitrogen levels significantly increased plant height, head diameter, seed yield/plant, 100-seed weight and seed yield /feddan as well as oil yield/feddan, while seed oil content was depressed. Application of 60 kg N/fed. produced the highest significant seed and oil yields /fed.

Seed and oil yield/ fed. as well as seed oil content were increased by adding potassium levels, and 48kg K_2O/fed produced the highest yield of seed and oil/fed. However , no signifcant difference was found in most cases between 24 and 48 kg K_2O/fed.

INTRODUCTION

At present , oil crops production in Egypt falls short of meeting domestic requirements . Sunflower is one of the our domestic requirements . Sunflower is one of the most important edible oil crops in the world. Great attention has been given to sunflower in Egypt due to its high content of oil with a high proportion of polyunsaturated fatty acids.

Many growth characters of sunflower were found to be affected by N and K

fertilization. Plant hight and head diameter were significantly increased by nitrogen application (El-Emam 1984, El-Ahmer *et al.* 1987 a, Shin 1988). Nitrogen fertilization also signifcantly increased seed and oil yields/ feddan, 100-seed weight and seed yield /plant (Nour El-Din *et al.* 1983, Shin 1988) Significant increase in seed oil content of sunflower was reported by Ahmed (1977) and Nour El-Din *et al.* (1983) due to nitrogen fertilization , while Moursi *et al.* (1983) and El-Ahmer *et al.* (1978 a and b) found that nitrogen application reduced oil content.

Regarding potassium effect on sunflower, it was found that seed yield, head diameter , plant high and number of seeds per head were increased by postassium application, while, seed oil content wa not affected (Tripath and Kalra, 1981, Shin, 1988). However, Al-Ahmer *et al.* (1987 b) reported that potassium fertilizer had no significant effect on head and stem diameters, but 100- seed weigh, seed yield/ fed., oil content and oil yield/fed. tended to increase due to potassium fertilization of sunflower.

The aim of the present investigation is to study the effect of nitrogen and potassium fertilization on some growth characterisitcs, yield and seed oil of sunflower grown at Giza Governorate.

MATERIALS AND METHODS

Two field experiments were conducted at Ouseem (Giza Governorate) during 1990 and 1991 seasons to study the effect of four nitrogen levels i.e. 30, 45, 60 and 75 kg, N/fed. and three potassium levels i.e., 0, 24 and 48kg K_2O/fed. On yield and its components of sunflower variety Giza 1 which was grown on June 8 and June 10 in the two seasons, respectively . A split plot design with four replications was used with the potassium levels as main plots and nitrogen rates were added to the sub plots. The sub-plot area was 21 m2, 5 ridges with 5m long and 60 cm apart. The seeds were planted in hills spaced 40 cm apart within the row. Before sowing , 15kg P_2O_5/fed. as superphosphate was applied. Potassium sulphate (48% K_2O) was applied at sowing , while , nitrogen in the form of urea (46% N) was applied in two equal doses , the first after thinning and before the first irrigation and the second before the second irrigation. Thinning took place after 24 days from planting to se-

cure one plant per hill. All agronomic practices were applied at the proper stages of development . Data of mechanical and chemical analysis of the soil of experimental field were carried out according to the methods described by Piper (1950) and Jakson (1967) , as presented in Table 1. Statistical analysis was acheived according to Snedecor and Cochran (1967) and treatments means were compared using L.S.D. at 5% level.

RESULTS AND DISCUSSION

a . Soil analysis

Data presented in Table 1 showed that the texture of the soil was clay loam. The soils were slightly alkaline with pH 8.0 and 7.9 for the two sites. Total soluble salts was low. The two sites were poor in organic matter and consequently n nitro-

Table 1. Mechanical and chemical analysis of the soil of experimental sites in 1990 and 1991 seasons.

Determination		1990	1991
Coarse sand	%	5.10	5.30
Fine sand	%	30.21	31.15
Silt	%	30.52	30.92
Clay	%	31.40	29.75
Total soluble salts	%	0.21	0.19
Organic matter	%	2.10	2.40
Total soluble N	ppm	35.00	42.00
Available P (Olsen)	ppm	6.30	8.20
K (ammonium acetat)	ppm	425.00	375.00
pH (1:25)		8.00	7.90

gen content. The available phosphorus as well as potassium in the soil were moderate.

b. Effect of nitrogen fertilizer

Data in Tables 2 and 3 show that nitrogen levels signifcantly increased plant height, head diameter, seed yield/plant , 100-seed weight, seed yield/fed. and oil yield /fed., in both seasons. Application of 60kg N/fed. produced the highest significant yield of seed and oil/ fed. However 75 kg N/fed. induced insignificant increase compared with 60 kg N/fed. The increase in growth characters by nitrogen fertilization may be due to the stiumlating effect of nitrogen on the metabolism process which in turn help in producing greater crop. These findings are similar with those obtained by El-Ahmer *et al.* (1980, 1987a and 1987b), Nour El-Din *et al.* (1983), El-Emam (1984) and Shin (1988).

Results of Tables 2 and 3 show that oil content was significantly decreased by increasing N level in both seasons. Adding 75kg N/fed. produced the lowest seed oil content. These results agreed with those obtained by Moursi *et al.* (1983), El-Ahmer *et al.* (1987a and 1987b) and Shin (1988).

c. Effect of potassium fertilizer

Results in Tables 2 and 3 illustrate that potassium fertilization had no significant effect on plant height and head diameter in both seasons. Meanwhile , seed yield/plant and 100-seed weight were increased by adding 48 kg K_2/ fed. in the first season only. Similar results were found by El-Ahmer *et al.* (1987b) . On the other hand, seed and oil yield / feddan as well as seed oil content were increased by adding potassium fertilizer to sunflower. Adding 24kg K_2O/fed. produced the highest significant yield of seed and oil while , 48 kg K_2O/fed. produced the highest seed oil content. Similar results were found by Tripath and Kalra (1981) , El-Ahmer, *et al.* 1987b) and Shin (1988).

The effect of the interaction between nitrogen and potassium levels under study was not significant with respect to the above mentioned characters in the two seasons.

In conclusion in the light of the results obtained from this study under similar conditions-60kg K_2O/fed. could be recommended for obtain good seed yield of sunflower as well as good oil yield.

Table 2. Effect of nitrogen and potassium levels on sunflower in 1991 season.

\Fertilizer treatments (kg/fed.)		Plant height (cm)	Head diam. (cm)	Seed/wt plant (gm)	100-Seed weight (gm)	Oil content (%)	Seed yield (kg/fed.)	oil yield (kg/fed.)
K2O	N							
	30	291	14.2	77	7.5	31.0	1320	409
O	45	299	14.1	82	7.7	30.5	1452	443
	60	306	19.0	90	8.0	29.9	1540	460
	75	310	20.5	92	8.3	29.5	1580	466
Mean		301	17.7	85	7.6	30.2	1473	445
	30	293	15.0	81	7.6	32.0	1380	442
	45	302	16.5	85	7.7	31.2	1465	457
24	60	310	18.6	92	8.1	30.7	1566	481
	75	308	21.0	93	8.4	30.4	1590	484
Mean		303	17.8	88	7.9	31.1	1500	466
		292	15.2	82	7.5	32.5	1395	453
	30	304	17.3	88	7.8	32.0	1485	475
	45	305	18.8	94	8.2	31.3	1590	498
48	60	315	22.0	95	8.5	31.1	1600	498
	75							
Mean		304	18.3	90	8.0	31.7	1517	481
Mean	30	292	14.8	80	7.5	31.8	1365	434
for nitrogen	45	302	17.0	85	7.7	31.4	1466	466
level	60	307	18.8	92	8.1	30.6	1565	478
	75	311	21.2	93	8.4	30.3	1590	483
L.S.D at 5% level								
K_2O		Ns	Ns	4.0	0.3	0.4	26	11
N		8	2.3	6.3	0.3	0.3	72	12
K_2O x N					Ns			

Table 3. Effect of nitrogen and potassium levels on sunflower in 1991 season.

\Fertilizer treatments (kg/fed.)		Plant height (cm)	Head diam. (cm)	Seed/wt plant (gm)	100-Seed weight (gm)	Oil content (%)	Seed yield (kg/fed.)	oil yield (kg/fed.)
K2O	N							
	30	282	15.3	80	7.4	31.5	1238	390
O	45	290	18.4	91	7.7	30.7	1380	424
	60	289	19.2	95	7.9	29.9	1470	439
	75	292	21.0	102	8.2	28.3	1505	441
Mean		288	18.5	92	7.8	30.1	1398	421
	30	284	15.6	82	7.6	32.0	1306	418
	45	288	18.0	96	7.8	31.6	1390	439
24	60	291	19.4	97	8.1	30.9	1500	464
	75	290	21.2	103	8.4	30.4	1575	480
Mean		288	18.6	93	8.0	31.2	1443	450
	30	285	16.0	83	7.5	32.0	1325	424
	45	289	18.7	93	7.8	31.9	1410	450
48	60	293	19.8	98	8.2	31.4	1520	477
	75	292	21.5	104	8.5	30.9	1607	497
Mean		290	19.0	95	8.0	31.6	1465	462
Mean	30	284	15.8	86	7.5	31.8	1390	410
for nitrogen	45	289	18.4	91	7.8	31.4	1393	438
level	60	291	19.5	97	8.0	30.7	1497	460
	75	291	21.2	103	8.4	30.2	1562	472
L.S.D at 5% level								
K_2O		Ns	Ns	Ns	Ns	0.5	41	14
N		5	2.1	9.0	0.3	0.4	82	16
K_2O x N						Ns		

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تأثير إضافة المستويات المختلفة من الآزوت والبوتاسيوم علي إنتاجية عباد الشمس

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أقيمت تجربتان حقليتان في ناحية أوسيم (محافظة الجيزة) خلال موسمي ١٩٩٠، ١٩٩١ لدراسة تأثير إضافة أربع مستويات من الآزوت (٣٠، ٤٥، ٦٠، ٧٥ كجم آزوت /ف) وثلاثة مستويات من البوتاسيوم (صفر ، ٢٤، ٤٨ كجم بو ٢أ /ف) علي محصول عباد الشمس وبعض مكوناته بالاضافة إلي محصول الزيت.

وقد أوضحت النتائج أن إضافة المستويات المختلفة من الآزوت أدت الي زيادة معنوية في طول النبات وقطر القرص ومحصول البذور للنبات ووزن ١٠٠ بذرة ومحصول البذور والزيت للفدان، بينما إنخفضت نسبة الزيت. وقد أعطي معدل ٦٠كجم آزوت /ف أعلي زيادة معنوية في محصول البذور والزيت للفدان.

بالنسبة للتسميد البوتاسي فقد أدت إضافته الي زيادة في محصول البذور والزيت للفدان ومحتوي البذور من الزيت . وكانت أكبر زيادة عن معدل ٤٨ كجم بو ٢ أ للفدان الآ أنه لا يوجد فرق معنوي بين ٤٨ ، ٢٤ كجم بو ٢أ للفدان.

وفي ضوء النتائج المتحصل عليها يمكن التوصية بأنه تحت الظروف المماثلة لهاتين التجربتين – تسميد عباد الشمس بمعدل ٦٠ كجم آزوت + ٢٤ بو ٢ أ للفدان.