Madras Agric. J. 90 (4-6) : 266-269 April-June 2003

Effect of levels of major nutrients with seed setting treatments on yield and economics of sunflower (CO 4)

A.P. SIVAMURUGAN, A. BALASUBRAMANIAN, C.R. CHINNAMUTHU, S. RADHAMANI AND N. SAKTHIVEL

Department of Agronomy, Tamil Nadu Agricultural University, Coimbatore-641 003, Tamil Nadu.

Abstract: Field experiments were carried out during summer and *kharif* 1997 at Tamil Nadu Agricultural University Farm, Coimbatore to study the influence of NPK levels and seed setting treatments on yield and economics of sunflower var CO 4. Among NPK levels, N:P:K at 80:40:40 kg ha^{-1} recorded higher seed yield. With respect to seed setting treatments, 0.2 per cent borax + 2 per cent DAP spraying at ray floret opening stage recorded higher seed yield. The treatment combination of N:P:K at 70:35:35 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray gave higher BC ratio of 2.95 during summer 1997 and 2.60 during *kharif* 1997 and it was followed by the treatment combination N:P:K at 80:40:40 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray which gave BC ratio of 2.91 during summer 1997 and 2.55 during *kharif* 1997

Key words : Sunflower, NPK, Seed setting, Yield, Gross and Net returns.

Introduction

Oil seeds play an important role in Indian agriculture as food and industrial commodity. India is the largest producer of oilseeds in the world in terms of output and second in terms of area. Among the oilseed crops, sunflower is an all-season crop. At present, in India, sunflower is being cultivated over an area of 20.93 lakh ha with a production of 11.85 lakh tonnes of seeds. The major factor affecting growth and yield of sunflower is the mineral nutrition especially N, P and K. Increase in yield due to application of nitrogen was reported by Guar *et al.* (1973). Essentiality of P in increasing the yield was earlier reported by Blamney *et al.* (1987) and Bhoite and Nimbalkar (1995). Now a days the cost of fertilizer is escalating which results in diminished returns. To reduce the cost of fertilizer, fixing economic doe of NPK is necessary which will help to increase the production and profit. The problem of poor seed set and filling has been one of the most commonly encountered problem in sunflower cultivation. Shatilov and Ikonnikov (1970) reported that boron increased the pollen viability, fertilizing capacity of the pollen and decreased the number of achenes and the percentage of empty achenes in sunflower. For newly released sunflower variety CO 4, economic optimum dose of NPK has not been identified. Studi on the combined effect of fertilizer levels and seed setting treatments on the yield of sunflowe is very limited. Hence the present study wa carried out to fix the economic dose of NPK and to work out the comparative economics of combined application of nutrients through soil and foliar spray for newly released sunflowe variety (CO 4).

Materials and Methods

The experiments were carried out at Tamil Nadu Agricultural University, Coimbatore during summer and *kharif* 1997 to study the influence of NPK levels and seed setting treatments on yield and economics of sunflower. The experiments were laid out in a split plot design with three replications. In the main plot, five levels of fertilizer (NPK) *viz.* 40:20:20 (N_1), 50:25:25 (N_2), 60:30:30 (N_3), 70:35:35 (N_4) and 80:40:40 kg ha^{-1} (N_5) and in the sub plot, four diferent seed setting treatments *viz.* control (no seed setting treatment) (S_1), hand pollination (S_2), 0.2 per cent borax + 2 per cent DAP spraying at ray floret opening stage (S_3) and 1 ppm brassinolide spraying at ray floret opening stage (S_4) were tried in both the seasons. The soil was sandy clay loam and low in available nitrogen (181 kg ha^{-1}), medium in available

ble 1. Effect of N, P and K levels and seed setting treatments on yield (kg ha^{-1})

	Summer 97							*Kharif* 97					
	N_1	N_2	N_3	N_4	N_5	S Mean		N_1	N_2	N_3	N_4	N_5	S Mean
	937	1020	1089	1146	1179	1074	S_1	777	860	929	986	1009	914
	1263	1397	1490	1554	1584	1458	S_2	1043	1153	1245	1325	1353	1224
	1381	1527	1628	1698	1731	1593	S_3	1132	1251	1353	1439	1469	1329
	1328	1469	1527	1634	1665	1525	S_4	1089	1206	1303	1384	1412	1279
	1227	1353	1434	1508	1540		N	1010	1118	1207	1284	1313	
ean							Mean						

	SEd	CD (P=005)	SEd	CD (P=0.05)
Mean	5.35	12.3	4.63	10.6
Mean	8.83	18.1	7.46	15.2
at S	17.93	37.1	15.18	31.3
t N	19.76	40.3	16.6	34.1

osphorus (12.1 kg ha^{-1}), rich in available tassium (626 kg ha^{-1}) with a pH of 8.1. e N,P and K were supplied in the form urea (46% N), single super phosphate (16% and muriate of potash (60% K_2O) respectively. fty per cent of N, P_2O_5, and K_2O were applied the time of sowing and the remaining 50 r cent was top dressed on 25 DAS. Sowing as done on 06.01.1997 and 08.08.1997. The eds were sown by dibbling at three seeds ll^{-1} on both the sides of ridges with a plant plant spacing of 30 cm and row to row acing of 30 cm. Thinning was done on the th day, maintaining one healthy plant per ll. Fluchloralin as pre-emergence herbicide s sprayed at the rate of 2.01 ha^{-1} on third y of sowing. Two hand weedings were given 15 and 30 DAS for effective weed management. nd pollination was done by hand covered th soft cloth (58 DAS). At ray floret opening ge, one round of spraying was given with rax at 0.2 per cent combined with DAP 2 per cent and brassinolide at 1 ppm as r the treatment schedule. Observations on ld and economics were recorded and presented.

sults and Discussion

The data on yield and economics as influnced treatments are presented in Table 1 and 2. The different NPK levels had significant influence on the grain yield of sunflower. Application of N:P:K at 80:40:40 kg ha^{-1} (N_5) recorded significantly higher grain yield (1540 kg ha^{-1} in summer 1997 and 1313 kg ha^{-1} in *kharif* 1997) in both the seasons and it was followed by N_4 (N:P:K at 70:35:35 kg ha^{-1}) which recorded a grain yield of 1508 kg ha^{-1} in summer and 1284 kg ha^{-1} in *kharif* 1997.

Among the seed setting treatments, combined spraying of borax and DAP at ray floret opening stage (S_3), recorded higher grain yield compared to other seed setting treatments. This increased yield might be due to increased seed filling percentage. Similar view has been expressed by Tufail Ahmedkhan *et al.* (1990). Brassinolide 1 ppm (S_4) spraying at ray floret opening stage increased the seed yield (1525 kg ha^{-1} in summer and 1279 kg ha^{-1} in *kharif* 19970 of sunflower in both the seasons. This increased yield might be due to better seed filling and seed weight. The result confirms with the findings of Mitchell *et al.* (1988) that brassinolide application to wheat crop at the beginning of anthesis, increased the ear weights of both tillers and main stem as well as the grain setting and grain weight. In respect of interaction effects,

it was found to be significant in both the seasons. The treatment combination of N:P:K at 80:40:40 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray recorded higher grain yield (1731 kg ha^{-1} in summer and 1469 kg ha^{-1} in *kharif* 19970 in both the seasons and it was on par with N_4S_3, (1698 kg ha^{-1} in summer and 1439 kg ha^{-1} in *kharif* 1997) in both the seasons.

The treatment combination of N:P:K at 80:40:40 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray resulted in higher net return of 11357 Rs ha^{-1} during summer 1997 and 8948 Rs ha^{-1} during *kharif* 1997 and it was followed by N:P:K at 70:35:35 kg ha^{-1} with seed setting treatment of 0.2 per cent borax + 2 per cent DAP spray which gave the net return of 11229 Rs ha^{-1} dur summer 1997 and 8550 Rs ha^{-1} during *kha* 1997. The treatment combination of N:P:K 70:35:35 kg ha^{-1} with seed setting treatm of 0.2 per cent borax + 2 per cent DAP sp gave higher BC ratio of 2.95 during sumn 1997 and 2.60 during *kharif* 1997 and it w closely followed by the treatment combinati of N:P:K at 80:40:40 kg ha^{-1} with seed setti treatment of 0.2 per cent borax + 2 per ce DAP spray which gave BC ratio of 2.91 duri summer 1997 and 2.55 during *kharif* 199

It may be concluded that the treatme combination of N:P:K, at 80:40:40 kg h with 0.2 per cent borax + 2 per cent DA spray recorded higher yield and net retur in sunflower.

Table 2. Economics - Summer and *kharif* 1997

Treatment combination	Summer 1997			*Kharif* 1997		
	Gross return (Rs ha^{-1})	Net return (Rs ha^{-1})	Benefit cost ratio	Gross return (Rs ha^{-1})	Net return (Rs ha^{-1})	Benefit cost ratio
N_1S_1	9370	4410	1.88	7770	3021	1.64
N_1S_2	12630	7091	2.28	10430	5102	1.96
N_1S_3	13810	8663	2.68	11320	6384	2.29
N_1S_4	13280	8139	2.58	10890	5960	2.21
N_2S_1	10200	5039	1.97	8600	3650	1.74
N_2S_2	13970	8200	2.40	11530	6001	2.09
N_2S_3	15270	9922	2.86	12510	7373	2.44
N_2S_4	14690	9348	2.75	12060	6929	2.35
N_3S_1	10890	5528	2.03	9290	4139	1.80
N_3S_2	14900	8959	2.51	12450	6720	2.17
N_3S_3	16280	10731	2.93	13530	8192	2.53
N_3S_4	15270	9727	2.75	13030	7698	2.44
N_4S_1	11460	5896	2.06	9860	4507	1.84
N_4S_2	15540	9397	2.53	13250	7318	2.23
N_4S_3	16980	11229	2.95	14390	8850	2.60
N_4S_4	16340	10595	2.84	13840	8306	2.50
N_5S_1	11790	6024	2.04	10090	4535	1.81
N_5S_2	15840	9495	2.50	13530	7396	2.20
N_5S_3	17310	11357	2.91	14690	8948	2.55
N_5S_4	16650	10703	2.80	14120	8384	2.46

(Data not statistically analysed)

eferences

hoite, S.V. and Nimbalkar, V.S. (1995). Effect of plant densities and fertilizer levels on yield of *kharif* sunflower. *J. Maharashtra Agrl. Univ.* **20**: 153-154.

lamney, F.P.C., Edwards, D.G. and Ahser, C.J. (1987). Nutritional disorders of sunflower. Department of Agriculture, University of Queensland, St.Lucia, Queensland, Australia. p.72.

aur, B.C., Tomar, D.S. and Trehan, K.B. (1973). A note on the effect of different levels of nitrogen and phosphorus on the yield of sunflower. *Indian J. Agron.* **18**: 109-110.

Mitchell, J.W., Worley, J.F. and Gregory, L.E. (1988). Practical applications of brassinolide in agriculture. *Annual Rev. Plant Physiol. and Plant Mol. Biol.* **39**: 23-52.

Shatilov, F.V. and Ikonnikov, P.A. (1970). Effect of soil drought on reproductive capacity of sunflower top dressed with phosphorus and boron. *Soil Fert.* **33**: 302.

Tufail Ahmedkhan, Venugopal, K., Chikka Devaiah and Seenappa, K. (1990). Effects of secondary nutrients and boron on some growth characters and yield in sunflower. *J. Oilsees Res.* **7**: 136-139.

(Received : February 2002 ; Revised : June 2002)