

Yield and nutrient uptake by winter sunflower (*Helianthus annuus*) as influenced by nitrogen and phosphorus

A. MISHRA, P. DASH AND R. K. PAIKARAY

Department of Agronomy, Orissa University of Agriculture and Technology,
Bhubaneswar 751 003

Received: December 1993

A field experiment was conducted during the winter season of 1991–92 to study the effect of nitrogen and phosphorus fertilization on sunflower (*Helianthus annuus* L.) at Bhubaneswar. The soil was sandy loam, having total nitrogen 0.03%, available phosphorus 16.5 kg/ha, available potassium 155.5 kg/ha and organic carbon 0.368%, with pH 5.7. The experiment consisting of 3 levels of nitrogen (20, 40 and 60 kg/ha) and 3 levels of phosphorus (20, 40 and 60 kg/ha) and the control with no N and P was laid out in randomized complete-block design replicated 3 times. Variety 'Morden' was used as a test crop. The crop was sown on 1 December 1991. A uniform dose of 30 kg K_2O /ha along with half dose of N and full dose of P_2O_5 as per treatment was applied at sowing and the rest half dose of N was top-dressed at 25 days after sowing. Two irrigations were applied at bud-development and flowering stages of the crop.

Dry-matter accumulation increased significantly with an increase in level of N

up to 60 kg/ha (Table 1). Similar effect of N levels was observed on uptake of N, P and K. Application of 60 kg N/ha had significant seed-yield advantage of 24 and 8.5% over 20 and 40 kg N/ha respectively. The stover yield and the harvest index showed the similar response to N levels. Higher seed and stover yields and the harvest index might be due to more uptake of N, P and K.

Application of P significantly increased the dry-matter yield/plant, seed yield, stover yield and N, P and K uptake. The response was very good up to 60 kg P_2O_5 /ha. The seed yield obtained at 60 kg P_2O_5 /ha was 8.5 and 3% more than that of 20 and 40 kg P_2O_5 /ha respectively. The response was higher up to 20 kg than the subsequent higher levels of P_2O_5 . The P application did not influence the harvest index of sunflower, but significantly increased the oil yield. This might be due to abundance of P in seeds which stimulated the formation of filled compact seeds and increase in seed number.

Table 1. Influence of nitrogen and phosphorus on yield and nutrient uptake by sunflower

Treatment	Dry matter/ plant (g)	Nutrient uptake (kg/ha)			Seed yield (q/ha)	Stover yield (q/ha)	Harvest index (%)	Oil content (%)
		N	P	K				
<i>Nitrogen (kg/ha)</i>								
20	44.4	46.2	21.3	37.2	7.42	19.3	31.6 (27.5)	38.2 (38.1)
40	47.6	58.4	27.8	47.9	8.48	21.0	32.4 (28.7)	37.8 (37.8)
60	50.3	66.4	30.4	54.7	9.20	22.1	32.9 (29.4)	37.5 (37.1)
CD (P = 0.05)	0.95	2.82	0.76	3.36	0.17	0.68	0.45	0.18
<i>Phosphorus (kg/ha)</i>								
20	45.9	55.5	21.7	44.7	7.98	20.3	32.1 (28.3)	37.5 (37.1)
40	47.7	57.2	27.1	46.9	8.41	21.0	32.3 (28.6)	37.8 (37.6)
60	48.8	58.8	30.7	48.1	8.66	21.2	32.4 (28.7)	38.2 (38.1)
CD (P = 0.05)	0.95	2.82	1.76	3.16	0.17	0.68	NS	0.18
Control	31.0	28.5	14.1	26.2	5.07	15.4	29.9 (24.8)	37.1 (36.4)
Rest	43.5	57.0	26.4	46.6	8.37	20.8	32.3 (27.6)	37.8 (37.6)
CD (P = 0.05) (control vs rest)	1.27	4.08	2.42	4.84	0.21	1.01	0.59	0.28

Figures in parentheses indicate % value