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PHOSPHORUS AND POTASH FERTILISATION STUDIES ON SUNFLOWER

N. M. MISRA[1] and AVIJIT SEN[2]

A field trial was conducted with four phosphate (0, 30, 60 and 90 kg P_2O_5/ha and three potash doses (0, 30 and 60 kg K_2O/ha) in the *kharif* season of 1978 at the Agricultural Farm of Banaras Hindu University to investigate its effect on the growth and yield of sunflower. Individually 90 kg P_2O_5 and 60 kg K_2O brought about highest plant height, shoot dry weight, stem diameter, flower diameter, 1000 seed weight, oil content and grain yield of sunflower but failed to differ significantly with 60 kg P_2O_5 and 30 kg K_2O/ha respectively. 30 kg and 60 kg P_2O_5/ha and 30 kg K_2O/ha exhibited the highest nutrient use efficiency, beyond which it started declining.

Sunflower, being a high yielding crop, has the potentiality of replacing all other traditional oil seed crops if cultivated properly. Fertilisation assumes added importance in sunflower due to its intensive growth in a comparatively shorter period which results in the production of a large amount of dry matter Among the nutrients phosphorus and potash increases the oil content of seed (Singh *et al.* 1977) in addition to its other beneficial effects. Keeping this in view an experiment was conducted under rainfed condition to evaluate an optimum dose of phosphorus and potash for sunflower.

MATERIALS AND METHODS

The field trial was undertaken during the rainy season of 1978 at the Agricultural Research Farm of Banaras Hindu University. The trial consisted of four phosphate doses (0. 30. 60. and 90 kg P_2O_5 /ha through single super phosphate) and three potash levels (0, 30 and 60 kg K_2O/ha through muriate of potash) and was laid out in a factorial randomised block design with three replications. Nitrogen was applied @ 120 kg/ha through urea (46% N) as a common dose. Seeds of the variety E.C 68414 with 96% germination were sown @ 15 kg/ha at a spacing of 60 x 20 cm. The soil of the site was sandy loam in texture with 0. 356% organic carbon, 0. 06% total nitrogen and 22 kg and 215 kg of available phosphorus and potash respectively.

The total rainfall received during the crop growth period was

1. Professor

2. Lecturer, Department of Agronomy, Institute of Agricultural Science, Banaras Hindu University, Varanasi - 221005, U.P.

Tacle 1. Effect of treatments on growth and yield characters of sunflower.

Treatments	Plant height (cm)	Shoot dry weight (g)	Stem diameter (cm)	Flower diameter (cm)	Sterility percentage	1000 seed weight (g)	Oil content (%)	Seed yield (g/ha)	Nutrien use efficiency (kg grain kg P_2O_5)
P_0	97.97	27.23	0.89	9.16	50.39	53.27	34.21	8.44	—
P_{30}	99.71	32.11	1.19	9.71	46.25	56.16	3.12	9.40	3.20
P_{60}	100.27	34.63	1.20	9.78	44.05	57.05	36.76	10.36	3.20
P_{90}	101.21	36.06	1.25	9.87	42.71	57.83	37.12	10.90	2.93
S Em+	0.36	0.74	0.03	0.13	0.61	0.44	0.34	0.06	—
C. D. at 5%	1.05	2.17	0.01	0.39	1.78	1.31	1.00	0.64	—
K_0	98.70	29.82	1.02	9.33	49.10	54.33	34.83	8.76	(kg grain kg K_2O)
K_{30}	100.20	33.42	1.18	9.72	44.64	56.37	36.37	10.15	4.63
K_{60}	100.46	34.28	1.19	9.84	43.79	57.54	36.97	10.36	2.66
S.Em +	0.31	0.64	0.001	0.11	0.52	0.38	0.30	0.04	—
C.D. at 5%	0.91	1.88	0 08	0.33	1.54	1.14	0.87	0.43	—

86.89 cm with the maximum and minmum being in July (44.52 cm) and October (0.65 cm) respectively. Interculture operations were carried out as and when felt necessary. No pesticide was applied as the crop was totally pest free.

Observations presented in table 1 were recorded at harvest and analysed as per the methodology of Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Significant differences in all the vegetative and yield components were observed by different doses of phosphorus and potash application (Table 1). Increased doses of nutrients brought about a corresponding increase in the values of the characters studied except sterility percentage. Plant height, shoot dry weight and stem diameter were highest with 90 kg P_2O_5 and 60 kg K_2O/ha individually, but were statistically at par with 60 kg P_2O_5 and 30 kg K_2O/ha respectively. Gaur *et al.* (1973) also reported that phosphorus and potash increased the total photosynthetic area which ultimately enhances the dry matter production per plant.

similar trend was observed with flower diameter and 1000 seed weight while it was revers in case of sterility percentage where 90 kg P_2O_5 and 60 kg K_2O decreased the percentage of sterility. Galgoczy (1968) also observed that higher rates of phosphorus and potash along with nitrogen decreased the percentage of sterile seeds.

The cumulative effects of all these characters ultimately resulted in higher seed yield under higher doses of phosphorus (90 kg) and potash(60 kg) although, they failed to differ significantly with 60 kg P_2O_5 and 30 kg K_2O/ha respectively. This result is in conformity with the findings of Yogeswara *et al.* (1973) who also recorded a higher yield by higher doses of phosphate and potash. However, in the oil content of seed 90 kg P_2O_5 and 60 kg K_2O significantly superseded all other doses. Singh *et al.* (1977) also reported an increase in the oil content by phosphorus and potash application, which might be due to their more effective role in fat metabolism.

Further perusal of the teble reveals that nutrient use efficiency i. e. seed produced per kg of nutrient applied was same with 30 kg and 60 kg P_2O_5/ha (3.20 kg), beyond which it decreased. Similarly in case of potash, nutrient use efficiency was higher when it was applied @ 30 kg ha (4.63 kg) than 60 kg/ha.

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