

EFFECT OF NPK ON PHOSPHORUS UPTAKE BY SUNFLOWER AT DIFFERENT STAGES OF GROWTH

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Fertilizer use is considered as an essential input for increasing the productivity of crops. The fertilizer dose, however, may be based on nutrient uptake since the crop yields are directly related to the amount of nutrients absorbed. The nutrient uptake behaviour is further useful in determining the peak periods of its uptake for maximising the efficiency of the applied fertilizer. The mineral content in plants also changes with the age. In order to find out the uptake pattern of phosphorus under different stages of growth of sunflower under varying levels of NPK, the present investigation was carried out.

Materials and Methods

A field trial was conducted in the Agricultural Research Station, Bhavani-sagar, Coimbatore district using EC 68415 sunflower as test crop under irrigated conditions. The experimental field was low in available nitrogen (176 kg/ha) and available phosphorus (10.3 kg/ha) and high in available potassium 358 kg/ha). The experiment was conducted adopting a factorial randomised block design with three replications. There were three levels of nitrogen, 0, 40 and 80 kg/ha, 3 levels of phosphorus 0, 60 and 120 kg/ha and 3 levels of potassium 0, 40 and 80 kg/ha. Half the dose of N and full doses of P and K were applied basally and the remaining half the dose of N was applied on 30th day of sowing as top dressing.

Representative plants numbering four and two from each plot were collected on 30th day (vegetative stage) and 60th day (flowering stage) of sowing respectively and were analysed for their phosphorus content. At post harvest stage the plant and seed samples were collected and analysed for their phosphorus content. From the phosphorus content of the plant and dry matter yield, the uptake of phosphorus at different stages was calculated and subjected to statistical scrutiny.

Results and Discussion

The data on the dry matter yield, seed yield and the uptake of phosphorus by sunflower plants at different stages of growth are presented in Table 1.

Vegetative stage

Higher P uptake values by plants were obtained by the application of 80 kg N or 120 kg P_2O_5 or 80 kg K_2O compared to other levels tried. The P uptakes obtained for the above treatments were 0.41, 0.41 and 0.39 kg/ha respectively (Table 1). Higher P uptake by the application of increased nitrogen dose was reported by Boatwright and Haas (1961); Gopalswami and Raj (1972), and Walia

Table 1

The dry matter yield, seed yield and uptake of phosphorus by sunflower at different stages of growth (Mean of three replications, kg/ha)

Treatments	Dry matter yield			Seed yield	Phosphorus uptake		
	Vegetative stage	Flowering stage	Post harvest stage		Vegetative stage	Flowering stage	Harvest stage (grain & stalk)
N ₀ P ₀ K ₀	310	5945	7122	893	0.272	3.24	6.26
N ₀ P ₀ K ₁	324	6250	7861	1005	0.284	3.44	6.94
N ₀ P ₀ K ₂	329	6307	7670	947	0.289	3.48	6.96
N ₀ P ₁ K ₀	325	6313	7915	1016	0.293	3.58	7.21
N ₀ P ₁ K ₁	373	6415	8325	1235	0.336	3.65	7.62
N ₀ P ₁ K ₂	384	6494	8184	1159	0.374	3.70	7.47
N ₀ P ₂ K ₀	349	6466	7602	942	0.317	3.76	6.98
N ₀ P ₂ K ₁	393	6965	7771	1098	0.354	4.08	7.18
N ₀ P ₂ K ₂	398	6998	7725	992	0.362	4.12	7.11
N ₁ P ₀ K ₀	377	6623	3043	1015	0.333	3.67	7.17
N ₁ P ₀ K ₁	398	6731	8993	1363	0.353	3.76	8.05
N ₁ P ₀ K ₂	408	6893	8776	1309	0.361	3.86	7.84
N ₁ P ₁ K ₀	409	6809	9015	1487	0.373	3.87	8.34
N ₁ P ₁ K ₁	452	7025	9561	1715	0.415	4.03	8.87
N ₁ P ₁ K ₂	462	7152	9419	1653	0.425	4.12	8.73
N ₁ P ₂ K ₀	422	6611	8369	1313	0.393	4.07	7.86
N ₁ P ₂ K ₁	466	7106	9247	1614	0.436	4.22	8.76
N ₁ P ₂ K ₂	472	7210	9113	1582	0.443	4.29	8.61
N ₂ P ₀ K ₀	394	6899	8003	995	0.349	3.88	7.09
N ₂ P ₀ K ₁	412	7121	8581	1292	0.367	4.03	7.62
N ₂ P ₀ K ₂	411	7205	8233	1220	0.373	4.08	1.31
N ₂ P ₁ K ₀	426	7093	8569	1394	0.393	4.06	7.86
N ₂ P ₁ K ₁	466	7162	8769	1623	0.431	4.13	8.12
N ₂ P ₁ K ₂	482	7291	8673	1578	0.445	4.21	7.98
N ₂ P ₂ K ₀	444	7183	7982	1215	0.416	4.26	7.49
N ₂ P ₂ K ₁	482	7284	8678	1498	0.455	4.35	8.21
N ₂ P ₂ K ₂	492	7307	8459	1409	0.465	4.37	7.67

et al. (1978), The interactions N x P, N x K and P x K were significant. Irrespective of the levels of P and K, 40 and 80 kg N being on par recorded the highest P uptake. Higher levels of N contributing for the enhanced vegetative growth (Table 1) have also contributed for the increased P uptake. Similarly the application of 40 and 80 kg K_2O/ha , irrespective of the levels of N and P, registered the highest P uptake and the above said treatments were on par with each other.

Irrespective of the levels of N and K, application of 60 and 120 kg P_2O_5 recorded the highest P uptake owing to the increased P availability and these two treatments were on par with each other at all N and K levels.

Flowering stage

The application of 80 kg N recorded the highest P uptake by plant (Table 1). This was true at all levels of P and K tried. This being the highest level of N tried, has increased the dry matter production (Table 1), and as a consequent the P uptake has increased markedly. This result was in line with the findings of Varghese *et al.* (1976), Singh *et al.* (1978) and Banarsi Dass and Rajodh Singh (1979). Similarly the application of 120 kg P_2O_5 the highest level of P tried, contributed for the enhanced P availability and in turn recorded the highest P uptake. The application of 40 and 80 kg K_2O/ha being on par recorded the highest P uptake. This was true at all levels of N and P tried.

Post-harvest stage

Higher P uptake of the plants was obtained by the application of 40 kg N or 60 kg P_2O_5 or 40 kg K_2O compared to other levels tried. The uptake values obtained for the above treatments were 8.25, 8.02 and 7.93 kg/ha respectively (Table 1). The ultimate uptake values were obtained by multiplying the dry matter yield by the nutrient content of plants. The above levels of NPK causing increased dry matter yield (Table 1) were therefore responsible for the higher P uptake at post-harvest stage. The interactions N x P and N x K were significant. At all levels of N and K, the application of 69 kg P_2O_5/ha recorded the highest P uptake. Similarly the application of 40 kg each of N or K_2O/ha at all levels of P registered the highest P uptake.

Summary

The application of higher levels of N (80 kg), P_2O_5 (120 kg) and 40 kg K_2O/ha increased the P uptake of sunflower plants at vegetative and flowering stages. The P uptake in plants at harvest stage was increased by the addition of 40 kg each of N and K_2O and 60 kg P_2O_5/ha .

സംഗ്രഹം

പാകുജനകം, ഭാവഹരം, ക്ഷാരം എന്നിവയുടെ ഉയർന്ന നിരക്കിലുള്ള (യഥാക്രമം ഹെക്ടറിന് 80 കി. ഗ്രാം, 120 കി. ഗ്രാം, 40 കി. ഗ്രാം, വീതം) പ്രയോഗം സൂര്യകാന്തി ചെടികളിൽ പുഷ്പിക്കുന്നതിനുമുമ്പും പുഷ്പിക്കുന്ന ദശയിലും ഭാവഹരത്തിന്റെ ആഗിരണം വർദ്ധിപ്പിക്കുന്നതായി തെളിഞ്ഞു.

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