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Effect of Phosphorus on Growth and Uptake by Different Legumes

KEYWORDS: Legumes, growth, nutrient concentration and uptake

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ABSTRACT A field experiment was conducted at Department of Agronomy, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) in clayey soil during Kharif season of 2001-02. The experiment was laid out in randomised block design in kharif season with six treatments of legumes grown in different levels of phosphate with four replications. All the growth characters viz. plant height and leaves plant-1 were significantly superior in treatment SP2, whereas leaf area plant-1, dry matter plant-1 were significantly higher in SOP2 and branches plant-1 were significantly more in GP2. In case of nutrient concentration (%) and uptake by straw (kgha-1) of N, P2O5 and K2O were showed significantly higher values in treatment SP2.

INTRODUCTION

Legumes are the richest, cheapest and easiest source of best quality proteins and fats and have a vast multiplicity of uses as food and industrial products. Legumes builds up the soil fertility by fixing large amounts of atmospheric nitrogen through the root nodules and also through leaf fall on the ground at maturity. It can be used as fodder, forage can be made in to hay, silage etc. Its forage and cake are excellent nutritive foods for livestock and poultry. It is well known that the phosphorus is one of the major nutrients which is required in large quantities to the legumes for their nodulation, N fixation and optimal growth, but it is a major constraint as nearly 98 per cent of soils in India have inadequate of supply of P (Singh *et al.*, 2002). Nitrogen fixation by leguminous crops can be increased by application of phosphatic fertilizers. This phosphorus is available to succeeding crop after mineralisation of the incorporated green manure crop.

MATERIAL AND METHODS

The field experiment was conducted during *kharif* season of 2001-02 on Farm of Agronomy Department, Dr. Panajabrao Deshmukh Krishi Vidyapeeth, Akola. The soil of the experimental plot was clayey in texture; low in total nitrogen, organic carbon, available nitrogen and phosphorous and marginally high in available potassium. The experiment was laid out in randomised block design in *kharif* season with six treatments of legumes grown in different levels of phosphate viz., GP1 - Greengram grown with 25 kg P_2O_5 ha^{-1}, GP2 - Greengram grown with 50 kg P_2O_5 ha^{-1}, SOP1 – Soybean grown with 25 kg P_2O_5 ha^{-1}, SOP2 – Soybean grown with 50 kg P_2O_5 ha^{-1}, SOP2 – Soybean grown with 50 kg P_2O_5 ha^{-1}, with four replications. N and K_2O were applied @ 25 kg ha^{-1} to all the treatments as basal dose. The data on various growth characters, nutrient concentrations (%) in straw and nutrient uptake by straw of legumes were recorded and analyzed statistically.

Results and discussion

Growth characters

All the growth characters influenced significantly due to different phosphorous treatments (Table 1). Plant height (cm) at harvest and number of leaves $plant^{-1}$ at 60 DAS were recorded heighest in treatment SP2 which was significantly superior over all other treatments. Leaf area $plant^{-1}$ (cm^2) at 60 DAS was significantly higher in treatment SOP2. It was significantly superior over all other treatments except SOP1, which recorded at par values with treatment SOP2. Significantly maximum number of branches was obsrved in treatment GP2 over all other treatments. In case of dry matter $plant^{-1}$, treatment SOP2 recorded maximum value, which was significantly more than treatments SP2, SP1 and GP1, whereas it was atpar with treatment SOP1 and GP2. The improvement in vegetative growth of legumes could be attributed to the favorable effects of applied phosphorus. Application of phosphorus @ 25 to 50 kg ha^{-1} had significant impact on different growth parameters studied during both the years of experimentation resulted in more nodulation, more nutrient uptake, more number of leaves leading to increased photosynthetic area and thereby profused branching and dry matter accumulation. Increase in plant height and number of branches $plant^{-1}$ could reasonably ascribed to increased cell division and their elongation stimulated by phosphate application. It is therefore, understandable that the use of phosphate application (25 to 50 kg ha^{-1}) had beneficial effect on production of greater amount of dry matter. Results observed in present investigation as regards growth attributes of legumes find support from the research work done by different workers like Shukla and Dixit (1996), Sharma and Singh (1997) in greengram, Goswami *et al.* (1999) in soybean, Deshmukh (1997) in sunnhemp.

Nutrient concentrations (%) and uptake by straw (kgha^{-1})

Nutrient concentrations (%) and uptake by straw (kg ha^{-1}) of legumes as influenced by different treatment were presented in Table 2. It was found that concentration of N, P_2O_5 and K_2O was significantly higher in treatment SP2, which was at par with SP1 and significantly higher than all other treatments. The uptake of N, P_2O_5 and K_2O by straw was highest in treatment SP2, which was significantly superior over all other treatments. The greater values of these characters might be associated with increased level of phosphate application and higher biomass production. These findings are in accordance with the work reported by Jadhao (1998) and Thomas and Palaniappan (1998).

Table 1. Growth of legumes as influenced by different treatments.

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Treatment	Plant height	Leaves plant^{-1}	Leaf area plant^{-1} (cm^2)	Branches plant^{-1}	Dry matter plant^{-1} (g)
	At harvest	60 DAS	60 DAS	At harvest	At harvest
GP1	69.40	23.70	494.83	4.15	13.78
GP2	73.97	26.65	499.39	4.60	16.57
SOP1	73.60	50.20	2595.75	3.85	17.45
SOP2	78.92	54.45	2685.50	4.25	21.00
SP1	176.32	85.75	321.06	2.03	12.49
SP2	193.39	112.55	428.63	2.45	14.47
SEm±	2.98	3.55	118.88	0.14	1.64
C.D.	8.97	10.69	358.27	0.41	4.93
G.M.	110.93	58.88	1170.86	3.56	15.96

Table 2. Nutrient concentrations (%) and uptake by straw (kg ha^{-1}) of legumes as influenced by different treatments.

Treatment	Nutrient concentrations (%)			Uptake by straw (kg ha^{-1})		
	N	P_2O_5	K_2O	N	P_2O_5	K_2O
GP1	0.49	0.043	0.31	25.14	2.19	15.70
GP2	0.51	0.044	0.32	32.98	2.86	20.91
SOP1	1.08	0.076	0.42	59.74	4.21	23.66
SOP2	1.12	0.088	0.43	73.96	5.72	27.81
SP1	1.59	0.347	1.21	417.72	91.23	318.09
SP2	1.62	0.351	1.22	537.53	116.37	406.16
SEm±	0.02	0.002	0.01	35.38	7.75	27.97
C.D.	0.07	0.006	0.04	106.63	23.35	84.30
G.M.	1.07	0.158	0.65	191.18	37.10	135.39

REFERENCE Deshmukh, Y.V. (1997). Effect of seed rate, spacing and fertility levels on growth and yield of sunnhemp (Crotolaria juncea L.).M. Sc. Thesis unpub.: 81. Goswami, S.; R. A. Khan; K. M. Vyas; J. P. Dixit and K. N. Namdeo (1999). Response of soybean (Glycine max) to levels, sources and methods of phosphorus application. Indian J. Agron 44(1): 126-129. Jadhao, P. G. (1998). Effect of irrigation schedules and phosphate levels on growth and seed yield of sunnhemp (Crotolaria juncea L.). M. Sc. Thesis unpub.: 83. Sharma, M. P. and R. Singh (1997). Effect of phosphorus and sulphur on greengram (Phaseolus radiatus). Indian J. Agron 42(4): 650-652. Shukla, S. K. and R. S. Dixit (1996). Effect of Rhizobium inoculation, plant population and phosphorus on growth and yield of summer greengram (Phaseolus radiatus). Indian J. Agron 41(4): 611-615. Singh, R. D.; K. Vairavan and M. Ramasamy (2002). Integrated phosphorus management in greengram. Madras Agric. J. 89 (1-3): 149-150. Thomas, L. and S. P. Palaniappan (1998). Biomass production and nitrogen accumulation of velvet beans, sunnhemp and pillipesara as influenced by plant density and phosphorus application. Madras Agric. J. 85 (5,6): 268-278.