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Effect of phosphorus and sulphur on growth and yield of moongbean

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ABSTRACT

The experiment was conducted during *Kharif* season of 2007 at the experimental farm of Department of Agronomy, Marathwada Agricultural University, Parbhani (Maharashtra) to study the effect of phosphorus and sulphur on growth and yield of mungbean. The experiment was laid in Factorial Randomized Block Design with 16 treatment combinations comprising of four phosphorus levels (0, 25, 50 and 75 kg/ha) and four levels of sulphur (0, 20, 40 and 60 kg/ha) replicated thrice. Based on the present investigation it can be concluded that application of phosphorus 50 kg/ha was optimum to harvest maximum yield of green gram and sulphur application @ 40 kg/ha was beneficial to increase growth and yield of green gram while there was no positive effect of phosphorus and sulphur interaction on growth and yield of greengram.

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Key words : Phosphorus, Sulphur, Yield, Moongbean

INTRODUCTION

Green gram locally called as moong or mung (*Vigna radiata* L.) belongs to the family leguminoceae, which fixes atmospheric nitrogen and improves soil fertility by adding 20-25 kg N/ha. Being a short duration and having wide adaptability, it can be grown in *Kharif* as well as in summer seasons. Green gram is nutritious, containing 23-26 per cent proteins, 57-58 per cent carbohydrate, 1.1 per cent fat, 9.7 per cent water, 3.3 – 3.8 per cent fibre and 4 to 4.8 per cent ash. As a vegetable protein it is rich in vitamin B (Purseglove, 1968).

There are various reasons for low yield of green gram and proper use of fertilizer is one of them. For any crop, fertilizer is the most critical input for utilizing the yield potential of improved high yielding crop varieties. The values of growing legume in sustaining and improving soil fertility has been known since long. However, in recent days *i.e.* post green revolution era, due to indiscriminate nutrient mining, soil fertility is depleting at an alarming rate. And to provide food for nearly 105 crores, there is need to add fertilizers to augment the sustainable crop production.

Phosphorus is the complex element for availability to plant growth. It's availability is influenced by many factors of which p^H is important. Majority soils of Marathwada are black cotton soils, in which phosphorus get fixed into calcium and magnesium phosphate and becomes unavailable to crop. Phosphorus use efficiency in black cotton soils ranges from 18 to 20 per cent. Therefore, to increase the phosphorus use efficiency, it is required to find out the optimum level of phosphorus for green gram. Thus the study of phosphorus to legumes is more important than that of nitrogen as later is being fixed by symbiosis with *Rhizobium* bacteria.

Like phosphorus, sulphur is also important for crop development. Now a day, sulphur is considered as 4th major essential plant nutrient after nitrogen, phosphorus and potassium. Sulphur is essential for protein synthesis. The quality of grain increases with increase in protein and oil percentage. Sulphur also promotes nodulation in legumes by fixing atmospheric nitrogen. It plays vital role in chlorophyll formation. It acts as biological agent in the chain of fatty acids. Keeping these views in front, the present investigation was undertaken.

MATERIALS AND METHODS

The experiment was conducted during *Kharif* season of 2007 at the experimental farm of Department of Agronomy, Marathwada Agricultural University, Parbhani (M.S.) to study the effect of phosphorus and sulphur on growth and yield of mungbean. The experiment was laid in Factorial Randomised Block Design with 16 treatment combinations comprising of four phosphorus levels (0, 25, 50 and 75 kg/ha) and four levels of sulphur (0, 20, 40 and

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60 kg/ha) replicated thrice. The recommended dose of fertilizer N was through urea and P and S as per treatment. As per the treatments phosphorus levels and sulphur levels were given at the time of sowing through single super phosphate, DAP and elemental sulphur, respectively. These were applied by placement method just before sowing. Seeds of green gram variety BM 2002-1 were taken from Department of Agronomy, M.A.U., Parbhani and used for sowing. The seeds were treated with Bavistin @ 4 g/kg of seed for controlling seed borne diseases. The seeds were also inoculated with *Rhizobium* before sowing. After receipt of sufficient rains, sowing was undertaken at optimum soil moisture. Two seeds per hill were dibbled with the spacing of 30 cm x 10 cm and covered with moist soil. Other cultural practices and plant protection measures were given according to the recommended package of practices. At maturity, the observations on ancillary characters were recorded on five randomly selected plants in each plot. The total yield/ ha were recorded on net plot basis.

RESULTS AND DISCUSSION

The results obtained from the present investigation as well as relevant discussion have been summarized under following heads :

Effect of phosphorus:

The various growth attributes were influenced significantly due to application of phosphorus throughout the crop growth period except at 20 DAS (Table 1). The growth attributes like plant height, number of functional leaves, number of branches per plant and pods per plant increased significantly upto 50 kg P_2O_5/ha, however, 25 and 75 kg P_2O_5/ha were found at par with each other. These results corroborate the findings of Sharma and Singh (1997), Patel and Patel (1991) and Jena *et al.* (1995).

The accumulation of dry matter per plant was not influenced significantly at 20 days of crop age, while significant differences were observed from 30 days onwards due to application of phosphorus. The dry matter accumulation per plant increased significantly superior at 50 kg P_2O_5/ha than rest of phosphorus levels. However, 25 and 75 kg P_2O_5/ha were at par with each other. Similar types of results were also reported by Tomar *et al.* (1995) and Sharma *et al.* (1994).

The growth analysis revealed that beneficial effect of phosphorus levels evident in increasing AGR (dry matter) and RGR. AGR of plant height and LAI were recorded higher values at the dose of 50 kg P_2O_5/ha than other doses (25 and 75 kg P_2O_5/ha). Similar types of results were also reported by Singh and Hiremath (1990).

The various yield attributes *viz.*, pods per plant, grain weight per plant, seeds per pod, weight of pod per plant and 1000 grain weight were influenced significantly with the levels of phosphorus. The mean values of these characters increased significantly with increase in levels of phosphorus upto 50 kg/ha. The grain and straw yield increased significantly with the level of phosphorus upto

Table 1 : Yield contributing characters of green gram as influenced by different treatments

Treatments	Pods/ plant	Pod weight/ plant (g)	Grain weight/ plant (g)	Seeds/ pod	Test weight (g)
Phosphorus levels (kg/ha)					
P_0 : 0	11.42	7.25	3.00	8.07	38.98
P_1 : 25	14.28	8.78	3.77	9.73	40.49
P_2 : 50	16.98	10.81	4.52	11.97	45.44
P_3 : 75	15.40	9.51	4.02	10.47	41.32
S.E. $\pm$	0.43	0.27	0.11	0.30	1.26
C.D. (P=0.05)	1.30	0.82	0.33	0.91	3.78
Sulphur levels (kg/ha)					
S_0 : 0	11.49	7.39	3.08	8.30	38.66
S_1 : 20	15.47	9.58	3.98	10.49	41.24
S_2 : 40	16.90	10.60	4.35	11.85	45.21
S_3 : 60	14.25	8.78	3.90	9.60	40.12
S.E. $\pm$	0.43	0.27	0.11	0.30	1.26
C.D. (P=0.05)	1.30	0.82	0.33	0.91	3.78
Interaction (PxS)					
S.E. $\pm$	0.89	0.56	0.22	0.63	2.60
C.D. (P=0.05)	NS	NS	NS	NS	NS
G. mean	14.52	9.08	3.82	10.06	41.55

NS=Non-significant

Table 2 : Mean grain yield and straw yield as influenced by different treatments

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)
Phosphorus levels (kg/ha)		
P_0 : 0	998.93	2895.21
P_1 : 25	1258.82	4037.47
P_2 : 50	1423.60	4657.30
P_3 : 75	1303.32	4270.84
S.E. ±	38.88	88.17
C.D. (P=0.05)	114.49	356.42
Sulphur levels (kg/ha)		
S_0 : 0	1002.93	2997.93
S_1 : 20	1296.58	4174.60
S_2 : 40	1412.65	4619.46
S_3 : 60	1272.51	4069.13
S.E. ±	38.88	88.17
C.D. (P=0.05)	114.49	356.42
Interaction (PxS)		
S.E. ±	76.38	245.53
C.D. (P=0.05)	NS	NS
G. mean	1246.16	3965.20

NS= Non-significant

50 kg/ha, however, application of 25 and 75 kg P_2O_5/ha remained at par with each other (Table 2). These results are in the line of Sharma and Singh (1997), Thakur *et al.* (1996) and Patel and Patel (1991).

Effect of sulphur:

Growth attributes were significantly affected by different sulphur levels under study (Table 1). The application of sulphur *i.e.* 40 kg S/ha recorded significantly more plant height than other treatments.

The number of functional leaves per plant, branches per plant, number of effective nodules per plant, mean dry matter per plant remained higher due to application of sulphur at 40 kg/ha, which was significantly higher than control. Application of 20 and 60 kg S/ha were found at par with each other. The similar results were obtained by Patil *et al*. (1992) and Sharma and Singh (1993).

The growth analysis revealed that beneficial effect of sulphur levels evident in increasing AGR (dry matter) and RGR. AGR of plant height and LAI were recorded higher values at the dose of 40 kg S/ha than other doses (20 and 60 kg S/ha). Similar results were also reported by Sharma and Singh (1993).

The yield contributing characters *viz*., pods per plant, grain weight/plant, seeds per pod, weight of pod/plant and 1000 grain weight were significantly influenced due to different levels of sulphur and the mean value of these characters were increased significantly with increasing levels of sulphur upto 40 kg/ha over control. The grain and straw yield increased significantly with increase in the levels of sulphur upto 40 kg S/ha (Table 2). These results are in conformity with the results reported by Patil *et al*. (1992) and Sharma and Singh (1993).

Effect of interactions:

The growth and yield characters and consequently the yields of mung were not influenced significantly by the interaction of various treatments tried. This indicates that both the factors under study *viz*., phosphorus and sulphur levels behaved independently in respect of growth and yield of green gram of variety BM 2002-1.

Conclusions:

On the basis of present investigations it can be concluded that application of phosphorus 50 kg/ha was optimum to harvest maximum yield of green gram and sulphur application @ 40 kg/ha was beneficial to increase growth and yield of green gram. While there was no positive effect of phosphorus and sulphur interaction on growth and yield of greengram.

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