Available online www.jocpr.com

Journal of Chemical and Pharmaceutical Research, 2012, 4(5):2571-2573

Research Article

ISSN : 0975-7384
CODEN(USA) : JCPRC5

Effect of phosphorus and sulphur nutrition on yield attributes, yield of mungbean (*Vigna radiata* L. Wilczek)

Rakesh Kumar[1]*, Y.V.Singh[1], Surendra Singh[1], A. M. Latare, P.K. Mishra[1] and Supriya[2]

[1]Department of Soil Science and Agricultural Chemistry, Institute of Agricultural Science, Banaras Hindu University, Varanasi (U.P.)
[2]Department of Soil Science and Agricultural Chemistry, RAU, Pusa Samastipur

---

ABSTRACT

Increasing levels of Phosphorus and Sulphur enhanced the growth, Plant height, yield attributes like Number of nodules/plant, Dry weight of nodules, Number of pods/plant, Number of grains/pod, 1000-grain weight, grain yield, and straw yield showed maximum increase at 45 kg P_2O_5 ha^{-1} and 30 kg S ha^{-1}, respectively. The increase in grain and straw yield with successive increase in phosphorus and sulphur levels, was more at 30 kg S ha^{-1} and 45 kg P_2O_5 kg ha^{-1}. Overall the difference between 20 kg and 30 kg S ha^{-1} was not differed significantly. But the growth characters yield attributes and yield of Mungbean response significantly the highest level of phosphorus i.e. 45 kg P_2O_5 ha^{-1}.

Key Words: Mung bean, Phosphorus, Sulphur, Nodules.

INTRODUCTION

Mungbean (*Vigna radiata* L. wilczek) is an important pulse crop having high nutritive value. It not only plays an important role in human diet but also in improving the soil fertility by fixing the atmospheric nitrogen. Its seed is more palatable, nutritive, easily digestible and non-flatulent than other pulses. Nutrient management is one of the most important factors that greatly affect the growth, development and yield of mungbean. Nitrogen and phosphorus are both integral components of virtually all the biochemical compounds that makes plant life possible. It is one of the popular short duration grain legumes in India and occupies third place after the chickpea and pigeonpea to assess the influence of phosphorus and sulphur application on yield attributes, yield and nutrient uptake by mungbean [1,2]

EXPERIMENTAL SECTION

Field experiments were conducted in (kharif season of 2009 and 2010) at the experimental form of Institute of Agricultural Sciences Banaras Hindu University, Varanasi, Uttar Pradesh. The soil of experimental field was sandy loam in texture and neutral in reaction (pH 7.4) having organic carbon 0.45 per cent, available Nitrogen 204.60 kg ha^{-1}, Phosphorus 25.7 kg ha^{-1}, Potassium 144.6 kg ha^{-1} and Sulphur 9.80 ppm. The experiment was conducted in factorial randomized block design with four levels of phosphorus viz., control, 15, 30 and 45 kg P_2O_5/ha and four levels of sulphur viz., control, 10, 20 and 30 kg S/ha, thus total treatment combinations were sixteen, were replicated three times. The sowing was done at the rate of 25 kg seeds/ha and Hand weedings were done at 30, 45 days after sowing. The crop was irrigated at different stages according to need. Nitrogen and phosphorus were applied through di ammonium phosphate at the rate of 100 kg DAP/ha while gypsum was used as sulphur source. Observations were recorded at different stages of plant growth and yield attributing parameters were recorded at maturity, and with the help of observations, recorded per plot. Growth parameters recorded were number of nodules/plant, dry weight of nodules (g), number of pods per plant, number of grains per pod, 1000-weight of grain (g), grain yield and straw yield.

RESULT AND DISCUSSION

Growth parameters

Increase in application of phosphorus upto 45 kg P_2O_5/ha increased nodules per plant, dry weight of nodules, number of pods, number of grains per pod, 1000-grain weight, grain yield, and straw yield considerably. (Table 1)

Table 1: Plant height (cm) at progressive growth states as affected by different levels of phosphorus and sulphur

Treatments	30 DAYS	45 DAYS	60 DAYS
P_0 – 0 kg P_2O_5 ha^{-1}	27.89	42.07	50.82
P_{15} – 15kg P_2O_5 ha^{-1}	29.42	43.53	52.60
P_{30} – 30 kg P_2O_5 ha^{-1}	31.18	44.05	53.72
P_{45} – 45 kg P_2O_5 ha^{-1}	33.76	45.37	55.25
S. Em. ±	0.27	0.16	0.17
C.D. at 5%	0.56	0.32	0.36
S_0 – 0 kg S ha^{-1}	29.77	43.25	52.62
S_{10} – 10 kg S ha^{-1}	30.11	43.43	52.85
S_{20} – 20 kg S ha^{-1}	30.55	43.71	53.12
S_{30} – 30 kg S ha^{-1}	31.04	44.12	53.32
S. Em. ±	0.27	0.16	0.17
C.D. at 5%	0.56	0.32	0.36

Plant height

Plant height increased continuously and significantly with increasing levels of phosphorus upto 45 kg P_2O_5 ha^{-1} at all stages of crop growth (Table 1). Maximum height was recorded at phosphorous level of 45 kg P_2O_5 ha^{-1}, at 60 days after sowing (55 cm). The increase in plant height under phosphorus treatment might be due to effect of phosphorus in metabolism of growing plants, in its growth yield, and yield parameters. The differences between the phosphorus treatments 30 and 45 kg P_2O_5 ha^{-1} was significant and higher over control. Minimum plant height was recorded at control (P_0) kg P_2O_5 ha^{-1} (28.89 cm) at 30 days (Table 1). Therefore, it is clear that plant height responded significantly with increase levels doses of phosphorus during the experimentation.

Plant height also increased continuously and significantly with increasing levels of sulphur upto 30 kg S ha^{-1}, at all the stages of crop growth (Table 1). But the 20 kg and 30 kg sulphur did not show any significant influence on plant height and was superior over control at all the stages of crop growth. The increase in plant height under sulphur treatment might be due to effect of sulphur in metabolism of growing plants. It is directly related with cell division, enlargement and elongation. These findings endorse the results of [3,4]. Reduction in plant height at higher dose might be due to antagonistic relationship in availability and uptake of nutrients which leads to poor nutrition and growth. Similar results were obtained by [5].

Nodulation

Observations on number of nodules per plant increased significantly with increasing levels of phosphorus upto 45 kg P_2O_5/ha (Table 2). Maximum and minimum, number of nodules per plant (45.42) and (36.40) were recorded at 45 kg and 0 kg P_2O_5 ha^{-1} respectively. At all the phosphorus levels the number of nodules per plant increased significantly. Number of nodules per plant also increased with increasing levels of sulphur upto 30 kg S ha^{-1} (Table 2). Maximum values 44.71 nodule, and minimum 39.13 nodule were recorded at 0 and 30 kg S ha^{-1} respectively. However, differences between the 20 and 30 kg S $ha^{-1}$was statistically at par. The dry weight of nodules recorded maximum value of 0.39 g at 45 kg P_2O_5 ha^{-1} but the difference between 30 and 45 kg P_2O_5 ha^{-1} were found non-significant. Similarly application of increasing doses of sulphur there was increasing dry weight of nodules from control to 30 kg S ha^{-1} maximum being with 20 kg S ha^{-1} (0.37 gm) following 30 kg S ha^{-1} (0.34 gm). However, the differences between 20 and 30 kg sulphur was at par.

Maximum value of number of pods / plant was 41.90 pods and minimum value of 34.25 pods was recorded at 45 kg P_2O_5 ha^{-1}s and 0 kg P_2O_5 ha^{-1} respectively. An increase in number of pods was observed with increase in doses of phosphorus and the difference among treatments were significant.

Maximum value of grains per pod (10.06) was also observed at 45 kg P_2O_5 ha^{-1} which differed significantly from the all levels 7.23 grains per pod, recorded in control plot and was significantly lower than all the increasing levels, sulphur application also the resulted significant increase in number of grains per pod the difference between 30 kg and 20 kg S found non-significant.

Maximum grain per quintal recorded 9.64 at 30 kg S ha^{-1} and minimum is 8.41 at 0 kg S ha^{-1}. There is non-significant difference in number of grain per pod from S_{20} to S_{30}. Maximum value of 34.01 (g) 1000 grain weight was observed at 45 kg P_2O_5 ha^{-1} and minimum at (31.65 (g) at 0 Kg P_2O_5 ha^{-1}. The differences between all the

treatments were statistically at par among themselves as well as over control except S_{30} which was on application significantly superior over control 33.74 g (1000 weight grain). The minimum value was 32.44 g at 0 kg S ha^{-1}. Treatment differences were not significant among themselves as well as control with treatments upto S_{20} kg S ha^{-1}. Continuous and significant increase in grain yield was observed with increasing sulphur and phosphorus levels upto 30 kg S ha^{-1} and 45 kg P_2O_5 ha^{-1}.

Maximum value of 10.78 grain yield was recorded at 45 kg P_2O_5 ha^{-1} and minimum value of 7.32 grain yield was recorded at 0 kg P_2O_5 ha^{-1}. The treatment differences were significant among themselves as well as over control. The sulphur application showed a decline in yield at 30 kg S ha^{-1} as compared to 20 kg S ha^{-1}. The increase in grain yield was more at lower level viz., 20 kg S ha^{-1} than 30 kg S ha^{-1}. However, difference between 20 and 30 kg were found non-significant.

Maximum straw yield was recorded 26.63 at 45 kg P_2O_5 ha^{-1} and minimum 18.09 at 0 kg P_2O_5 ha^{-1}. The differences between the treatments were significant among themselves and over control. There was rise in straw yield with increasing doses of phosphorus. On increasing doses of sulphur also gradual increase in straw yield was observed but the treatment were statistically at par maximum value recorded was 23.81 at 30 kg S ha^{-1} and minimum value recorded was 20.77 at 0 Kg S ha^{-1}.

Table 2: Effect of different levels of phosphorus and sulphur on yield attributes and yield of Mungbean

Treatments	No. of nodules/plant	Dry weight of nodule (g)	No. of pods/plant	No. of grain/pod	1000-grain weight (g)	Grain yield (q/ha)	Straw yield (q/ha)
P_0 – 0 kg P_2O_5 ha^{-1}	36.40	0.30	34.25	7.27	31.65	7.32	18.09
P_{15} – 15kg P_2O_5 ha^{-1}	40.35	0.33	38.07	8.34	32.83	8.83	21.79
P_{30}–30 kg P_2O_5 ha^{-1}	44.81	0.38	40.58	9.41	33.94	9.46	23.35
P_{45} – 45 kg P_2O_5 ha^{-1}	45.42	0.39	41.90	10.06	34.01	10.78	26.63
S. Em. $\pm$	0.90	0.01	0.84	0.13	0.72	0.20	0.51
C.D. at 5%	1.84	NS	1.71	0.25	1.47	0.42	1.03
S_0 – 0 kg S ha^{-1}	37.53	0.31	35.52	6.98	32.44	8.41	20.77
S_{10} – 10 kg S ha^{-1}	41.20	0.34	38.24	8.57	32.78	8.99	22.21
S_{20} – 20 kg S ha^{-1}	43.54	0.37	39.90	9.49	33.47	9.34	23.06
S_{30} – 30 kg S ha^{-1}	44.71	0.38	41.13	10.03	33.74	9.64	23.81
S. Em. $\pm$	0.90	0.01	0.84	0.13	0.72	0.20	0.51
C.D. at 5%	1.84	NS	1.71	0.25	1.47	0.42	1.03

CONCLUSION

The application of 30 kg S ha^{-1} and 45 kg P_2O_5 kg ha^{-1} is suitable for the getting higher production and increasing soil fertility by the process of nitrogen fixation .

Acknowledgement
Author is thankful to Head of Department Soil Science and Agricultural Chemistry for the providing necessary facility to carry out this work.

REFERENCES

[1] Mozumdar, S.N.; Salim, M; Islam, N, Nazrul M.I. and Zaman, M.M. *Asian Journal of Plant Sciences* .**2003**,**2**, 817-822.
[2] Singh, G., Sekhon, H.S.; Ram, H. and Sharma, P., *Indian Journal of Ecology* **2008**,**35** , 28-30.
[3] Pasricha, N.S. and Randhawa, N.S. , *Indian J. Agric. Sci*, **1973**,.**43** , 270-274.
[4] Pathak, R.K. and Tripathi, R.D. , *Indian J. Agric. Chem.*,**1979**, **2** , 12-15.
[5] Singh, N. and Rao, D.N., *Acta Botanica* India, (**1986**). , **4** (2) , 230-235.