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Effect of Phosphorus and Zinc on Yield and Quality of Green Gram (*Vigna Radiata* L.) in Inceptisol

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Abstract:
The field experiment was carried out on "Effect of phosphorus and zinc on yield and quality of green gram (*Vigna radiata* L.) in inceptisol" during *kharif* season of the year 2017-18 at the Research farm of College of Agriculture, Latur. The experiment was laid in randomized block design with three replications and variety BPMR-145 as a test crop along with ten treatments. The results of field study indicated that the yield and quality of green gram were significantly influenced by application of phosphorus and zinc. The yield attributing character *viz*. seed yield, straw yield and quality parameters such as protein content, protein yield and test weight of seed in green gram were significantly improved in treatment T_9 (100% N +50 kg P_2O_5+ 25 kg $ZnSO_4$ ha^{-1}) followed by T_8 (100% N +40 kg P_2O_5+ 25 kg $ZnSO_4$ ha^{-1}). Thus, it can be concluded that application of phosphorus @ 50 kg ha^{-1} along with 25 kg $ZnSO_4$ ha^{-1} recorded significantly superior in yield and quality of green gram as compare to alone application of phosphorus @ 60 kg ha^{-1} on low content of N, P and Zn inceptisol.

I. INTRODUCTION

Green gram is an important pulse crop of India and believed to originated from India. It belongs to family *Leguminoceae* and sub family *Papilionaceae*. Green gram is scientifically known as (*Vigna radiata* L.) and commonly known as mung bean. The calorific value of green gram is 334 cal/100 g and chemically it contains crude protein 25%, fat 1.3%, carbohydrates 56.6%, minerals 3.5%, lysine 0.43%, methionine 0.10%, calcium 124 mg phosphorus 3.26 mg and iron 7.3 mg.

Green gram is short duration pulse crop which contains 25 per cent protein of high digestibility and has appreciable amount of riboflavin and thiamine. The root nodule of moonbeam contain aerobic bacteria rhizobia which fix atmospheric nitrogen in the root. It is also used as green manure crop which improves physical condition and fertility of soil. Phosphorus is essential constituent of majority of enzyme which are of great importance in the transformation of energy in carbohydrates metabolism and also in respiration. P is closely related to cell division and development. Zinc influences the formation of growth hormones and helpful in reproduction of certain plants. Hence, this study was taken on priority to see the influence effect of different levels of phosphorus and zinc on yield and quality of green gram in inceptisol.

II. MATERIAL AND METHODS

A field experiment was conducted on deep soil, black in colour, with good drainage at Departmental research farm of Soil Science and Agricultural Chemistry, College of Agriculture, Latur during *Kharif* 2017-2018 on green gram Cv. BPMR-145.

The experimental soil was clayey in texture, slightly alkaline reaction, low in available nitrogen, available phosphorous, DTPA zinc and high in available potassium. The experiment was laid in randomized block design with three replications and variety BPMR-145 as a test crop along with ten treatments. In order to evaluate the effect of different level of phosphorus and zinc on yield and quality of green gram in inceptisol with various treatment *viz*.

T_1-Absolute control, T_2- 25 kg $ZnSO_4$ ha^{-1}, T_3- 100% N+30 kg P_2O_5 ha^{-1}, T_4 -100% N+40 kg P_2O_5 ha^{-1},T_5-100% N+50 kg P_2O_5 ha^{-1},T_6-100% N+60 kg P_2O_5 ha^{-1}, T_7-100% N+30 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1},T_8-100% N+40 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1},T_9-100% N+50 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1},T_{10}-100% N+60 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1}.N, P and Zn were applied through urea, single super phosphate and zinc sulphate at the time of sowing. The method for application of fertilizer was band placement. With Spacing Row to Row 30 cm and Plant to Plant 10 cm.

III. RESULTS AND DISCUSSION

Data on effect of phosphorus and zinc on straw yield and grain yield was tabulated in Table 1. Data indicated that the application of P and Zn markedly influence the straw yield in the range of (2036.60-2655.37 kg ha^{-1}) and grain yield in the range of (1131.37-1356.67 kg ha^{-1}).

The single application of various level of phosphorus significantly increased the straw yield and grain yield. Maximum straw yield and grain yield was found under the treatment (T_6) -100% N + 60 kg P_2O_5 ha^{-1} (2464.73 kg ha^{-1} and 1325.18 kg ha^{-1}) followed by (T_5)-100% N + 50 kg P_2O_5 ha^{-1}(2424.42 kg ha^{-1} and 1300.08 kg ha^{-1}) in green gram crop over control. The combined application of different level of phosphorus along with zinc enhanced the straw and grain yield of green gram. Maximum straw and grain yield obtained in treatment (T_9) -100% N + 50 kg P_2O_5 ha^{-1} + 25 kg $ZnSO_4$ ha^{-1} (2655.37 kg ha^{-1} and 1356.67 kg ha^{-1}) which is significantly superior followed by (T_8)-100% N + 40 kg P_2O_5 ha^{-1}+ 25 kg $ZnSO_4$ ha^{-1} (2493.33 kg ha^{-1} and 1338.33 kg ha^{-1}) in green gram crop over control. This shows symbiotic relationship between phosphorus and zinc.

Table.1. Effect of phosphorus and zinc on straw yield and grain yield of green gram

Treatment	Straw yield (kg ha^{-1})	Grain yield (kg ha^{-1})
T_1:Absolute control	2036.60	1131.37
T_2:25 kg $ZnSO_4$ ha^{-1}	2310.10	1210.25
T_3:100 % N + 30 kg P_2O_5 ha^{-1}	2352.10	1237.37
T_4:100 % N + 40 kg P_2O_5 ha^{-1}	2388.04	1257.15
T_5:100 % N + 50 kg P_2O_5 ha^{-1}	2424.42	1300.08
T_6:100 % N + 60 kg P_2O_5 ha^{-1}	2464.73	1325.18
T_7:100 % N + 30 kg P_2O_5 ha^{-1} + 25 kg $ZnSO_4$ ha^{-1}	2440.00	1285.65
T_8:100 % N + 40 kg P_2O_5 ha^{-1} +25 kg $ZnSO_4$ ha^{-1}	2493.33	1338.33
T_9:100 % N + 50 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1}	2655.37	1356.67
T_{10}:100 % N + 60 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1}	2374.48	1220.67
S.E±	55.48	9.10
CD @ 5%	164.86	27.05

As increase in phosphorus dose from 50 to 60 kg ha^{-1} there was decrease in straw yield. This decrease in yield shows that negative effect between P and Zn. Phosphorus increases yield due to its well developed root system, increased N fixation and its availability to the plants and favourable environments in the rhizosphere by reducing the pH leading to higher nutrient availability of various insoluble inorganic and organic phosphorus present in the soil and zinc also play an important role in metabolic processes which improved straw and grain yield. Similar results were also reported by Balai *et al*. (2017) observed that higher seed yield (1588 kg ha^{-1}) obtained with application 40 kg P_2O_5 in combination with 6.0 kg Zn ha^{-1}.The increase in seed yield due to phosphorus application is attributed to source and sink relationship. It appears that greater translocation of photosynthates from source to sink might have increased seed yield. Data pertaining to effect of phosphorus and zinc on protein content and protein yield is presented in Table 2. Data shows that the application of P and Zn enhance the protein content and protein yield in the range of (21.00-24.18%) and (237.51-328.55 kg ha^{-1}) respectively in green gram crop over control.

Table .2. Efficiency of phosphorus and zinc on protein content and protein yield of green gram

Treatment	Protein content %	Protein yield (kg ha^{-1})
T_1:Absolute control	21.00	237.51
T_2:25 kg $ZnSO_4$ ha^{-1}	21.25	257.63
T_3:100 % N + 30 kg P_2O_5 ha^{-1}	22.00	272.74
T_4:100 % N + 40 kg P_2O_5 ha^{-1}	22.30	280.04
T_5:100 % N + 50 kg P_2O_5 ha^{-1}	22.48	292.91
T_6:100 % N + 60 kg P_2O_5 ha^{-1}	23.13	306.81
T_7:100 % N + 30 kg P_2O_5 ha^{-1} + 25kg $ZnSO_4$ ha^{-1}	23.00	295.21
T_8:100 % N + 40 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1}	23.71	317.48
T_9:100 % N + 50 kg P_2O_5 ha^{-1}+25 kg $ZnSO_4$ ha^{-1}	24.18	328.55
T_{10}:100 % N + 60 kg P_2O_5 ha^{-1}+25kg $ZnSO_4$ ha^{-1}	22.96	280.20
S.E±	0.27	8.56
CD at 5%	0.81	25.44

The single application of various level of phosphorus significantly increased the protein content and protein yield. Protein content and protein yield in treatment (T_6) -100% N + 60 kg P_2O_5 ha^{-1} (23.13% and 306.81 kg ha^{-1}) was found superior followed by (T_5)-100% N + 50 kg P_2O_5 ha^{-1} (22.48% and 292.91 kg ha^{-1}) in green gram crop over control. The combined application of different level of phosphorus along with zinc enhanced the protein content and protein yield of green gram. Maximum protein content and protein yield obtained in treatment (T_9) -100% N + 50 kg P_2O_5 ha^{-1} + 25 kg $ZnSO_4$ ha^{-1} (24.18% and 328.55 kg ha^{-1}) followed by (T_8)-100% N + 40 kg P_2O_5 ha^{-1}+ 25 kg $ZnSO_4$ ha^{-1} (23.71% and 317.48 kg ha^{-1}) in green gram crop over control as compared to single application of $ZnSO_4$ over control and other treatment. Increased protein content and protein yield due to P solubilizers, might be attributed to enhanced nitrogen fixation to be utilized by the plant along with adequate supply of phosphorus, therefore, enhancing the protein synthesis in the plant and its higher concentration in the grain. The increase in protein content with Zn addition may be attributed to its involvement in N metabolism. Similar results were in conformity with the findings of Patel *et al*. (2017) observed that significantly higher protein content (19.34%)and protein yield (226.20 kg ha^{-1}) of green gram were produced with the 40 kg P_2O_5 ha^{-1} over control. Protein content is essentially the manifestation of nitrogen content in seed. Hence, increase in nitrogen content of seed might have increased the protein content with increasing levels of phosphorus application.

Chesti *et al*. (2012) observed that increasing level of P_2O_5 upto 30 kg ha^{-1} increase in protein content of green gram.

IV. CONCLUSION

The result indicated that yield and quality parameters of green gram were significantly influenced by application of phosphorus and zinc. The yield parameters *viz.*, straw yield and grain yield of green gram were significantly improved in treatment T_9 (100% N +50 kg P_2O_5+ 25 kg $ZnSO_4$ ha^{-1}) followed by T_8 (100% N +40 kg P_2O_5+ 25 kg $ZnSO_4$ ha^{-1}). Whereas, quality parameters such as protein content and protein yield of seed in green gram were also increased. Thus, it can be concluded that application of phosphorus @ 50 kg ha^{-1} along with 25 kg $ZnSO_4$ ha^{-1} recorded significantly superior in yield and quality of green gram as compare to alone application of phosphorus @ 60 kg ha^{-1} on low content of N, P and Zn inceptisol.

V. REFERENCES

[1]. A.OA.C. (1975) Official method of analysis. Ed.12, Association of Official 1984 Analytical chemist, Washington, D.C.

[2]. Balai, K., Jajoria, M., Verma, R., Deewan, P., Barwa, S. K. (2017) Nutrient content, uptake, quality of chickpea and fertility status of soil influenced by fertilization of phosphorus and zinc *JPP*, **6** (1);392-398.

[3]. Chesti, M. H., Ali, T., Bhat, M. A. (2012) Effect of organic and inorganic phosphorous sources on quality of green gram (*Vigna radiate* L.) under temperate conditions of *jammu and Kashmir Legume Res*. **35** (11):47 49.

[4]. Patel, H. B., Shah, K. A., Barvaliya, M. M., Patel, S. A. (2017) Response of green gram (*Vigna radiate* L.) to different level of phosphorus and organic liquid fertilizer *Int. J. Curr. Microbial. App. Sci*, **6** (10); 3443-3451.