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ORIGINAL ARTICLE

Effect of Phosphorus and Zinc application on yield and yield attributes of green gram (*Vigna Radiata L.*)

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ABSTRACT
To study the influence of different levels of phosphorous and zinc on yield and yield attributes of mung bean (Vigna Radiata. L) an experiment was conducted atCrop Research Farm, RRS, FAO Wadura Sopore . Four phosphorus (P) levels (0, 15, 20 and 25 kg P ha-1) and three zinc (Zn) levels (0, 1.5 and 3 kg Zn ha-1) were used in the study. The results of the study shown that stover and seed yield of mung bean improved with increasing phosphorus and zinc levels up to positive level. For instance, of Phosphorous the significant maximum stover yield (25.9 qt ha-1) and seed yield (15.3 qt ha-1) were obtained with the treatment P3 (25kg P ha-1) and the significant minimum stover yield (20.8 qt ha-1) and minimum seed yield (14.3 qt ha-1) were obtained with the treatment P0 (0kg P ha-1). In case of Zn the significant maximum stover yield (27.7 qt ha-1) and maximum seed yield (17.7 qt ha-1) were obtained with the treatment Zn2 (4 kg Zn ha-1) and the significant minimum stover yield (21.9 qt ha-1) and minimum seed yield (13.8 qt ha-1) were achieved with the treatment Zn0 (0 kg Zn ha-1). The significant maximum number of branch plant-1 (3.32), taller plant (53.45cm), seed yield (19.4 qtha-1), number of pods plant-1 (20.89), 1000 seeds weight (45.66 g) and number of seeds pod-1 (12.98) were achieved with the treatment combination P2Zn2 (20 kg P ha-1+ 3 kg Zn ha^{-1}).
Keywords: Green gram, phosphorous and zinc,

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INTRODUCTION

Legume is widely recognized to be a symbol of agricultural economy, being a major source of protein for vegetarian human diet and improve the soil fertility by their nitrogen fixing capability. Pulses contain a higher percentage of quality protein nearly three times as much as cereals, thus they are a cheaper source to overcome protein malnutrition among human being. Mung bean (*Vigna radiata* L.) is an excellent source of easily digestible protein and is one of the chief pulse crop . It belongs to the family Leguminosae. It is considered as poor man's meat containing almost triple amount of protein as compared to rice. It contains 50.4% carbohydrates, 3.5-4.5% fibers, 1-3% fat and 4.5-5.5% ash, while phosphorus and calcium are 367 and 132 mg per 100 grams of seed, respectively . Hence, on the nutritional point of view, mung bean is perhaps the best of all other pulses . Due to short duration of mung bean it can fit as a cash crop between major cropping seasons. Mung bean cultivation can advance the physical, biological and chemical properties of soil as well as enhance fertility of soil through nitrogen fixation by symbiotic process with the help of micro-symbionts (Rhizobium). Phosphorus is a key constituent of ATP and it plays a significant role in the energy transformation in plants . And also essential for energy storage and release in living cells. The Zn essentially is being employed in functional and structural component of several enzymes, such as carbonic anhydrase, alcohol dehydrase, alkaline phosphatase, phospholipase, carboxypeptidase and RNA polymerase . Further, plants emerging from seeds with lower Zn could be highly sensitive to biotic and abiotic stresses . Zn enriched seeds performs better with respect to seed germination, seedling growth and yield of crops .Thus, the present study is aimed at following objectives to determine the effects of phosphorus and Zinc on the growth and yield of mung bean and to study the combine effect of phosphorus and zinc on growth and yield of mungbean .

MATERIAL AND METHODS

A plot experiment was undertaken at SKUAST -K RRS/FOA wadura, Sopore, during kharif season for the two consecutive years. Composite soil sample collected from the field to a depth of 0-15 cm were air dried, grinded and passed through 2mm sieve for physical and chemical analysis. The soil used for cultivation of the crop was clay loam in texture, with ph of 7.2, O.C 0.6mg/kg and CEC of 14.7c mol (P^{-1}) kg. The experiments were laid out in factorial randomized block design with three replications. The variety tested was (Shalimar moong-1). The results of the study shown that stover and seed yield of mung bean improved with increasing phosphorus and zinc levels up to positive level. For instance, of Phosphorous the significant maximum stover yield (25.9 qt ha-1) and seed yield (15.3 qt ha-1) were obtained with the treatment P3 (25kg P ha-1) and the significant minimum stover yield (20.8 qt ha-1) and minimum seed yield (14.3 qt ha-1) were obtained with the treatment P0 (0kg P ha-1). In case of Zn the significant maximum stover yield (27.7 qt ha-1) and maximum seed yield (17.7 qt ha-1) were obtained with the treatment Zn2 (3 kg Zn ha-1) and the significant minimum stover yield (21.9 qt ha-1) and minimum seed yield (13.8 qt ha-1) were achieved with the treatment Zn0 (0 kg Zn ha-1). The significant maximum number of branch plant-1 (3.32), taller plant (53.45cm), seed yield (1.94 t ha-1), yield supporting factors as number of pods plant-1 (20.89), 1000 seeds weight (45.66 g) and number of seeds pod-1 (12.98) were achieved with the treatment combination P2Zn2 (20 kg P ha-1 + 3 kg Zn ha-1).. The experiment comprised of two factors: Factor A: Phosphorus (P), P0= No P ha1, P1=15 kg P ha-1, P2= 20 kg P ha-1 and P3= 30 kg P ha-1; Factor B: Zinc (Zn), Zn0= No Zn ha-1, Zn1=1.5 kg Zn ha-1 and Zn2=3 kg Zn ha-1. 12 treatment combinations were arranging from these levels. Recommended doses of K, N and Sulphur (, 30 kg K from MoP, 20kg N from urea and 15 kg S ha-1 from Gypsum, respectively) were applied. The basal dose of whole amounts of MoP, Gypsum and half of total Urea fertilizer were applied during land preparation. The rest of the fertilizer urea was given after 28 days of seed sowing. The required amounts of P and Zn were applied at a time as per treatment combination after field layout of the experiment and were mixed properly through hand spading . The harvested crop of each plot was bundled separately. Ten plants from each plot were selected as random and were tagged for the data collection. Data were collected at harvesting stage.

RESULTS AND DISCUSSION

Influence of Phosphorus on Growth and Yield of Mung Bean:

Mung bean plants revealed significant variation in respect of plant height, number of branches plant-1, number of pods plant-1, number of seeds pod-1, Pod length, 1000 seeds weight, seed yield (qt ha-1) and stover yield (qt ha-1) when phosphorus application in different dosages were applied (Table 1). Plant height, number of branches plant-1, number of pods plant-1, number of seeds pod-1, Pod length and thousand seeds weight were increased with P levels from 0-20 kg ha-1. The taller plant (50.02cm), number of branches plant-1 (2.85), number of pods plant-1 (20.75) and number of seeds pod-1 (13.31) were achieved with the application of 20 kg P ha-1. On the other hand, the shorter plant (43.1cm), number of branches plant-1 (1.78), number of pods plant-1 (15.03) and number of seeds pod-1 (10.40) were observed where no application of phosphorous. The result is approved with the findings of Kumar et al. [13]. Pod length and weight of 1000-seeds as affected by different doses of phosphorus showed significant variation statistically. Among the different doses of Phosphorous the highest pod length (9.44cm) and thousand seeds weight (45.33g) was observed in P2 (20 kg P ha-1). The lowest pod length (7.43cm) and thousand seeds weight (42.23g) were observed where no phosphorous fertilizers were applied i.e. P0. The result is similar with the outcomes of Kumar et al . Who detected significant increase in pod length, number of grains pod-1, 1000 seeds weight, seed yield, and Stover yield of mung bean due to the application of increasing level of Phosphorous fertilizer. Seed yield and stover yield was also found significant by different doses of Phosphorous been applied (Tables 1-3). The highest seed yield (15.4 qt ha-1) was recorded in P2 (20 kg P ha-1) but the highest stover yield (25.9 qt ha-1) was recorded in P3 (30 kg P ha-1) treatment. The lowest seed yield (14.3 qt ha-1) and stover yield (20.8 qt ha-1) of mung bean was recorded where no phosphorous application was applied i.e. P0. There was no significant difference between P2 and P3 treatments. The result is fixed with the findings of Oad et al. who recorded significant increase in grain yield, and straw yield of mung bean by the application of 100 kg P fertilizer.

Effect of Zinc on Growth and Yield of Mung Bean:

Mung bean crop revealed significant variation for plant height, number of branches plant-1, number of pods plant-1, number of seeds pod-1, pod length, 1000 seeds weight, seed yield and stover yield. Different dosages of zinc were applied. Among zinc fertilizer dosages, Zn2 (3 kg Zn ha-1) showed the taller plant (50.55 cm), number of branches plant-1 (2.54), number of pods plant-1 (19.11) and number of seeds pod-1 (11.70). On the divergent, the shorter plant (46.80 cm), number of branches plant-1 (2.01), number of pods plant-1 (15.34) and number of seeds pod-1 (10.14) was noted in the treatment where no application of zinc was practiced. Islam et al. noticed significant increase in plant height, number of branches plant-1, number of pods plant-1 and number of seeds pod-1 of mung bean due to the application of 0.3% - 0.6% ZnO solution. Among the different Zn doses, Zn2 (3 kg Zn ha-1) showed the highest pod length (9.43cm) and 1000 seeds weight (42.86g). On contrary, the lowest pod length (8.04cm) and 1000 seeds weight (38.22 g) was noted where no application of zinc practiced i.e. Zn0. Islam et al. recorded significant increase in length of pod of mung bean due to the application of 0.3% - 0.6% ZnO solution. Among the zinc fertilizer dosages, Zn2 (3 kg Zn ha-1) gave the highest seed yield (17.7 qt ha-1) and stover yield (27.7 qt ha-1) of mung bean. On the other hand, the lowest seed yield (l3.8 qt ha-1) and stover yield (21.9 qt ha-1) of mung bean were found in Zn0 where no Zn fertilizer was applied. Zn1 and Zn2 were statistically similar in case of stover yield.

Table 1: Influence of phosphorous on parameters of growth.

Levels of P (Kg ha^{1})	Plant height (cm)	No. of branches Plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	pod length (cm)	1000 seeds weight (g)	Seed yield (qt ha^{-1})	Stover yield (qt ha^{-1})
P0	43.11	1.78	15.03	10.40	7.43	42.23	20.8	20.8
P1	47.83	2.44	17.23	11.43	8.32	43.87	14.8	23.1
P2	50.02	2.85	20.75	13.31	9.44	45.33	15.4	25.8
P3	48.93	2.66	18.97	10.69	8.34	42.17	15.3	25.9
CD (0.05)	1.22	0.071	0.76	0.48	0.44	1.18	0.069	0.082

Table 2: Influence of zinc on parameters of growth:

Levels of P (Kg ha^{-1})	Plant height (cm)	No. of branches Plant^{-1}	No. of pods plant^{-1}	No. of seeds pod^{-1}	pod length (cm)	1000 seeds weight (g)	Seed yield (qt ha^{-1})	Stover yield (qt ha^{-1})
Zn0	46.80	2.01	15.34	10.14	8.04	38.22	13.8	21.9
Zn1	48.32	2.43	16.43	10.92	8.78	40.48	16.5	23.0
Zn2	50.55	2.54	19.11	11.70	9.43	42.86	17.7	27.7
CD (0.05)	1.22	0.09	0.82	0.53	0.76	1.96	0.06	0.06

Table 3: Interactive effect of phosphorous and zinc on yield and yield attributes of mung bean:

Interaction of P and Zn	Plant height (cm)	No. of branches Plant-1	No. of pods plant-1	No. of seeds pod-1	pod length (cm)	1000 seeds weight (g)	Seed yield (qt ha^{-1})	Stover yield (qt ha^{-1})
P0Zn0	41.55	1.58	14.06	8.74	6.43	38.98	10.9	20.6
P0Zn1	42.17	2.09	14.65	9.42	6.87	39.67	11.5	20.4
P0Zn2	43.44	1.98	15.43	10.30	7.12	41.57	11.8	21.5
P1Zn0	45.66	2.54	15.59	9.97	7.27	40.80	12.0	21.6
P1Zn1	46.33	2.76	16.64	10.94	7.28	42.00	13.0	21.7
P1Zn2	49.32	2.90	18.54	11.34	8.27	43.32	14.3	24.2
P2Zn0	49.09	2.79	17.86	10.59	7.95	42.08	14.2	23.8
P2Zn1	52.21	3.12	19.37	12.95	9.94	43.25	14.8	25.4
P2Zn2	53.45	3.32	20.89	12.98	10.57	45.66	19.4	26.9
P3Zn0	49.98	2.79	17.04	10.58	8.44	42.07	14.2	25.3
P3Zn1	50.39	2.87	17.48	11.03	8.96	43.70	15.3	25.9
P3Zn2	49.07	2.60	18.46	10.91	9.27	43.33	16.4	26.8
CD (0.05)	1.23	0.09	0.98	0.52	0.63	1.17	0.073	0.072

Effect of Phosphorous and Zinc on Yield and Yield Attributes of Mung Bean :

Mutual application of dosages of phosphorus and zinc revealed significant effect on the plant height, number of branches plant-1, number of pods plant-1, number of seeds pod-1, pod length, thousand seeds weight, seed yield and stover yield of mung bean. The shorter plant (41.55cm), number of branches plant-1 (1.58), number of pods plant-1 (14.06) and number of seeds pod-1 (8.74) were observed where no phosphorous and zinc application applied i.e. P0Zn0. On the contrary the taller plant (53.45 cm), number of branches plant-1 (3.32), number of SS pods plant-1 (20.89) and number of seeds pod-1 (12.98) were noted in P2Zn2 (20 kg P ha-1 + 3 kg Zn ha-1) treatment combination. Ahmed et al. recorded significant increase in plant height, number of branches plant-1, number of pods plant-1 and number of seeds pod-1 of mung bean due to the increasing application level of P and Zn. The highest pod length (10.57cm) and thousand seeds weight (45.66g) were noticed in P2Zn2 (20 kg P ha-1+ 4 kg Zn ha-1) treatment combination. On the divergent, the lowest pod length (6.43 cm) and 1000 seeds weight (38.98g) were noted in P0Zn0. Singh et al. recorded significant increase in pod length and thousand seeds weight of mung bean due to the increasing application levels of P fertilizer. The highest seed yield (19.4 qt ha-1) and stover yield (26.9 qt ha-1) of mung bean were verified with the treatment combination of P2Zn2 (20 kg P ha-1 + 3 kg Zn ha-1). On the other hand, the lowest seed yield (1.09 t ha-1) and stover yield (2.06 t ha-1) of mung bean were recorded in P0Zn0 and P0Zn1 (No P and 1.5kg Zn) treatment combinations, respectively. Singh and Bajpai found that P and Zn enhance significantly the grain as well as stover yields of chickpea.

REFERENCES

1. Ahmed AU, S Rahman, Begum, NMS Islam (1986) Effect of phosphorus and zinc application on the growth, yield and P, Zn and protein content of mung bean. J Indian Soc Soil Sci 34(2): 305-308.
2. Bukvić1, G., M. Antunović, S. Popović, M. Rastija, (2003). Effect of P and Zn fertilization on biomass yield and its uptake by maize lines (Zea mays L.), Plant Soil Environ, 49(11):505-510.
3. Cakmak, I., 2008. Enrichment of cereal grains with zinc: Agronomic or genetic biofortification? Plant Soil, 302:1-17.
4. Cakmak, I., H. Marschner, F. Bangerth, (1989). Effect of zinc nutritional status on growth, protein metabolism and levels of indole-3-acetic acid and other photo hormones in bean (Phasseolus vulgaris). Journal of Experimental Botany, 40:405-412.
5. Carolina, A., F.D. Vasconcelos, C. Williams, A. Nascimento, F.C.F. Fernando, 2011. Distribution of zinc in maize plants as a function of soil and foliar Zn supply .International Research Journal of Agricultural Science, 1(1):001-005.
6. Das, K., R. Dang, T.N. Shivananda, P. Sur, (2005). Interaction between phosphorus and zinc on the biomass yield and yield attributes of the medicinal plant stevia (Stevia rebaudiana). Science World Journal, 5:390–395.
7. Gokhan, H., L. Ozturk, I. Cakmak, R.M. Welech, L.V. Kochian, 2003. Genotypic variation in common bean in response to zinc deficiency in calcareous soil. Plant and Soil, 176: 265-272.
8. Islam MS, MSU Bhuiyan, MG Miah (1989) Effect of zinc on lentil yield and yield components. Lens-Newsletter 16(1): 30-32.
9. Khorgamy, A., A. Farnia, (2009). Effect of phosphorus and zinc fertilisation on yield and yield components of chick pea cultivars. African Crop Science Conference Proceedings, 9: 205-208.
10. Kumar R, YV Singh, S Singh, AM Latare, PK Mishra, et al. (2012) Effect of phosphorus and sulphur nutrition on yield attributes, yield of mung bean (Vigna radiata L. Wilczek). J Chem and Pharma Res 4(5): 2571- 2573.
11. Mousavi, S.R., M. Galavi, G. Ahmadvand, 2007. Effect of zinc and manganese foliar application on yield, quality and enrichment on potato (Solanum tuberosum L.). Asian Journal of Plant Sciences, 6: 1256-1260.
12. Oad FC, AN Shah, GH Jamro, SH Ghaloo (2003) Phosphorus and potassium requirements of mung bean (Vigna radiata). J Applied Sci 3(6): 428-431.
13. Rengel, Z., R.D. Graham, 1995a. Importance of seed Zn content for wheat grown on Zn defiant soil grain yield. Plant and Soil, 176: 317-324.
14. Rengel, Z., R.D. Graham, 1995b. Importance of seed Zn content for wheat grown on Zn defiant soil vegetable growth. Plant and Soil, 176: 217-224.
15. Salimpour, S., K. Khavazi, H. Nadian, H. Besharati, M. Miransari, (2010) Enhancing phosphorous availability to canola (Brassica napus L.) using P solubilizing and sulfur oxidizing bacteria, Australian Journal of Crop Science, 4(5): 330-334.
16. Singh AP, RK Chaudhur, RPR Sharma (1993) Effect of inoculation and fertilizer levels on yield, nutrient uptake and economics of summer pulses. J Potassium Res 90: 176-178.
17. Singh G, MR Bajpai (1982) Response of Chikpea to P and foliar application of Zinc and sulphuric acid. Indian Agric Sci 52(12): 835- 837.
18. Webb, M.J., J.F. Loneagan, 1988. Effect of zinc deficiency on growth, phosphorus concentration and phosphorus toxicity of wheat plants. Soil Science Society of America, 52: 1676-1680.
19. Yosefi, K., M. Galavi, M. Ramrodi, S.R. Mousavi, (2011). Effect of bio-phosphate and chemical phosphorus fertilizer accompanied with micronutrient foliar application on growth, yield and yield components of maize (Single Cross 704). Australian Journal of Crop Science, 5(2): 175-180.

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