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Response of broad bean (*vicia faba l.*) to phosphorus and molybdenum

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Abstract

Broad bean (Vicia faba L.) is one of the major leguminous crops grown in the world. A field experiment was conducted to investigate of different phosphorus and molybdenum fertilizer sources and their importance in broad been were carried out in the experiment of research farm in Raja Balwant Sing College, Bichpuri, Agra during rabi seasons. The aim of this study was to determine the effect of four levels phosphorus (0, 30, 60, and 90 kg ha^{-1}) and four levels of molybdenum (Mo) 0, 1.0, 2.0, and 3.0 kg ha^{-1}) on yield, and yield attribute of broad bean. The plant height, No. of pods plant^{-1}, no of grain pod^{-1}, grain and stover yield of broad bean increased significantly with each level of phosphorus as compared to control. The maximum plant height No. of pods plant^{-1}, no of grain pod^{-1}, grain and stover yield of broad bean were noted under highest level of phosphorus @ 90 kg ha^{-1}. The plant height, No. of pods plant^{-1}, no of grain pod^{-1}, grain and stover yield of broad bean were increased affected significantly by the levels of molybdenum .The plant height no. of pods plant^{-1}, no of grain pod^{-1}, grain and stover yield of broad bean increased significantly with M_3 @ 3 Kg ha^{-1} level of molybdenum over control.

Keywords: Phosphorus, Molybdenum, Yield attribute of broad bean

Introduction

Phosphorus is essential element required for plant growth and root development. It is found in every living cell of the plant and animals. It is known to be associated with several vital functions in the plant body such has utilization of sugar and starch, photosynthesis, nuclear formation, cell division, fat and albumin formation, cell organization and transfer of the heredity, the availability of phosphorus from soil to plants depends upon the equilibrium adjustment around the root zone. The equilibrium is influenced mainly by salt concentration pH, Calcium Carbonate, Nature of exchangeable complex and organic matter. The essential role played by trace elements in nutrition and metabolism of plants is established beyond any controversy. Molybdenum, one of the important members of this group is of special significance due to its contribution in activation of several enzyme systems and physiological activities encountered inside the plant body. Molybdenum is a constituent part of the enzyme nitrate reductase concerned with the reduction of nitrate to nitrite in both microorganisms and higher plants. It is also known to be specific inhibitor for acid phosphates. Deficiency of molybdenum has also been shown to decrease the concentration of sugar, particularly reducing sugars, suggesting an involvement of molybdenum in carbohydrate metabolism. On the other hand, besides nitrogen, phosphorus and molybdenum application has been of farmer's interest for proper nodulation and increasing fodder production. Anderson (1956) concluded that phosphorus and sulphur deficiencies often occur in the same conditions as that of molybdenum deficiency and no response to molybdenum most legume crops. In the eastern part of the United States, at succeeds without the addition of time. *Vicia hirsute* and *Vicia faba* are found in cultivated areas as need in Uttar Pradesh, Madhya Pradesh, West Bengal and Bihar. Even these are grown in Nepal and up to 2,000 M. of the Nilgiris. In India, garden bean (*Vicia faba L.*) and hairy Vetch (*Vicia hirsute*) seed should be sown in succession from the middle of September to the end October the seed should be soaked in warm water for 6 to 8 hours before sowing. The chemical analysis indicates that the broad bean is comparable in feeding value to cover and other legume crops. The protein content of hay usually ranges from 12 to 20 percent, depending upon the stage of development of the crop when out.

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Materials and Methods

The field experiments were conducted at the Agriculture Research farm of R.B.S. College Bichpuri, Agra (located in semi arid or gray steppe arid region of South-Western Uttar Pradesh. the intersect of 27.2 0 N attitude and 77.9 ^{0}E longitude), during two consecutive rabi seasons of 2007-08 and 2008-09 on sandy loam soil. The soil had EC 0.16 dSm^{-1}, pH 8.4, organic carbon 3.4 g kg^{-1}, available N 170, P 9.4, K 111 kg ha^{-1}, and molybdenum 0.05 mg kg^{-1}. The experiment was laid out in randomised block design with four levels of phosphorus (control, 30, 60 and 90 kg P_2O_5 ha^{-1}) and four levels of molybdenum (control, 1.0, 2.0 and 3kg ha^{-1}) with three replications. The recommended doses of N and K @ 25 and 60 kg K_2O ha^{-1}, respectively were applied as urea and muriate of potash. Phosphorus and molybdenum were supplied through single super-phosphate and ammonium molybdate as per treatments. The broad bean was sown on Oct. 25, 2007 and Oct. 27, 2008 and irrigated at the proper time as judged by the appearance of soil and crop. The weeds were eradicated time to time from the crop. The crop was harvested on maturity.

Results and discussion

Plant height:

The plant height of broad bean significantly affected by phosphorus application. The plant height of broad bean increased significantly with each level of phosphorus as compared to control. The maximum plant height of broad bean was noted under highest level of phosphorus @90 kg ha^{-1}. Similarly, the enhancement in plant height of broad bean with P_1 (30 Kg ha^{-1}), P_2 (60 Kg ha^{-1}) and P_3 (90 Kg ha^{-1}) levels of phosphorus over control were 4.05, 7.92, and 12.10 percent respectively during pooled data of two years. These results are in agreement with the opinion of Singh et al (2008). The plant height of broad bean increased affected significantly by the levels of molybdenum the plant height of broad bean increased significantly with M_3 @ 3 Kg ha^{-1} level of molybdenum over control. On the basis of pooled data, the increases in plant height of board bean with M_1 (1 Kg ha^{-1}), M_2 (2 Kg ha^{1}) and M_3 (3 Kg ha^{-1}) over control were 6.58, 14.16, and 17.74% respectively. Our findings are in agreement with those of Maurya et al (1992).

Number of pods plant^{-1}:

The number of pods $plant^{-1}$ of broad bean significantly affected by phosphorus application. The number of pods $plant^{-1}$ increased significantly with the application of P_3 @ 90 Kg ha^{-1} as compared to control. The maximum no. of pods $plant^{-1}$ of broad bean was noted under highest level of phosphorus @ 90 Kg ha^{-1}, similarly the enhancement in no. of pods $plant^{-1}$ of broad bean with P_1 @ 30 Kg ha^{-1}, P_2 @ 60 Kg ha^{-1} and P_3 @ 90 Kg ha^{1} levels of phosphorus over control were 4.87, 9.64, and 20.06, respectively during pooled data of two years. These results are in agreement with the opinion of Singh and Singh (2003). The number of pods planted of broad bean increased affected significantly by the levels of molybdenum. The number of pods plant of broad bean increased significantly with M_3 @ 3 Kg ha^{-1} level of molybdenum our control. On the basis of pooled data of two years, the increase in number of pods planted of broad bean with M_1 @ Kg

Table 1: Effect of phosphorus and molybdenum on plant height (cm), no. of pods $plant^{1}$, no. of grain Pod^{1}, grain yield (q ha^{1}) and stover yield (q ha^{1}) of broad bean during pooled data of two years

Treatment	Plant Height (cm)	No. of Pods $Plant^{-1}$	No. of Grain Pod^{-1}	Grain yield (q ha^{-1})	Stover yield (q ha^{-1})
Phosphorus Levels					
P_0	41.90	9.02	3.10	36.71	31.43
P_1	43.60	9.46	3.30	37.65	32.31
P_2	45.22	9.89	3.60	38.73	33.07
P_3	46.97	10.83	3.85	40.01	34.38
S.Em±	0.2293	0.107	0.027	1.595	1.255
C.D. at 5 %	0.6421	0.299	0.075	4.466	3.514
Molybdenum Levels					
M_0	40.52	8.69	3.08	35.76	30.33
M_1	43.19	9.40	3.33	37.24	31.93
M2	46.26	10.14	3.63	39.53	33.83
M_3	47.71	10.98	3.81	40.57	35.10
S.Em±	0.2293	0.107	0.027	1.595	1.255
C.D. at 5 %	0.6421	0.299	0.075	4.466	3.514

ha^{-1} M_2 @ 2 Kg ha^{-1} and M_3 @ 3 Kg ha^{1} were 8.17, 16.68, and 26.35 percent.

Number of grains Pod^{-1}

The number of grain pod^{-1}of broad bean significantly affected by phosphorus application. The number of grain pod^{-1} of broad bean increased significantly with each level of phosphorus as compared to control. The maximum number of grain pod^{-1} of broad bean was noted under highest level of phosphorus @ 80 Kg ha^{-1}. Similarly, the enhancement in number of grain pod^{1} of broad bean with P_1 @ 30 Kg ha^{1}, P_2 @ 60 Kg ha^{-1} and P_3 @ 90 Kg ha^{1} levels of phosphorus over control were 6.45, 16.12, and 24.19, percent respectively during pooled data of two years. The number of grain pod^{-1} of broad bean increased affected significantly by the level of molybdenum. The number of grain pod^{1} of broad bean increased significantly with M_3 @ 3 Kg ha^{1}level of molybdenum over control. On the basis of pooled data, the increases in number of grain pod^{1} of broad bean with M_1 @ 1 kg ha^{1}, M_2 @ 2 kg ha^{1} and M_3 @ 3 kg ha^{-1} over control were 8.11, 17.85, and 23.70. Percent.

Grain Yield:

The levels of phosphorus affected significantly the grain yield of broad bean. The grain yield of broad bean increased significantly with each level of phosphorus as compared to control. The maximum grain yield of broad bean was noted under highest level of phosphorus @ 90 Kg ha^{-1}. On the basis of pooled data of two years, (fig. 1) the increase in grain yield of broad bean with P_1 @ 30 Kg ha^{1}, P_2 @ 60 Kg ha^{-1} and P_3 @ 90 Kg ha^{1}. Levels of phosphorus were 2.56, 5.50 and 8.98% in comparison to control, respectively. Similar results were reported by Nusakho Nyekha *et al.* (2015) in green gram and Singh *et al.* (2016).The grain yield of broad bean increased affected significantly by the levels of molybdenum. The grain yield of broad bean increased significantly with P_3 @ 3 Kg ha^{-1} level of molybdenum over control. On the basis of pooled data of two years, the percent increase in grain yield of broad bean with M_1 @ 1 Kg ha^{1}, M_2 @ 2 Kg ha^{1} and M_3 @ 3 Kg ha^{-1} over control were 4.13, 10.54 and 13.45 presented, respectively. These results confirm the findings of Singh *et al.* (2014).

Stover yield:

The straw yield of broad bean increased significantly with increasing levels of phosphorus. The maximum Stover yield of broad bean was recorded under highest level of phosphorus P_3 @ 90 Kg ha^{-1}. The percent increase in straw yield of broad bean due to P_1 @ 30 Kg ha^{1}, P_2 @ 60 Kg ha^{-1} and P_3 @ 90 Kg ha^{1} levels over control were 2.79, 5.21 and 9.38 percent respectively during pooled data of two years . These results are in favor of Nusakho Nyekha *et al.* (2015) in green gram and Singh *et al.* (2016). The straw yield of broad bean affected significantly by the levels of molybdenum. The stover yield of broad bean increased progressively and significantly with increasing levels of molybdenum as compared to control. The maximum straw yield of broad bean was recorded under highest levels of molybdenum. The present increased in straw yield of broad bean due to M_1 @ 1 Kg ha^{1}, M_2 @ 2 Kg ha^{1} and M_3 @ 3 Kg ha^{-1} levels were 5.27, 11.53 and 15.72% in comparison to control, respectively during pooled data of two years . These results are in accordance with those of Singh *et al.* (2014).

References

Anderson,A.«J.(1956). Molybdenum as a fertilizer. Adv.Agron.8,163-202.

Maurya, A.N., Chaurasia, S.N.S. and Reddy, Y.R.M. (1992). Effect of nitrogen and molybdenum levels on growth, yield and quality of cauliflower (*Brassica oleracea var. Botrytis*) *C.V. Haryana J. Hort. Sci. 21 (3-4): 232-235*

Nusakho Nyekha, Sharma, Y.K., Sharma, S.K. and Gupta, R.C. (2015). Effect of phosphorus and phosphorus solubilizing bacteria on performance of green gram and soil properties. *Annals of Plant and Soil Research* 17(3): 323-325.

Singh, Harendra, Chaudhary Birendra Singh and Ahamad Bashir, (2008). Effect of phosphorus, sulphur and phosphate solubliging bacteria on growth yield and uptake of nutrients by cowpea, Annals *Plant and Soil Research. 10(1): 56-58*

Singh, S.P. And Singh, B. (2003). Effect of phosphorus on germination, growth, yield and nutrient composition of French bean, irrigated with sodic water, *Annals Plant and Soil Res.. 5(1):78-80.*

Singh, V., Ali, J. Singh, H. and Singh, J.P. (2016). Effect of sources of phosphorus and bio-fertilizers on yield nutrient uptake and quality of lentil. *Annals of Plant and Soil Research 18(1) : 14-17.*

Singh, S., Singh, H., Seema, Singh, J.P. and Sharma, V.K. (2014). Effect of integrated use of rock phosphate, molybdenum and phosphate solubilizing bacteria on lentil (*Lens culinaris*) in an alluvial soils. *Indian Journal of Agronomy* 59(3): 433-438.