The Journal of Rural and Agricultural Research Vol. 19 No. 1, 81-83 (2019)
Received January 2019; Acceptance June 2019

Interaction effect of phosphorus and molybdenum on growth attribute of broad bean (V*icia faba l)*

MUNNA LAL, R.B. SINGH[1], DEVENDRA PAL[2], P. HAINDAVI, ARVIND KUMAR[4], RANJEET SINGH RAGHAV[4], SANGHARSH RAO[3], P.P.S. YADAV[3] AND A.P. SINGH[4]
ICAR-CRIDA, Hyderabad

Abstract

A field experiment was conducted during Rabi *season at Agricultural Research Farm R.B.S. College Bichpuri Agra, to study the interaction effect of phosphorus and molybdenum on growth attribute of broad bean (*Vicia Faba L.*). The experiment was laid out in randomized 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 3 kg ha^{-1}) The combined effect of phosphorus and molybdenum early reflects that increased doses of phosphorus and molybdenum were significantly useful in respect of plant height, number of pods $plant^{-1}$, number of grains pod^{-1} and yield of broad bean. The most beneficial effect was confined to P_3 @ 90 kg ha^{-1} level of phosphorus and M_3 @ 3 kg ha^{-1} level of molybdenum in respect to plant height of broad bean number of pods $plant^{-1}$, number of grains pod^{-1} and yield of broad bean.*

Key words: Broad bean, growth attributes

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. It also results in a decrease in the ratio of organic phosphorus/ inorganic phosphorus, an effect that could perhaps be explained in the light of the known role of molybdenum as an inhibitor or acid phosphates. Excessive molybdenum level in herbage seldom retards the plant growth, but is toxic to ruminant animals that are fed such molybdenum rich herbage; the excessive intake of molybdenum causes a disease in the animals called molybdenosis. Hence, molybdenum is important in fodders as it determines the suitability of fodder for animal use. 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.

[1]AICRP Saline water project, R.B.S. College, Bichpuri, Agra
[2] Krishi Vigyan Kendra, Sambhal
[3]Remote Sensing Applications Centre, U.P. Sector-G, Jankipruam, Kursi Road, Lucknow
[4]Deptt. of Ag. Chem. & Soil Sci., R.B.S. College, Bichpuri, Agra

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. The broad bean are mostly used in the Southern part of United States as a cover and green manure crop although occasionally they are cut for hay except the Pacific North- West where it is used for hay either alone or in mixtures with small grains. Generally, broad bean is not grown in India, but some authorities consider that they have same future in India for fodder and green manure purposes. The principal agronomic advantage of faba bean is its ability to fix nitrogen by symbiosis with Rhizobium bacteria, and thereby substantially contribute to the supply of protein for human food and animal feed and greatly reduce dependence on energyconsuming mineral N fertilizers. It is an advantage that in contrast to other legumes, faba bean can maintain high rates of BNF in the presence of high amounts of available N in the soil (Schwenke et al., 1998; Turpin et al., 2002

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 2006-07 and 2007-08 on sandy loam soil. The soil had EC 0.16 dSm^{-1}, pH 8.4, organic carbon 4.4 g kg^{-1}, available N 190, P 19.4, K 211 kg ha^{-1}, and molybdenum 0.05 mg kg^{-1}. The experiment was laid out in randomized 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 3 kg 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 Plants were thinned out 15 days after sowing. Equal amount of water was supplied to every plot at the time of irrigation. The crop was harvested after maturity and grain and stover yield were also recorded by keeping the samples in air drier at 40°C temperature.

Results and discussion

Plant height:

Interaction effect of phosphorus and molybdenum for rabi (2006-07), (2007-08) and pooled data of two year's are given in tables (1) respectively with respect to plant height. The combined effect of phosphorus and molybdenum early reflects that increased doses of phosphorus and molybdenum were significantly useful in respect of plant height. The most beneficial effect was confined to P_3 @ 90 kg ha^{-1} level of phosphorus and M_3 @ 3 kg ha^{-1} level of molybdenum in respect to plant height of broad bean. These findings are agreement (Subbiah and Ramiah, 1982) (Hala et al., 2013) and (Munna et al., 2018).

Number of pods plant^{-1}:

Interaction effect of phosphorus and molybdenum (PxM_0) for rabi (2006-07), (2007-08) and pooled data of two years are given in table the table (2) respectively with respect to number of pods plant of broad bean. Like no. of pods plant^{-1} increased significantly increasing levels of phosphorus and molybdenum. The maximum number of pods plant 12.41, 12.48 and 12.45 were counted at P_3 @ 90 Kg ha^{1} phosphorus 4.37, 4.40 and 4.39 levels under each level of M_3 @ 3 Kg ha^{-1} molybdenum. These findings are Hala et al., 2013) and (Munna et al., 2018).

Number of Grains Pod^{-1}

Interaction effect of phosphorus and molybdenum was found significant in case of number of grains pod^{-1} of broad bean. It could be inferred from table (3), respectively with respect to number of grain

Table 1: Interaction of effect of phosphorus and molybdenum on plant height (cm) of broad bean

Phosphorus Levels	(2006-07)				(2007-08)				Pooled data of two years			
	Molybdenum Levels											
	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3
P_0	38.29	40.55	43.34	44.85	38.48	40.81	43.74	45.13	38.48	40.81	43.74	45.13
P_1	39.29	42.46	45.15	46.66	39.63	42.91	45.73	46.94	39.63	42.91	45.73	46.94
P_2	41.17	43.78	46.92	48.16	41.48	44.14	47.18	48.93	41.48	44.14	47.18	48.93
P_3	42.73	45.17	48.81	50.16	43.10	45.73	49.18	50.84	43.10	45.73	49.18	50.84
S.Em±		0.122				0.093				0.093		
C.D. at 5 %		0.351				0.266				0.266		

Table 2: Interaction of effect of phosphorus and molybdenum on no. of pods plant-1 of broad bean.

Phosphorus Levels	(2006-07)				(2007-08) Molybdenum Levels				Pooled data of two years			
	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3
P_0	8.25	8.75	9.25	9.75	8.30	8.81	9.29	9.80	8.27	8.78	9.27	9.78
P_1	8.41	9.16	9.70	10.50	8.46	9.12	9.76	10.59	8.43	9.14	9.73	10.55
P_2	8.70	9.41	10.20	11.12	8.78	9.47	10.26	11.15	8.74	9.44	10.23	11.14
P_3	9.30	10.20	11.30	12.41	9.36	10.27	11.36	12.48	9.33	10.23	11.33	12.45
S.Em±		0.11				0.021				0.053		
C.D. at 5 %		0.31				0.060				0.140		

Table 3: Interaction of effect of phosphorus and molybdenum on no. of grains pod-1 of broad bean

Phosphorus Levels	(2006-07)				(2007-08) Molybdenum Levels				Pooled data of two years			
	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3	M_0	M_1	M_2	M_3
P_0	2.91	3.00	3.15	3.25	2.95	3.05	3.20	3.32	2.93	3.03	3.18	3.29
P_1	2.99	3.22	3.39	3.50	3.05	3.28	3.44	3.55	3.02	3.25	3.42	3.53
P_2	3.11	3.40	3.76	4.00	3.16	3.46	3.82	4.06	3.14	3.43	3.79	4.03
P_3	3.22	3.60	4.11	4.37	3.27	3.66	4.17	4.40	3.25	3.63	4.14	4.39
S.Em±		0.02				0.017				0.013		
C.D. at 5 %		0.06				0.049				0.037		

Table 4: Interaction of effect of phosphorus and molybdenum on no. of grain yield q ha-1 of broad bean (2007-08)

Phosphorus Levels	Molybdenum Levels M_0	M_1	M_2	M_3
P_0	34.68	36.15	37.88	38.78
P_1	35.18	36.92	39.16	40.28
P_2	36.74	37.68	40.18	41.36
P_3	37.17	39.44	41.93	42.84
S.Em±	0.11			
C.D. at 5 %	0.32			

pod-1 of broad bean. Like number of grains pod-1 increased significantly with increasing levels of phosphorus and molybdenum. The maximum number of grain pod-1 4.37, 4.40 and 4.39 were counted at P_3 @ 90 Kg ha-1 phosphorus and M_3 @ 3 Kg ha-1 molybdenum. Similar result were also obtained by (Hala et al., 2013) and (Munna et al., 2018).

Grain Yield:

Interaction effect of phosphorus and molybdenum (PxM) was found significant in case of grain yield of broad bean. It is evident from table (4) the grain yield of broad bean significantly affected by the phosphorus and molybdenum levels. The maximum grain yield of broad bean (42.25 q ha-1) increased significantly the higher dose of phosphorus 90 kg-1 and molybdenum 3 kg ha-1. These resulted are aggregated (Modholkar and Ahlawat, 1979) and (Hala et al., 2013) (Munna et al., 2018).

References

Anderson, A.J. (1956) Molybdenum as a fertilizer Advances in Agronomy.8:163-202

Hala Kandil, Nadia Gad and Magdi T. Abdelhamid (2013). Effects of Different Rates of Phosphorus and Molybdenum Application on Two Varieties Common Bean of *(Phaseolus vulgaris L.) J. Agric. Food. Tech.*, 3(3)8-16

Munna Lal, R.B. Singh, Devendra Pal, Laxman M. Ahire and A.P. Singh (2018). Response of broad bean (vicia faba l.) to phosphorus and molybdenum The Journal of Rural and Agricultural Research Vol. 18 No. 1, 71-73 (2018)

Schwenke, G.D., Peoples, M.B., Turner, G.L., Herridge, D.F., (1998). Does nitrogen fixation of commercial, dryland chickpea and faba bean crops in north- west New South Wales maintain or enhance soil nitrogen? Aust. J. Exp. Agric. 38 (1),61–70.

Turpin, J.E., Herridge, D.F., Robertson, M.J., (2002). Nitrogen fixation and soil nitrate interactions in field-grown chickpea (Cicer arietinum) and fababean (Vicia faba). Aust. J. Agric. Res. 53, 599–608.