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SHORT COMMUNICTION

Effect of nitrogen, phosphorus and bio-fertilizers on quality of Indian Bean (*Lablab purpureus* L. var. *typicus*)

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Indian bean or Dolichos bean (*Lablab purpureus* L. var. *typicus*) belongs to the family Fabaceae (2n = 22). The crop is grown for its green pods which consumed as vegetable when pods are immature, tender and green. Its dry seeds are also used in various vegetable food preparations. The nutritional composition of edible green pods contain 86% moisture, 2.0% fibre, 4.0% protein, 1.0% fat, 7.10% carbohydrate, 48 Kcal energy, 210mg calcium, 68mg phosphorus, 1.0mg iron, 668IU vitamin A, 0.08mg thiamine, 0.11mg riboflavin, 0.75mg niacin and 9.3mg vitamin C (Gopalan *et al*., 2004).

Indian bean is affected by inadequate availability of nutrients in the soil and being a leguminous crop, it is highly responsive to nitrogenous fertilizer application especially in early stage. It also requires large quantity of phosphorus for optimum growth and yield. The modern day intensive crop cultivation requires the use of chemical fertilizers. However, due to hike in the prices of chemical fertilizers and also with a view to maintain the ecosystem of soil, it has become necessary to minimize the use of chemical fertilizers by adding organic ones to the soil more particularly biofertilizers of microbial origin. To enhance the plants capacity to utilize such nutrients effectively including in the soil, *Rhizobium*, PSB and VAM inoculation has been considered to be effective. When the seed of legumes crops are inoculated with *Rhizobium* and sown, it increased microbial population in the *rhizosphere*, thereby increasing the amount of microbiologically fixed nitrogen for the plant growth. The inoculation of seed with right strain of *Rhizobium* culture increases the seed yield over no inoculation. About 93-99 per cent of the total phosphorus is insoluble and hence directly not available to plants. Researchers in the few decades established that VAM helps in phosphorus nutrition by not only increasing its availability but also increasing its mobility (Kristek *et al.,* 2005). The PSB culture was also proved broad spectrum bio-fertilizer which increase yield of crops (Legumes, vegetables *etc*.) by 10-30 per cent and supplement phosphorus upto 30 kg ha^{-1} (Tilak and Annapurna, 1993). Use of PSB culture increased nodulation, crop growth, nutrient uptake and crop yield (Shrivastava and Ahlawat, 1995).

Investigation on the effect of biofertilizers with graded doses of nitrogen and phosphorus on quality of Indian bean cv. Arka vijay was carried out at Horticulture farm, S.K.N. College of Agriculture, Jobner, Jaipur during *kharif* season 2013-14. Soil texture was loamy sand, Soil pH 8.2, ECe 1.35 dSm^{-1}, organic carbon 0.15 %, Available nitrogen 135 kg ha^{-1} and phosphorus 16.25 kg ha^{-1}. The experiment was laid out in split plot design with 20 treatments and replicated four times. The treatments consisted of four levels of nitrogen and phosphorus (0, 50% RDF, 75% RDF, 100% RDF ha^{-1}) in main plots and five levels of inoculation with bio-fertilizers (control, PSB, VAM, *Rhizobium* and PSB + VAM + *Rhizobium*) in sub plots. Observations on nitrogen content and its uptake, phosphorus content and its uptake, crude protein content and crude fibre content (%) of pods were recorded.

The results of the present study indicate that among the treatments application revealed that significant increase in protein content from 2.91 per cent in control to 3.51 per cent with 75% RDF (22.5 kg N and 37.50 kg P_2O_5/ha) (Table1) has been observed in the present investigation because of increased N concentration in green pod which might be the result of increased availability of nitrogen to plants. Another reason for higher nitrogen concentration might be due to increased activity of nitrate reductase enzyme. Higher nitrogen in green pod is directly responsible for higher protein because it is a primary component of amino acids which constitute the basis of protein. These

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results are in close conformity with the findings of Kasturikrishna and Ahlawat (2000), Singh *et al*. (2006) and Pandya and Bhatt (2007).

The increasing levels of N and P also significantly increased N and P concentration in green pods. This might be due to improved nutritional environment in the rhizosphere as well as in the plant system leading to enhanced translocation of N and P in plant parts. Since the nutrient uptake is a function of its content in crop plant and green pod yield of the crop. The increase in these parameters due to N and P fertilization led to an increased uptake of nutrient in the present study.

Inoculation with PSB, VAM, *Rhizobium* alone and PSB + VAM + *Rhizobium* significantly enhanced the nitrogen and phosphorus concentration in green pod and protein content in green pod over control. Thus, inoculation with PSB + VAM + *Rhizobium* proved superior to other treatments. The increase in these values due to inoculation of seed with *Rhizobium* was probably due to more fixation of nitrogen resulting into better utilization of nutrients by plants, which led to more chlorophyll formation and ultimately nitrogen and phosphorus concentration in green pod and protein content in pods. Significant increase in nitrogen and phosphorus concentration of green pod was also observed with PSB and VAM. PSB and VAM enhanced the availability of phosphorus to plants, which might have utilized by the crop in greater root development and nodulation that in turn resulted in higher nitrogen fixation in the soil by nodules. Thus, increased availability of nitrogen and phosphorus might have resulted in greater uptake by the plants for proper development and ultimately increased their content in plants. VAM increased nutrient uptake through reduction of the distance that nutrient must diffuse to

Table 1. Effect of fertility levels and bio-fertilizers on crude protein, crude fibre content, nitrogen and phosphorus content in pods and nitrogen and phosphorus uptake.

Treatments	Protein content (%)	Crude fibre (%)	Nitrogen content (%)	Nitrogen uptake (kg/ha)	Phosphorus content (%)	Phosphorus uptake (kg/ha)
Fertility levels						
F_0 (0 % RDF)	2.91	1.90	0.453	20.55	0.417	17.79
F_{50} (50 % RDF)	3.13	1.82	0.508	34.23	0.447	30.86
F_{75} (75 % RDF)	3.49	1.82	0.573	42.56	0.493	37.52
F_{100} (100 % RDF)	3.51	1.71	0.576	42.98	0.510	39.81
SEm ±	0.08	0.04	0.012	0.87	0.007	0.66
CD (P=0.05)	0.26	0.12	0.037	2.78	0.024	2.10
Bio-fertilizers						
B_0 (Control)	3.01	1.85	0.482	30.85	0.454	28.73
Bp (PSB)	3.24	1.84	0.526	34.56	0.465	30.14
Bv (VAM)	3.26	1.84	0.528	34.93	0.469	32.80
Br (Rhizobium)	3.35	1.81	0.543	35.93	0.460	31.02
Bpvr (PSB+VAM+Rhizobium)	3.45	1.75	0.559	39.13	0.486	34.80
SEm ±	0.06	0.03	0.010	0.58	0.007	0.45
CD (P=0.05)	0.17	0.08	0.030	1.65	0.021	1.27

plant roots by accelerating the rate of nutrient absorbing surface (Bowen *et al*. 1975) and finally by chemically modifying the availability of nutrient for uptake by plant through *mycorrhizal hyphae* (Somani, 2004).

The combined inoculation with PSB + VAM + *Rhizobium* was more beneficial in enhancing all the above parameters due to increased solubility of phosphorus and higher nitrogen fixation in nodules, leading to increased availability of nitrogen and phosphorus. The greater uptake of nitrogen and phosphorus might be due to increased content of these nutrients in green pod. These results corroborate the findings of Rasal (1996), Tanwar *et al.* (2003), Jain and Trivedi (2005) and Vikram and Hamzehzarghani (2008).

References

Bowen, G.D., Bevege, D.I. and Mosse, B. 1975. The phosphate physiology of vesicular arbuscular mycorrhizae. In : Endomycorrhizas, Eds. Sanders, F.E., Mosse, B. and Tinker, P.B. Academic Press, London : 241-260.

Gopalan, C., Rama Sastri B.V. and Balasubramanian, S.C. 2004. Nutritive Value of Indian Foods, National Institute of Nutrition, ICMR, Hyderabad.

Jain, P.C. and Trivedi, S.K. 2005. Response of soybean to phosphorus and biofertilizers. *Legume Research,* 28 : 30-33.

Kasturi Krishna, S. and Ahlawat, I.P.S. 2000. Effect of moisture stress and phosphorus, sulphur and zinc fertilizers on growth and development of pea (*Pisum sativum* L.). *Indian Journal of Agronomy,* 45 (2) : 353-356.

Kristek, S., Kristek, A. and Pavlovic, H. 2005. The influence of mycorrhizal fungi (*Glomus sp*.) on field pea plant survival along with in drought caused stress conditions. *Plant, soil and Environment,* 51(9) : 385-389.

Pandya, C.B. and Bhatt, V.R. 2007. Effect of different nutrient levels on yield and nutrient content of fodder cowpea. *Legume Research,* 30 (3) : 218-220.

Rasal, P.H. 1996. Effect of phosphomicrobials and *Rhizobium* on green gram. *The Madras Agricultural Journal,* 83 : 399-401.

Shrivastava, T.K. and Ahlawat, I.P.S. 1995. Response of pea to phosphorus, molybdenum and biofertilizers. *Indian Journal of Agronomy***,** 40 : 630-635.

Singh, A.K., Tripathi, P.N., Kumar, R.P., Srivastava, A.K. and Singh, R. 2006. Response of nitrogen, phosphorus levels and *Rhizobium* inoculation on nutrient uptake, yield and protein content of cowpea. *Journal of Soil and Crops,* 16 (2) : 475-477.

Somani, L.L. 2004. Handbook of Biofertilizer. *Agrotech Publishing Academy,* Udaipur : 1168.

Tanwar, S.P.S., Sharma, G.L. and Chahar, M.S. 2003. Effect of phosphorus and biofetilizer on yield, nutrient concentration and uptake by blackgram (*Vigna mungo* L. Hepper). *Legume Research,* 26 (1) : 39-41.

Tilak, K.V.B.R and Annapurna, K. 1993. Effect of PSB in different crop. *Proc. of India National Academic Science,* 59 (3-4) : 315-324.

Vikram, A. and Hamzehzarghani, H. 2008. Effect of phosphate solubilizing bacteria on nodulation and growth parameters of greengram (*Vigna radiata* L. Wilczek). *Research Journal of Microbiology,* 3 (2) : 62-72.