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Effectiveness of fertilizer doses, liming and *Rhizobium* inoculation in vegetable pea under acidic soil of Jharkhand

A.C. MISHRA[1], V.K. PANDEY AND **V.P. RAI[2]**

Members of the Research Forum

Associated Authors:
[1]Department of Vegetable Science, University of Forestry and Hill Agriculture, Ranichauri, TEHRI-GARHWAL (UTTARAKHAND) INDIA
Email : acm24680@gmail.com

[2]Krishi Vigyan Kendra (B.A.U.), Chatra, RANCHI (JHARKHAND) INDIA

Author for correspondence :
V.K. PANDEY
Krishi Vigyan Kendra (B.A.U.), Chatra, RANCHI (JHARKHAND) INDIA
Email : vinod.bau@rediffmail.com

ABSTRACT : Present experiment was conducted in participatory mode in farmers' field of Garhwa district of Jharkhand during *Rabi* 2011-12. The treatments included farmers' practice *i.e.* application of NPK @ 13:35:0 kg/ha (TO_1), application of recommended dose of NPK @25:50:30 kg/ha (TO_2) and application of recommended dose of NPK along with lime @3.0 quintals per hectare and *Rhizobium* (*R. leguminosarum*) culture inoculation as seed treatment @ 5.0 g/kg seed (TO_3). The results exhibited that TO_3 resulted in appreciable profitability (3.48) as compared to recommended dose of fertilizers (3.27). Therefore, application of recommended dose of fertilizers + liming + *Rhizobium* inoculation is an advisable technology in agro-economic conditions of Jharkhand.

KEY WORDS : Vegetable pea, *Rhizobium leguminosarum*, Liming, *Pisum sativum*, Root nudulation

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The vegetable pea (*Pisum sativum* L.) is an important cash crop of subsistence farming community of Jharkhand during winter season. It is grown in partially irrigated conditions. The important setbacks in the plateaus of Jharkhand leading to low yield are lack of availability of the seeds of suitable varieties, poor knowledge of packages of practices to the farmers and crops prone to moisture stress. Validation of optimum package of nutrient in this crop is relevant for acquainting and convincing the growers and to ensure remunerative yield. Pea is a legume which is capable of meeting a portion of its N needs biologically, as long as roots have been colonized by *Rhizobium leguminosarum*, a N-fixing bacteria. Production guides suggest that somewhere between 30% to 80% of N need of pea can be met through biological fixation (Bowren *et al*., 1986; Murray *et al*., 1979). The rest of the N must be provided from the soil or from fertilizer applications. Peas require adequate amounts of P (Bowren *et al.*, 1986; Slinkard and Drew, 1988), and yield and seed quality can be enhanced by P fertilizer in P deficient soil after soil testing (Pulung, 1994). It is proved that K content is not limiting factor in production of vegetable pea. However, a minimum level is indispensable for optimum performance of the crop. It is reported that almost 40-60 per cent P become unavailable to the crop when soil pH is below 6.0. Therefore, soil amendment is one of the most necessary operations for harvesting full impact of applied P fertilizers particularly in acidic soils. Because of poor technological awareness and economic status of the farmers of Jharkhand particularly of Palamu division, appropriate doses of fertilizers are not used for production of the most of the crops. On farm validation of a set of treatment packages one of the efficient ways to convince the growers for adopting appropriate technology. With this view, present experiments were conducted in participatory mode among the subsistence farming community of Jharkhand.

RESEARCH METHODS

The experiments were conducted during *Rabi* (October to February), 2011-12 in participatory mode of ten farmers of Garhwa district falling in rainfed plateaus of Jharkhand (latitude

between 23034'11" and 24032'05", longitude between 83010'13" and 83056'38" and altitude 350 m above msl). Soils of experimental plots were moderately acidic (pH5.5-6.0) and organic matter content varied from 0.5 to 0.6%. The treatment included farmers' practice *i.e.* application of NPK @ 13:35:0 kg/ha and recommended doses of NPK with and without liming and *Rhizobium* inoculation as seed treatment. The detailed description of treatments is as follows:

Technology option (TO_1): Farmers' practice (FP) *i.e.* application of NPK @13:35:0 kg/ha.

TO_2: Application of recommended dose of NPK @25:50:30 kg/ha.

TO_3: Application of recommended dose of NPK along with lime @3.0 quintals per hectare and *Rhizobium* (*R. leguminosarum*) culture inoculation as seed treatment @ 5.0 g/kg seed.

All the three treatments were tested by growing vegetable pea cv. AZAD PEA-2 in plots of 100 m^2 of ten farmers' field in randomized block design. Data were recorded on plant height at flowering (cm), number of shoots/ plant, root length (cm), number of primary roots / plant, number of bilobed root nodules / plant, total number of root nodules per plant, number of pods per plant, pod yield (q/ha) and B:C ratio.

RESEARCH FINDINGS AND DISCUSSION

Preliminary statistical analysis indicated that the treatments varied significantly for all the traits (Table 1). Among three treatments, TO_3 *i.e.* application of recommended dose of fertilizer@ 25:50:30 kg NPK/ha + lime + *Rhizobium* inoculation exhibited significantly higher plant height at flowering (36.24 cm), number of shoots per plant (3.85), root length (16.50 cm), number of bilobed root nodules per plant (10.15) number of pods per plant (15.20), pod yield (63.67 q/ha) and B:C ratio (3.48). In the treatment with recommended dose of fertilizers @ 25:50:30 kg NPK/ha (TO_2) also exhibited significantly higher values for these parameters as compared to farmers' practice (TO_1) including partial doses of N and P @13:35:0 kg/ha. It indicates that a balance dose of nitrogen and phosphorus are necessary for maximum performance of pea in rainfed temperate conditions. Similar responses of vegetable pea has earlier been reported by Pachauri *et al*. (1988), Zhagloul *et al.* (1988), Szegi *et al*. (1991), Singh *et al.* (1992), Kovak (1994), Reddy *et al.* (1998) and Uniyal and Mishra (2009). However, number of primary roots per plant was found to be the highest (24.15) in the farmers' practice (TO_1) (24.15) and least in TO_3 (8.42). Total number of root nodules per plant was found maximum in the treatment with recommended dose of NPK (TO_2) *i.e.* 14.55. However, a major number of the nodules in this treatment were having single lobes. In contrary to this, the plants supplied with recommended dose of fertilizer, lime and *Rhizobium* culture had relatively less number of total root nodules per plant (11.90) but maximum number of bilobed root nodules per plant was 10.15. A positive association was

Table 1 : Performance of the vegetable pea cv. Azad Pea-2 as affected by different treatments during *Rabi* 2011-12

Technology options	Technology assessed	Plant height at flowering (cm)	Number of shoots/ plant	Root length (cm)	Number of primary roots / plant	Number of bilobed root nodules / plant	Total number of root nodules per plant	Number of pods per plant	Yield (q/ha)	B:C ratio
TO_1	FP: Application of NPK @13:35:0 kg/ha	30.86	1.75	12.15	24.15	3.80	9.43	7.10	43.33	2.7
TO_2	Application of recommended dose of NPK @ 25:50:30 kg/ha	33.42	2.80	13.78	19.0	6.85	14.55	11.40	55.60	3.27
TO_3	TO_2 + Lime @3.0 q/ha + *Rhizobium* as seed treatment	36.24	3.85	16.50	8.42	10.15	11.90	15.20	63.67	3.48
S.E. (n)		0.39	0.13	0.54	0.76	0.37	0.37	0.34	4.2	-
C.D. (P= 0.05)		0.82	0.33	1.13	1.60	0.78	0.78	0.72	8.82	-

Note: Selling rate of pods was Rs.1200/-q^{-1}

realized between number of bilobed root nodules and pod yield and yield contributing characters indicating higher nitrogen fixation efficiency of bilobed root nodules as compared to single lobed ones. External inoculation of rhizobial cells in less acidic edaphic environment supplementd with minimum required level of nitrogen, adequate phosphorus and potash exhibited maximum bacterial activity in terms of colonization, nitrogen fixation, plant growth and yield in pea crop. Although, externally applied nitrogen has feedback inhibition on *in vivo* nitrogen fixation by *R. leguminosarum* (Sosulski and Buchan, 1978) but a certain minimum amount is indispensable for proper growth and development of the plant (Kauskik *et al*., 1995; Bowren *et al*., 1986; McKenzie *et al*., 2001 a and b).

In view of B:C ratio, it was evident that nominal extra input in TO_3 resulted in appreciable profitability (3.48) as compared to recommended dose of fertilizers (3.27). Therefore, application of recommended dose of fertilizers + liming + *Rhizobium* inoculation is an advisable technology in agro-economic conditions of Jharkhand.

REFERENCES

Bowren, K.E., Biederbeck,V.O., Bjorge, H.A., Brandt, S.A., Goplen, B.P., Henry, J.L., Ukraintetz, H., Wright, T. and McLean, L.A. (1986). Soil improvement with legumes. *Saskatchewan Agric. Soils & Crops Branch, Bul.,* M10-86-02. 24 p.

Kauskik, U.K., Dogra, R.C. and Dudeja, S.S. (1995). Effect of fertilizer N on nodulation, acetylene-reducing activity, and N uptake in pigeonpea (*Cajanus cajan*). *Trop. Agric*. (Trinidad) **72** (1) : 76-79.

Kovac, K. (1994). The effect of some intensification factors on the yield of intermediate type peas grown in the maize growing region. *Rostlinna Vyroba*., **40** (10): 949-956.

McKenzie, R.H., Middleton, A.B., Solberg, E.D., DeMulder, J., Flore, N., Clayton, G.W. and Bremer, E. (2001a). Response of pea to rate and placement of phosphate fertilizer in Alberta. *Can. J. Plant Sci.,* **81**: 645-649.

McKenzie, R.H., Middleton, A.B., Solberg, E.D., DeMulder, J., Flore, N., Clayton, G.W. and Bremer, E. (2001b). Response of pea to rhizobia inoculation and starter nitrogen in Alberta. *Can. J. Plant Sci*., **81**: 637-643.

Murray, G.A., Auld, D.L., Kraft, J.M., Lee, G.A., Muehlbauer, F.J. and O'Keeffe, L.E. (1979). Dry pea and lentil production in the Pacific Northwest. *Univ. Idaho Agric. Exp. Stat. Bul*., **578**, Moscow. 8 p.

Pachauri, D.C., Thakur, P.C. and Verma, T.S. (1988). Effect of different levels of nitrogen, phosphorus and potash on seed yield of peas (*Pisum sativum* var. hortense). *Prog. Hort*., **20** (1-2) : 58-62.

Pulung, M.A. (1994). Effect of fertilizer rates on yield, productive efficiency of pea on brown Podzolic soil. *Acta Hort.,* **369**:306-310.

Reddy, R., Reddy, M.A.N., Reddy, Y.T.N., Reddy, N.S. and Anjanappa, M. (1998). Effect of organic and inorganic sources of NPK on growth and yield of pea (*Pisum sativum*). *Legume Res*., **21** (1) : 57-60.

Singh, R.M., Singh, S.B. and Warsi, A.S. (1992). Nutrient management in field pea (*Pisum sativum). Indian J. Agron.,* **37** (3):474-476.

Slinkard, A.E. and Drew, B.N. (1988). Dry pea production in Saskatchewan. Ag. Dex. 140/10 (rev.), Univ. Saskatchewan, Saskatoon. 7 p.

Sosulki, F. and Buchan, J.A. (1978). Effects of rhizobium and nitrogen fertilizer on nitrogen fixation and growth of peas. *Can. J. Plant Sci*., **58**:553-556.

Szegi, J., Gulyas, F., Koves, P.K. and Soos, T. (1991). Experiments with Rhizobial inoculants in Hungsrisn soils. *Zentralblatt-fur-Microbiologie*, **146** (7-8) : 539-543.

Uniyal, S.P. and Mishra, A.C. (2009). Effect of different levels of nitrogen and phosphorus on performance of vegetable pea in rainfed hills. *Pantnagar J. Res.,* **7**(2) : 184-186.

Zhagloul, M.M., Darweesh, M.M. and Abdel Naby, H.E. (1988). Effect of rhizobiz inoculation and levels on growth and yield of pea plants. *J. Agric. Sci*., **13** (4): 1951-1958.