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Influence of nitrogen and phosphate levels on yield and economics of *rabi* french bean under Marathwada condition

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ABSTRACT

A study on french bean was conducted at Agriculture College Farm, Parbhani during *rabi* season of 2002-2003 to study the response of french bean (*Phaseolus vulgaris* L.) to different nitrogen and phosphate fertilization levels. The nitrogen response study for french bean has it's own significance due to shy-nodulation and absence of 'NOD' gene regulator. The results showed that nitrogen applied @ 150 and 100 kg/ha were at par and recorded significantly more grain yield over application of 50 kg N/ha and control. Similarly, application of 75 kg P_2O_5/ha recorded higher grain yield than phosphate applied at 25 kg P_2O_5/ha and control. The increase in grain yield with increased nitrogen and phosphorus levels is attributed due to improvement in all the growth and yield attributes like number of pods/ plant, weight of pods/plant, total dry matter/plant and test weight. Every increase in N and P levels was found to increase the net returns per hectare, however net returns was higher with the application of 150 kg N/ha and 75 kg P_2O_5/ha (Rs.14673.50 and 12827.75, respectively).

Key words : French bean, Nitrogen, Phosphate, Grain yield.

INTRODUCTION

French bean (*Phaseolus vulgaris* L.) is being grown during *rabi* season mostly as an excellent vegetable both in the form of immature pods and dried grains in southern as well as northern plains of India. French bean have nutritious value and is highly palatable containing 21.25 per cent crude protein, 1.7 per cent fat, 70 per cent carbohydrate, 5 per cent minerals besides 157 mg Fe, 1.76 mg copper. It is precious and highly relished pulse crop. It reduces the cholesterol percentage in blood. French bean is used as a soil improving crop in rotation and cropping system. It is a crop, well fitted in multiple cropping systems as well as used as intercrop, cover crop, smoothering crop and vegetable crop and can be taken twice in a year. Through a leguminous crop, it has no mechanism to fix atmospheric nitrogen as it is shy-nodulator and specially characterized by lack in nodules, owing to the absence of 'NOD' gene regulator (Pathak and Khurana, 1993).

It has been seen from the past research evidences on french bean that most of the research workers had given little importance to nitrogen fertilization (Sarode and Deshmukh, 1974). This necessitated to carry the research work on various aspects of it's nutrition. Since, it become totally a new crop to Marathwada region, it is necessary to initiate research on requirement of nitrogen in combination with phosphate levels.

MATERIALS AND METHODS

Field experiment on french bean was conducted during *rabi* season of 2002-2003 at Agricultural College Farm, Marathwada Agricultural University, Parbhani (MS) to study the response of french bean to levels of nitrogen and phosphate fertilization. The design used was split plot and the experiment was replicated thrice. Main plot comprise of four nitrogen levels *i.e.* 0, 50, 100 and 150 kg N/ha whereas, four phosphate levels *i.e.* 0, 25, 50 and 75 kg P_2O_5/ha were in sub plots. The soil was medium dark gray in colour and about 100 cm deep, slightly alkaline in reaction, low in available nitrogen, medium in available phosphate and rich in potash. The french bean variety HPR-35 was sown on 19th October at 45 cm x 15 cm spacing by dibbling. The gross and net plot size was 4.5 m x 1.5 m and 3.6 m x 2.7 m, respectively. The half dose of nitrogen and full dose of phosphate, as per the respective treatments, were applied one day before the sowing along with a common dose of 50 kg K_2O/ha. Irrigation was followed immediately after sowing whereas subsequent irrigations were applied as and when needed. Observations regarding different yield attributing characters were averaged over five randomly selected plants.

RESULTS AND DISCUSSION

Effect of nitrogen:

The data on ancillary characters, grain yield and net returns are presented in Table 1. Application of nitrogen was found to have profound influence on grain yield of french bean. Nitrogen applied @ 150 and 100 kg/ha were at par with each other and recorded significantly higher grain yield over 50 kg N/ha and control whereas,

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Table 1 : Yield attributes, grain yield and economics of french bean

Treatment	No. of pods/plant	Weight of pods/plant	No. of grains/ plant	Test weight (g)	Grain yield (q/ha)	Net returns (Rs/ha)
Nitrogen levels						
N_0- Control	8.05	11.31	18.75	38.22	9.42	3552.75
N_1- 50 kg/ha	9.45	14.38	25.18	40.52	13.66	9865.50
N_2- 100 kg/ha	10.38	17.33	31.54	41.29	16.46	13876.38
N_3- 150 kg/ha	10.63	17.54	33.21	41.73	17.29	14673.50
S.E. $\pm$	0.19	0.38	1.31	0.19	0.78	718.58
C.D. (P=0.05)	0.56	1.10	3.82	0.56	2.26	2094.20
Phosphate levels						
P_0- Control	8.54	12.56	19.55	39.44	10.93	6088.50
P_1- 25 kg/ha	9.25	14.66	25.05	40.09	13.94	10291.50
P_2- 50 kg/ha	10.13	16.55	30.76	41.05	15.81	12760.50
P_3- 75 kg/ha	10.58	16.79	33.31	41.19	16.15	12827.75
S.E. $\pm$	0.22	0.30	1.38	0.12	0.32	622.89
C.D. (P=0.05)	0.64	0.87	4.01	0.35	0.94	1815.30
Interaction						
S.E. $\pm$	0.44	0.59	1.38	0.24	0.65	1245.8
C.D. (P=0.05)	N.S.	N.S.	N.S.	N.S.	N.S.	N.S.
G. Mean	9.63	15.14	27.17	40.44	14.21	10492.06

application of 50 kg N/ha was found to record more grain yield than control (Table 1). The results are in line those obtained by Singh and Singh (1990), Durge *et al*. (1997) and Rana and Singh (1998). The above results envisage that though french bean is a leguminous crop, it shows high response to nitrogen levels. This was attributed because of it's shy-nodulations and absence of the 'NOD' gene regulator (Pathak and Khurana, 1993).

Effect of phosphate:

Profound influence of phosphate application was also evident on grain yield of french bean. Application of phosphate @ 75 and 50 kg/ha were at par and was found to record significantly higher grain yield than its lower level *viz.*, 25 kg P_2O_5/ha and no phosphate application whereas application of 25 kg P_2O_5/ha recorded highest grain yield than no phosphate application.

Economics:

Significant influence of nitrogen application was evident in increasing the net returns per hectare. Significantly highest net returns (Rs 14673.50) were obtained with the application of 150 kg N/ha and lowest with no nitrogen application (Rs. 3552.75). However, application of 150 and 100 kg N/ha were at par and recorded significantly higher net returns than application of 50 kg N/ha and control.

Beneficial effect of phosphate application was also observed in increasing the net returns per hectare. The respective net returns obtained with 0, 25, 50 and 75 kg P_2O_5/ha were Rs. 6088.50, 10291.50, 12760.50 and 12827.75, respectively. Phosphate application @ 75 kg and 50 kg/ha were at par and recorded significantly higher net returns than application of 25 kg P_2O_5/ha and no phosphate application. Similarly, application of 25 kg P_2O_5/ha also resulted in significantly higher net returns than no phosphate application.

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