



P-ISSN: 2349-8528

E-ISSN: 2321-4902

IJCS 2018; SP4: 218-222

**Ajeet**

1. Department of Horticulture,  
FAST, AKS University Satna  
Madhya Pradesh, India  
2. Faculty of Agricultural  
Sciences and Technology, AKS  
University Satna Madhya  
Pradesh, India

**Khiromani Nag**

1. Department of Horticulture,  
FAST, AKS University Satna  
Madhya Pradesh, India  
2. Faculty of Agricultural  
Sciences and Technology, AKS  
University Satna Madhya  
Pradesh, India

**DK Sahu**

1. Department of Horticulture,  
FAST, AKS University Satna  
Madhya Pradesh, India  
2. Faculty of Agricultural  
Sciences and Technology, AKS  
University Satna Madhya  
Pradesh, India

**LP Bhardwaj**

1. Department of Horticulture,  
FAST, AKS University Satna  
Madhya Pradesh, India  
2. Faculty of Agricultural  
Sciences and Technology, AKS  
University Satna Madhya  
Pradesh, India

**Correspondence****Ajeet**

1. Department of Horticulture,  
FAST, AKS University Satna  
Madhya Pradesh, India  
2. Faculty of Agricultural  
Sciences and Technology, AKS  
University Satna Madhya  
Pradesh, India

(Special Issue -4)

**International Conference on Food Security and  
Sustainable Agriculture  
(Thailand on 21-24 December, 2018)**

**To workout the interactive effect of nitrogen and  
spacing on growth and yield of French bean  
(*Phaseolus vulgaris* L.)**

**Ajeet, Khiromani Nag, DK Sahu and LP Bhardwaj**

**Abstract**

Field experiment entitled "To workout the interactive effect of nitrogen and spacing on growth and yield of French bean (*Phaseolus vulgaris* L.)" have been conducted at the research farm, AKS University, Sherganj Satna. During rabi season of 2015-16. Experiment comprised of three levels of spacing's viz.- 30 x 10 cm, 30 x 15 cm and 30 x 20 cm and four levels of Nitrogen (0 kg N/ha), (30kg N/ha), (60kg N/ha) and 90 N/ha. Experiment was laid out in Randomized Block Design with three replications. Plant spacing 30 x 15 cm caused not significant effect on growth parameters such as height of the plant, number of leaves per plant, pod diameter, 1000 seed weight and weight of pods were also affected by plant spacing. The yield of pods q/ha was not found from medium spacing (30 x 15cm). Nitrogen levels not significantly influenced growth, yield and yield attributes such as height of the plant, number of leaves per plant 1000 seed weight and weight of pods per plant were also affected by nitrogen levels, when nitrogen applied @ 90 kg/ha pod yield were not found to be significant both on growth as well as on yield parameters.

**Keywords:** French bean (*Phaseolus vulgaris* L.) interactive of nitrogen, spacing, growth & yield

**Introduction**

French bean (*Phaseolus vulgaris* L.) belongs to the family Fabaceae and is also known as Rajma, Rajmash, Kindey bean, Snap bean, field bean and pole bean etc. However, common beans are found in Europe, Africa and Asia and presently it is been grown throughout the cooler tropics. (Chatterjee and Bhattacharyya (1986) [2]. There are a large number of cultivars which have been developed, however, they are group in two type's viz., bush and pole type. In pole type staking is done by poles and dry branches of plants with wide spaced than the former one. French bean is grown in different parts of the world for its mature dry seeds and immature tender green pods. In Northern India, The dry seeds of French bean give better price than other pulse crops. Besides, it is more nutritious when it is used as vegetable. The dry seeds of French beans is canned also and exported to other countries of the world. The tender parts of French bean used for vegetable purposes can be harvested in about two months after sowing. It is quite nutritious and good source of Protein, Carbohydrates, minerals and crude fibre. Whereas crude proteins are stored in the cotyledons of French bean. (Singh *et al.*, 1997) [7]. It contains 1.82 g protein; 7.13 g carbohydrate; 31 Kcal energy; 0.34 g fat; 3.4 g dietary fibre; 0.10 mg riboflavin; 0.08 mg thiamine; 690 IU vitamin-A; 16.3 mg vitamin-C; 6 mg sodium; 209.0 mg potassium; 37.0 mg calcium; 1.04 mg iron, 25.0 mg magnesium and 38.0 mg phosphorus in per 100 g of Edible portion of green pods. The nutritional status of French bean on dry seed basis it contains about 17.5-28.7 percent protein, 40.38 g carbohydrate, 371 Kcal energy, 0.85 g fat, 0.22 mg riboflavin, 0.64 mg thiamine, 23 IU vitamin-A, 4.8 mg vitamin-C, 15 mg sodium, 10.13 mg potassium, 176.0 mg calcium, 4.36 mg iron, 198.0 mg magnesium and 44.0 mg phosphorus. The general recommendation of reduced nitrogen application to legume crops is due to its ability to fix atmospheric nitrogen.

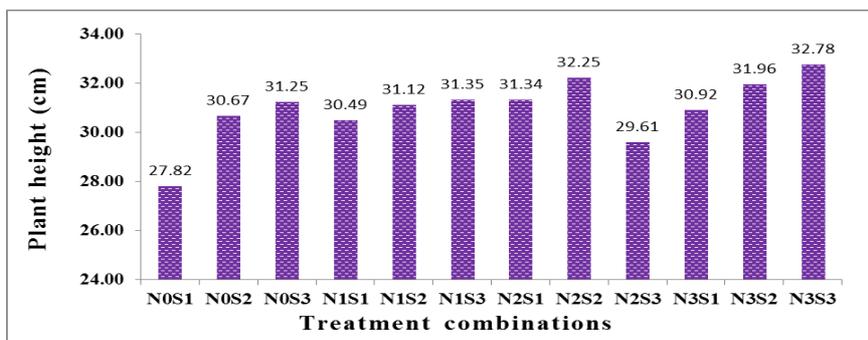
French bean readily responds to large dose of nitrogen. Soil fertility and plant density are the two most important factors of crop production. The role of adequate plant spacing is considered as major factor in determining the yield of French bean. The yield of French bean may be increased through an appropriate combination of plant spacing and nitrogen application. (Dhanjal *et al.*, 2001) [3].

**Materials and Methods**

The present research works ‘To work out the interactive effect of nitrogen and spacing on growth and yield of French bean

(*Phaseolus vulgaris* L.)’ Have been undertaken at the Department of Horticulture, AKS University, Satna (M.P.) during 2015-2016. Experiment has been conducted at the farm of AKS University, Satna M.P. Experimental plot was located about 2000 meters East of AKS University, Campus. Satna. Experimental design - RBD (Randomized Block Design), Number of replications -03, Number of treatments - 12, Total number of plots -36, Plot size -3.0 × 1.0 m<sup>2</sup> Row to row distance -30 cm, Plant to plant distance -10, 15 and 30 cm, Total area under layout -10.5 × 16.5 m<sup>2</sup> and Variety- Contender etc.

**Results; (A) Growth parameters; (i) Plant height;**



**Fig 1:** Plant height (cm) of French bean as influenced by interaction of levels of nitrogen and spacing at 25days after sowing

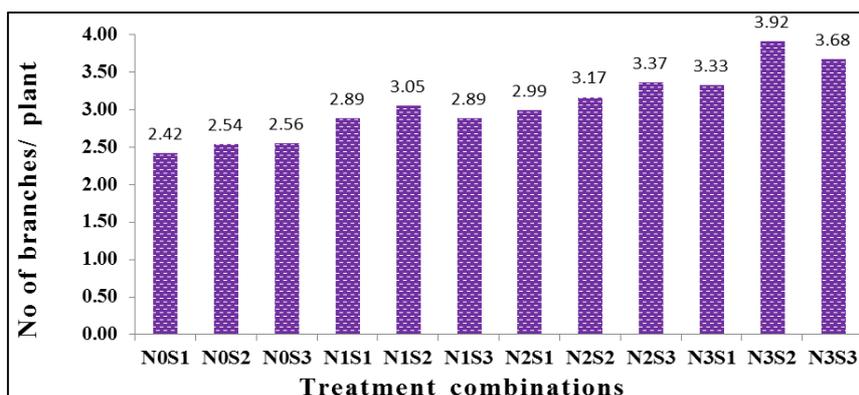
**(ii)Number of leaves per plant:** The number of leaves per plant interaction effect of nitrogen levels and plant spacing’s

was found to be non-significant with respect to the number of leaves (Table 1.0).

**Table 1:** Table showing number of leaves/ plant of French bean as influenced by levels of nitrogen, plant spacing interaction at 25 days after sowing DAS

Number of leaves/ plant 25 DAS	
Interaction	
N <sub>0</sub> S <sub>1</sub>	3.04
N <sub>0</sub> S <sub>2</sub>	3.07
N <sub>0</sub> S <sub>3</sub>	3.06
N <sub>1</sub> S <sub>1</sub>	3.15
N <sub>1</sub> S <sub>2</sub>	3.29
N <sub>1</sub> S <sub>3</sub>	3.27
N <sub>2</sub> S <sub>1</sub>	3.26
N <sub>2</sub> S <sub>2</sub>	3.40
N <sub>2</sub> S <sub>3</sub>	3.21
N <sub>3</sub> S <sub>1</sub>	3.37
N <sub>3</sub> S <sub>2</sub>	3.43
N <sub>3</sub> S <sub>3</sub>	3.44
SEm ±	0.03
CD (P=0.05)	NS

**(iii) Number of branches per plant**



**Fig 2:** Number of branches/ plant of French bean as influenced by the interaction between levels of nitrogen and plant spacing at 25 days after sowing

(iv) **Number of flower per plant;** Result on the effect of nitrogen and spacing had significant effect on the number of

flower per plant (Table 3.0).

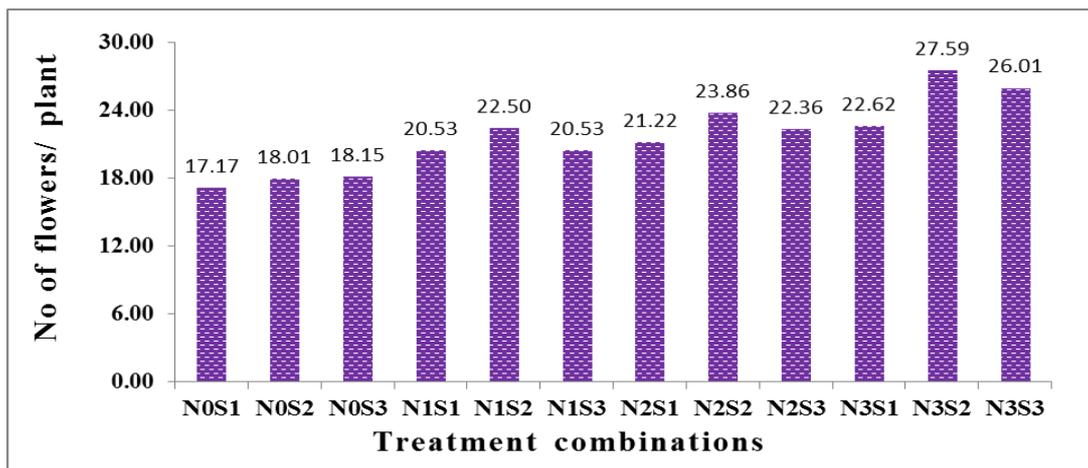


Fig 3: Number of flowers/ plant of French bean as influenced by the interaction between levels of nitrogen and plant spacing

(v) **Number of pods per plant:** There was not a significant interaction effect between different doses of nitrogen and

plant spacing.

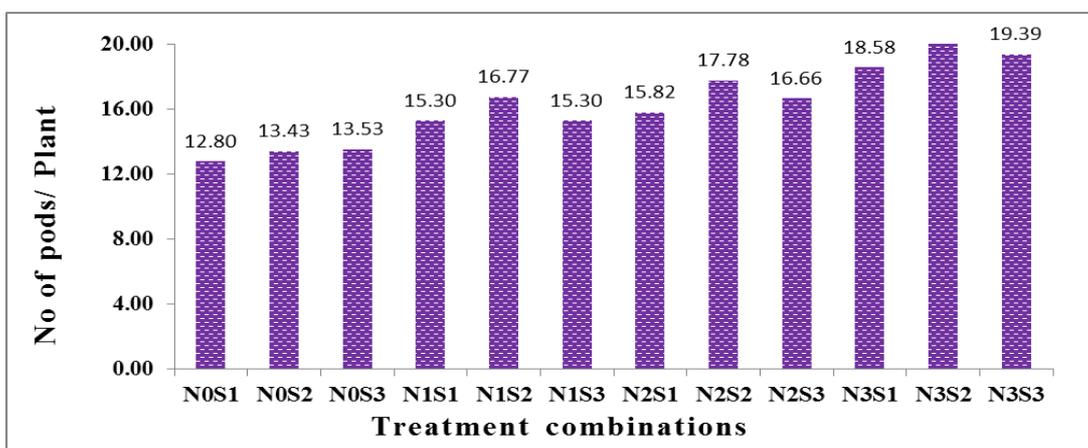


Fig 4: Number of pods/ plant of French bean as influenced by the interaction between levels of nitrogen and plant spacing

(vi) **Diameter of green pod (cm):** The result on the main effect of the interaction effect between nitrogen and plant spacing was not found to be significant (Table 2.0).

Table 3: Table showing number of seeds/ green pod of French bean as influenced by interaction of levels of nitrogen and plant spacing

Table 2: Table showing diameter of green pod (cm) of French bean as influenced by levels of nitrogen, plant spacing interaction

Interaction	
N <sub>0</sub> S <sub>1</sub>	1.01
N <sub>0</sub> S <sub>2</sub>	1.35
N <sub>0</sub> S <sub>3</sub>	1.18
N <sub>1</sub> S <sub>1</sub>	1.33
N <sub>1</sub> S <sub>2</sub>	1.60
N <sub>1</sub> S <sub>3</sub>	1.33
N <sub>2</sub> S <sub>1</sub>	1.38
N <sub>2</sub> S <sub>2</sub>	1.55
N <sub>2</sub> S <sub>3</sub>	1.64
N <sub>3</sub> S <sub>1</sub>	1.62
N <sub>3</sub> S <sub>2</sub>	1.79
N <sub>3</sub> S <sub>3</sub>	1.69
SEm ±	0.06
CD (P=0.05)	NS

Interaction	
N <sub>0</sub> S <sub>1</sub>	3.39
N <sub>0</sub> S <sub>2</sub>	4.55
N <sub>0</sub> S <sub>3</sub>	3.96
N <sub>1</sub> S <sub>1</sub>	4.47
N <sub>1</sub> S <sub>2</sub>	5.38
N <sub>1</sub> S <sub>3</sub>	4.47
N <sub>2</sub> S <sub>1</sub>	4.63
N <sub>2</sub> S <sub>2</sub>	5.15
N <sub>2</sub> S <sub>3</sub>	5.50
N <sub>3</sub> S <sub>1</sub>	5.43
N <sub>3</sub> S <sub>2</sub>	6.02
N <sub>3</sub> S <sub>3</sub>	5.67
SEm ±	0.19
CD (P=0.05)	NS

(vii) **Number of seeds per green pod:** The result on the main effect of the interaction effect between nitrogen and plant spacing was not found to be significant (Table 3.0).

(xii) **Weight of pods per plant:** The interaction effect of nitrogen and different plant spacing on pod weight per plant was not found to be significant (Table 5.0).

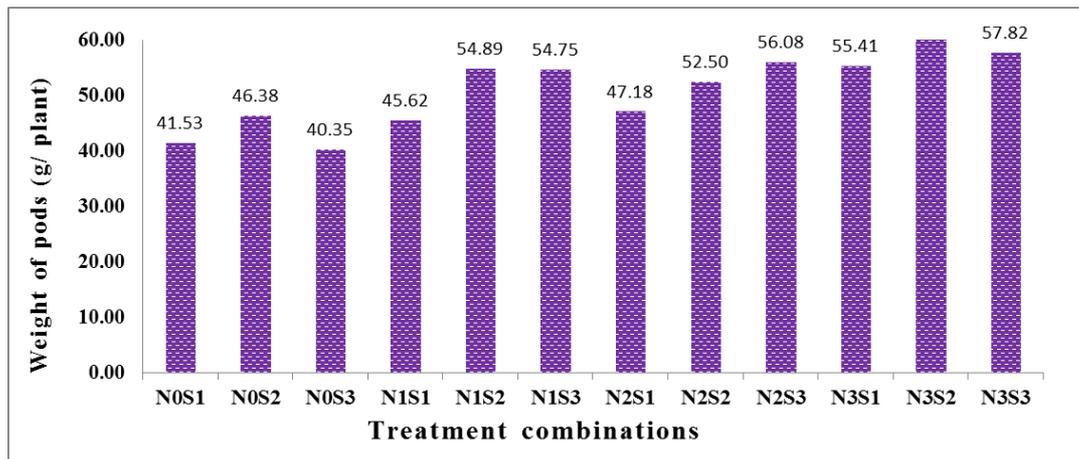


Fig 5: weight of pods per/ plant of French bean as influenced by the interaction between levels of nitrogen and plant spacing

(xiii) **Pod yield (q/ha):** The interaction effect of nitrogen and different plant spacing on pod yield was not found to be significant.

### Discussion and Summary

The results of the experiment as influenced by different levels of nitrogen and plant spacing's combinations have been discussed in this under the following heads.

Plant height; the results on the effect of nitrogen levels on plant height of French bean were recorded at 25 days. The effect of nitrogen revealed that there was significant difference in plant height due to different levels of applied nitrogen. The plant height at 25 days after sowing was not significantly influenced by the combined effect of different plant spacing's and nitrogen levels. Number of branches per plant; the number of branches per plant varied significantly with the nitrogen applications in French bean. There was no significant interaction effect between nitrogen and spacing on the number of branches per plant. Number of flowers per plant; the results on the effect of nitrogen had significant effect on the number of flowers per plant. The number of flowers/plant was increased with increasing levels of nitrogen. The interaction effect between nitrogen levels and plant spacing's was not found to be significant. Number of pods per plant; There was influence due to the effect of nitrogen on the number of pods per plant. This is in agreement with the findings of Sharma and Bhadoria (2009) [6] who stated that increased plant density reduced the pod number per plant in French bean. There was no any significant interaction effect between different doses of nitrogen and plant spacing's. Diameter of green pod; The interaction effect between nitrogen levels and plant spacing was found to be non-significant. Number of seeds per green pod; The interaction effect between nitrogen and plant spacing was found to be non-significant. Weight of pods per plant; The application of different doses of nitrogen showed a marked influence on the pod weight per plant of French bean. The interaction effect of nitrogen levels and plant spacing's on pod weight per plant was found to be non-significant. Pod yield (q/ha); The variation in pod yield was found to be not significant due to different levels of nitrogen. Nitrogen applied at 90 kg N/ha produced the pod yield (q/ha) and the pod yield (q/ha) was obtained from the control where no nitrogen was applied. Also found good response of French bean to applied nitrogen. Seed yield was not increased with the not increase of nitrogen levels. These findings are in agreement with those of Patel *et al.* (2003) [5], Tripathi *et al.* (2006) [8] and Kumawat *et al.* (2009). The combination effect of different nitrogen levels

and plant spacing not significantly influenced the yield of pod per hectare.

### Conclusion

Field experiment was conducted in the research farm of AKS University, Satna, during the period from December, 2015 to March 2016 to observe the effect of nitrogen doses and plant spacing on growth and yield of French bean. The experiment comprised two factors namely, nitrogen levels (0, 30, 60 and 90 kg/ha) and plant spacing (30 x 10cm, 30 x 15cm, 30 x 20cm). The experiment consisted of twelve treatment combinations which was laid out in randomized block design with three replications. The size of each unit plot was 1.0m x 3.0m. The seeds of French bean were sown in each plot on 1<sup>st</sup> week of December, 2015. Five plants were randomly-selected from each plot to record data on growth of plants, yield components and finally yield. The collected data were subjected to statistical analysis an order is draw the valid conclusion and the unit C.D value. In the present study, the application of nitrogen levels and plant spacing, showed significant effect on most of the growth parameters, yield components and yield of French bean. The highest plant height was recorded with nitrogen level of 90 kg/ha from 25 days after sowing up to the harvest stage and become statistically similar in different levels of nitrogen. Nitrogen levels had not significant effect on plant height, number of leaves per plant, branch per plant, number of flowers, pods/plant, and pod yield per hectare of French bean. The diameter of green pod was not found from the crop receiving 90 kg N/ha in control treatment (0 kg N/ha). The diameter of green pod was not found from the crop receiving 90 kg N/ha and the lowest diameter of green pod in control treatment (0 kg N/ha). The number of seeds per green pod was noted in the crop which received 90 kg N/ha and the number of seeds obtained from control treatment. The number of seeds per pod was found in case of 30 x 15cm plant spacing while the lowest was obtained from the closer spacing. It may be noted that the highest pod weight was obtained from 90 kg N/ha. Nitrogen applied 90 kg N/ha produced the highest pods yield (q/ha). The results of the present experiment revealed that the most of the parameters studied were not significantly influenced by plant spacing's which not significantly increased green pod yield t/ha. The broad diameter of green pod was observed from 30 x 15 cm and short diameter of green pod was observed from 30 x 10 cm which is closer spacing. The broad diameter of green pod was observed from 30 x 15 cm and short diameter of green pod was observed from 30 x 10 cm which is closer spacing. The pod weight of

French bean was obtained from the plant spacing of 30 x 15 cm. The pod yield was not obtained from the 30 x 15 cm plant spacing. The pods yield (q/ha) was not found from medium spacing (30 x 15 cm) from the results summarized above, the following conclusions are being warranted. The combined use of nitrogen levels and plant spacing's were not found to be significant on growth as well as yield and yield attributes of Contender French bean.

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