J. Hortl. Sci.
Vol. 8(2):268-270, 2013

Short communication

Studies on French bean (*Phaseolus vulgaris* L.) varieties under different N, P, K and S levels for growth, yield and economics

B.K. Sharma, S.S. Kushwah, K.S. Verma and O.P. Singh[1]
Department of Vegetable Science, College of Horticulture
Rajmata Vijayaraje Scindia Krishi Vishwa Vidyalaya
Gwalior, Mandsaur - 458 001, India
E-mail: kushwahhort@rediffmail.com

ABSTRACT

Fifteen combinations of three French bean varieties viz., Arka Komal (V_1), Swaran Priya (V_2) and Contender (V_3) and five fertilizer levels (F_1- 20:40:40:20kg/ha NPKS; F_2- 40:40:40:20kg/ha NPKS; F_3 - 60:60:60:40kg/ha NPKS; F_4 - 80:60:60:40kg/ha NPKS, and F_5 -100:80:80:50kg/ha NPKS) were tested in factorial Randomized Block Design, with three replications. Among the varieties, Swaran Priya was superior for growth attributes, yield attributes and yield. Among fertilizer levels, F_5 (100:80:80:50kg/ha NPKS) resulted in highest growth parameters, yield parameters and yield of pods. Economic evaluation showed that variety Swaran Priya under F_5 (100:80:80:50kg/ha NPKS) resulted in maximum gross returns, net returns and cost:benefit ratio for green pod production.

Key words: French bean, varieties, fertilizer levels, growth, yield, economics

French bean (*Phaseolus vulgaris* L.) is an important leguminous vegetable crop in India. It is also known as Kidney bean, Snap bean, Common bean, Haricot bean, Tepary bean, Bush bean and *Fras* bean. It is used as vegetable when pods are immature and tender. Beans are also pickled and cooked beans are served cold in salads. Canned and home-prepared red kidney beans are used in salads, meat and fish dishes (Begum *et al*, 2003). French bean is a good source of protein, carbohydrate, calcium, iron, phosphorus and vitamins, particularly, Vitamin B.

Genetic constitution of a variety makes a great contribution to growth, yield and pod quality in French bean. Improved varieties, in general, give higher yields if supplied with optimum nutrition and are grown under favourable conditions (Farkade and Pawar, 2002). French bean does not nodulate with native rhizobia in the plains. Consequently, it responds well to application of nitrogen (Kushwaha 1991). Nitrogen, phosphorus, potassium and sulphur are classified as major plant nutrients as these are required in relatively large amounts. Increase in growth and yield has been registered with higher doses of these nutrients (Farkade and Pawar, 2002). Earlier studies were confined mainly to N, P and K requirement of this crop. Not much attention was paid to sulphur nutrition. Sulphur deficiency is identified as a yield-limiting factor, particularly, in production of pulse and oilseed crops. Intensive cultivation and use of high-grade fertilizers have resulted in depletion of sulphur in the soil. Sulphur has been observed in several legume crops to increase crop yield and quality of the produce (Najar *et al*, 2011). With these facts in view, a field experiment was conducted to evaluate performance of French bean varieties under different fertilizer levels.

The experiment was conducted at Bahadari farm, College of Horticulture, Mandsaur, during *rabi* 2008-09. Fifteen combinations of three varieties (V_1- Arka Komal, V_2 - Swaran Priya and V_3 - Contender) and five fertilizer levels (F_1- 20:40:40:20kg/ha NPKS; F_2- 40:40:40:20kg/ha NPKS; F_3 - 60:60:60:40kg/ha NPKS; F_4 - 80:60:60:40kg/ha NPKS, and F_5 -100:80:80:50kg/ha NPKS) were laid out in factorial Randomized Block Design, with three replications. Soil in the experimental field was medium-black (Vertisol), clayey in texture, with uniform topography. Soil pH, EC (dSm^{-1}), available nitrogen (kg/ha), phosphorus (kg/ha), potassium (kg/ha) and sulphur (kg/ha) were 7.10, 0.24, 141, 22, 389 and 27, respectively. Seeds were sown on 6th October 2008, at a spacing of 45×15cm. Observations were recorded on plant height (cm), number of leaves per plant, number of branches per plant, leaf area (cm^2) per plant, days to 50% flowering, number of pods per plant, length of pods (cm), fresh weight (g) of green pods per plant, pod yield (q) per

[1]Department of Plant Physiology and Botany

hectare, and analyzed statistically as per standard procedures. Green pods were harvested between 30th November and 20th December, 2008. Economic evaluation of various combinations for fresh-pod production in French bean was done on the basis of existing price of the produce inputs provided.

The findings (Table1) showed significant influence of variety on various growth parameters. Plant height attained was maximum in cv. Swaran Priya, followed by Arka Komal and was least in cv. Contender. Highest number of leaves per plant, leaf area per plant, number of branches per plant was maximum in cv. Swaran Priya, followed by cv. Arka Komal and Contender. These findings corroborate those of Farkade and Pawar (2002). Days taken to 50% flowering varied from 31.6 to 33 days.

Application of fertilizers exerted significant influence on growth parameters. Maximum plant height, number of leaves per plant, leaf area per plant and number of branches per plant were recorded with application of F_5, followed by F_4, F_3, F_2 and F_1, respectively. Higher dose of NPKS (these nutrients play important role in photosynthesis as well as energy transport) may have enhanced growth attributes in French bean. Similar findings were reported by Farkade and Pawar (2002) and Singh and Verma (2002). Higher levels of fertilizer delayed flowering by 2 days compared to F-$_1$. Higher doses of fertilizer, particularly nitrogen, prolonged the growth period and resulted in delayed flowering.

Yield parameters and yield showed significant influence of variety (Table 1). Cultivar Swaran Priya recorded highest number of pods per plant, fresh weight of green pods per plant, and pod yield per hectare. This was followed by cvs. Arka Komal and Contender. Length of pod was maximum in cv. Arka Komal, followed by Swaran Priya and Contender. Higher photosynthetic area could have resulted in improved yield parameters and yield in cv. Swaran Priya. Moniruzzaman *et al* (2007) also found significant influence of cultivar on these attributes in French bean.

Fertilizer application had significant effect on yield parameters and yield in French bean. A linear increase in yield parameters and yield was seen with increasing levels of fertilizer. Highest number of pods per plant, length of

Table 2. Economic evaluation of various treatments for pod production in French bean

Treatment	Pod yield (q/ha)	Cost of cultivation (Rs./ha)	Gross returns (Rs./ha)	Net profit (Rs./ha)	Cost:Benefit ratio
V_1F_1	87.47	15256	43735	28479	1:1.87
V_1F_2	91.66	15456	45830	30374	1:1.97
V_1F_3	92.67	16146	46335	30189	1:1.87
V_1F_4	99.33	16326	49665	33339	1:2.04
V_1F_5	100.80	16946	50400	33454	1:1.97
V_2F_1	97.23	15256	48615	33359	1:2.19
V_2F_2	101.47	15456	50735	35279	1:2.28
V_2F_3	103.83	16146	51915	35769	1:2.22
V_2F_4	105.77	16326	52885	36559	1:2.24
V_2F_5	111.97	16946	55985	39039	1:2.30
V_3F_1	81.68	15256	40840	25584	1:1.68
V_3F_2	82.81	15456	41405	25949	1:1.68
V_3F_3	85.20	16146	42600	26454	1:1.64
V_3F_4	89.00	16326	44500	28174	1:1.73
V_3F_5	92.97	16946	46485	29539	1:1.74

French bean pod selling price: Rs. 5/kg

Table 1. Effect of variety and fertilizer level on growth attributes, yield attributes and yield in French bean

Treatment	Plant height (cm)	Number of leaves per plant	Number of branches per plant	Leaf area per plant (cm^2)	Days to 50% flowering	Number of pods per plant	Length of pod (cm)	Fresh weight of green pods per plant (g)	Pod yield (q) per hectare
Variety									
V_1 (Arka Komal)	36.17	57.76	10.45	657.80	33.00	27.04	14.58	64.15	94.38
V_2 (Swaran Priya)	42.09	66.84	11.69	905.56	32.20	33.78	14.22	71.91	104.05
V_3 (Contender)	35.85	53.69	9.69	640.33	31.60	25.61	14.08	59.49	86.33
S.Em±	0.19	0.29	0.14	2.58	0.17	0.28	0.09	0.48	0.95
CD (*P=0.05*)	0.57	0.81	0.39	7.46	0.49	0.81	0.26	1.39	2.75
Fertilizer level (F)									
F_1 (20:40:40:20kg/ha NPKS)	33.76	51.84	9.36	543.88	30.89	23.69	13.62	61.46	88.79
F_2 (40:40:40:20kg/ha NPKS)	35.52	54.77	9.96	632.82	31.89	25.56	14.03	62.89	91.98
F_3 (60:60:60:40kg/ha NPKS)	38.18	59.74	10.44	715.88	32.33	28.61	14.25	64.80	93.90
F_4 (80:60:60:40kg/ha NPKS)	40.16	63.53	11.01	846.66	32.89	30.93	14.58	66.87	98.03
F_5 (100:80:80:50kg/ha NPKS)	42.58	67.27	12.28	933.59	33.33	35.26	15.00	69.89	101.91
S.Em±	0.23	0.33	0.16	3.32	0.20	0.33	0.11	0.62	1.23
CD (*P=0.05*)	0.66	0.94	0.46	9.63	0.57	0.94	0.30	1.80	3.55

pod, fresh weight of green pods per plant, and pod yield per hectare were seen with application of F_5 (100:80:80:50kg/ha NPKS). This was followed by F_4, F_3, F_2 and F_1, respectively. Higher availability of nutrients may have resulted in improved growth parameters, yield parameters and yield with application of higher levels of fertilizer. Srinivas and Nayak (1988), Farkade and Pawar (2002) and Singh and Verma (2002) also reported higher growth parameters and yield with higher doses of fertilizer in French bean.

Economic evaluation of fresh pod production (Table 2) revealed highest net returns in cv. Swaran Priya under F_5 (100:80:80:50:kg/ha NPKS), followed by V_2F_4 (Swaran Priya, under 80:60:60:40kg/ha NPKS). Cost:Benefit ratio was maximum in V_2F_5 (Swaran Priya, under 100:80:80:50:kg/ha NPKS). Singh and Verma (2002) also reported higher returns with high-yielding varieties and higher doses of fertilizer.

REFERENCES

Begum, A., Ahad, A., Kaisar, M.O., Islam, M.M. and Anam, M.K. 2003. Morphological and reproductive attributes in French bean (*Phaseolus vulgaris*) as influenced by sowing time and fertilizer treatments. *Pakistan J. Biol. Sci.*, **6**:1902-1906

Farkade, B.K. and Pawar, W.S. 2002. Growth performance and yield of French bean varieties as influenced by different fertilizer levels. *J. Soils & Crops*, **12**:142-144

Kushwaha, B.L. 1991. Response of winter French bean at varying levels of nitrogen and phosphorus in north Indian plains. *Indian J. Pulses Res*., **4**:217-218

Moniruzzaman, M., Rahman, S.M.L., Kibria, M.G., Rahman, M.A. and Kaisar, M.O. 2007. Performance of vegetable French bean as influenced by varieties and sowing dates in *rabi* season. *Int'l. J. Sustain. Crop Prodn*., **2**:69-73

Najar, G.R., Singh, S.R., Akhtar, F. and Hakeem, S.A. 2011. Influence of sulphur level on yield, uptake and quality of soyabean (*Glycine max*) under temperate conditions of Kashmir valley. *Indian J. Agri. Sci.*, **81**:340-343

Singh, N.B. and Verma, K.K. 2002. Nitrogen and phosphorus nutrition of French bean (*Phaseolus vulgaris* L.) grown in eastern Uttar Pradesh under late sown condition. *Indian J. Agron*., **47**:89-93

Srinivas, K. and Naik, L.B. 1988. Response of vegetable French bean (*Phaseolus vulgaris* L.) to nitrogen and phosphorus fertilization. *Indian J. Agri. Sci.*, **58**:707-708

(MS Received 14 May 2012, Accepted 21 August 2013, Revised 17 September 2013)