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Effect of nutrients on yield attributing character of French bean (*Phaseolus vulgaris* L.)

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Abstract

The present investigation entitled "Effect of nutrients on yield attributing characters of French bean (*Phaseolus vulgaris* L.)" was carried out during Rabi, 2018-19 at Instructional Farm-II of Institute of Agricultural Sciences, Bhubaneswar. The recommended dose of fertilizer (RDF) used for French bean was 50:75:75 NPK kg/ha-1 along with FYM @ 15 ton ha-1, which was applied in three levels i.e. 50 %, 100 % and 150 % of the RDF with various combinations of rhizobium culture and micronutrients. The experiment was consist of twelve treatments in various combinations of different levels of fertilizer with and without rhizobium culture (30 g kg-1 of seed) and micronutrients (0.1 %). The results obtained from the present investigation indicated that the treatment receiving 50:75:75 NPK kg/ha-1 (100 % RDF) along with FYM @ 15 ton ha-1, rhizobium culture (30 g kg-1 of seed) and micronutrients (0.1 %) recorded significantly higher value in yield parameters of French bean var. Harsh had produced pod length (3.42 cm), maximum number of pods plant-1 (35.64), pod weight (6.7g), highest pod yield ha-1 (237.0 q). Maximum number of nodules plant-1 (99.07) was also recorded in the same treatment. Thus, it may be suggested that RDF with rhizobium culture and micronutrients application gave maximum yield in case of French bean.

Keywords: Legume, French bean, N:P:K, rhizobium, micronutrients, yield

Introduction

French bean (*Phaseolus vulgaris* L.) also known as 'rajmash' or 'haricot bean' or 'kidney bean' or 'common bean' or 'snap bean', 'navy bean' is one of the most commercially valuable vegetables grown in India. It is valued for its protein rich (23%) seeds. French bean is also known as 'meat of poor', 'grain of hope' and 'super food' in virtue of the nutritional properties it possesses. The fresh pods and green leaves are used as vegetable. The anti- metabolites of dry beans need removal by cooking and soaking in water. French bean is an important and highly profitable vegetable crop of North Eastern Hill Region of India. It occupies an important position among various Kharif pulses and vegetable crops grown in temperate hills of India. The increase in productivity of French bean will meet the increasing demand for green vegetables of the region. In Odisha, this crop is mainly grown during winter season, with assured irrigation facilities. As a whole there is urgent need for increasing the productivity with better quality pods. Hence, proper production technologies are essential to achieve the goal. From among the production technologies, nutrient management plays an important role in this crop. The Rhizobium inoculation significantly enhanced the growth and yield parameter of French beans Ahmed *et al.* (2016) [1]. French bean var. PDR-14 (Uday) inoculated with Rhizobium gave significant high results with respect to days to first flowering, and days to 50% flowering, number of pods / plant, number of grains / pod, green pod length (cm), green pod width (cm), single green pod weight, green pod yield / plant (g), green pod yield / plot (kg), green pod yield (q / ha), seed weight (g), moisture (%), total sugars (%), protein (%) Meena *et al.* (2018) [7]. The biofertilizers along with graded dose of fertilizers give good yield in French bean also gives that number of clusters per plant, number of seeds per pod, 100-seed weight(g), pod yield per hectare(t/ha). which was significantly increased in Arka Suvidha by applying 75% RDF + VAM @2kg ha-1 + PSB @ 2.5 kg ha-1 Ramana *et al.* (2010) [13]. The combined effect of biofertilizers and micronutrients (biofertilizer + Zn + Fe treatment) was significantly better than their individual effects on yield attributes, yield and harvest index.

Furthermore, integration of 100 % NPK + 25 % N organic and biofertilizer + Zn + Fe was conducive for getting significantly optimum yield in French bean Kumar *et al.* (2009) [6]. The present investigation was carried out to observe the response of different levels of RDF with rhizobium and micronutrients on yield and yield attributing characters of French bean.

Materials and Methods

The present investigation entitled "Effect of nutrients on yield attributing character of French bean (*Phaseolus vulgaris* L.)" was carried out during Rabi, 2018-19 at Instructional Farm-II of Institute of Agricultural Sciences, Bhubaneswar. The experiment was carried out to study the effect of rhizobium culture and micro-nutrient at different levels of fertilizer on yield of French bean. Variety Harsh was selected. 12 treatments using different recommended dose of fertilizer (NPK: 50:75:75), rhizobium culture (30 g kg⁻¹ of seed) and micronutrients (0.1 %) were applied in different treatments. The sowing is done in rabi season using RBD. The sowing spacing of 30 cm x 15 cm in 1.5 m X 1.2 m with total area of 65 m² for each treatment is done. From each plot five observation plants were selected from each treatment to calculate the pod length, pod girth, number of pods per plant, pod weight, pod yield per plant and pod yield per hectare. The detail of the treatments applied in this experiment is given below.

Table 1: The experiment comprised of the following treatments

Treatments	Treatment details
T1	50 % of RDF
T2	100 % of RDF
T3	150 % of RDF
T4	50 % of RDF + Rhizobium culture
T5	100 % RDF + Rhizobium culture
T6	150 % of RDF + Rhizobium culture
T7	50 % of RDF + Micronutrient
T8	100 % of RDF + Micronutrient
T9	150 % of RDF + Micronutrient
T10	50 % of RDF + Rhizobium culture + Micronutrient
T11	100 % of RDF + Rhizobium culture + Micronutrient
T12	150 % of RDF + Rhizobium culture + Micronutrient

Results and Discussions

Significant variation on pod length was observed in the experiment, which is presented in table 2. Maximum pod length of (13.42 cm) was recorded in T11 receiving 100 % RDF with rhizobium and micronutrients, which is at par with T9, T6, T12, T10 and T8. The pod length varies from 12.5 cm to 13.4 cm. However the higher dose of NPK with rhizobium and micronutrients increase the length of the pod over control. This was in confirmation with the findings of Gharib *et al.* (2009) [4] in snap bean and Meena *et al.* (2018) [8] in French bean.

Table 2: Effect of nutrients on pod length & girth of French bean (*Phaseolus vulgaris* L.)

Treatments	Pod length (cm)	Pod girth(cm)
T1	12.50	2.68
T2	12.81	2.66
T3	12.86	2.88
T4	12.89	2.73
T5	13.14	2.71
T6	13.37	2.92
T7	12.92	2.76
T8	13.32	2.79

T9	13.40	2.80
T10	13.33	2.73
T11	13.42	2.79
T12	13.37	2.81
Sem (±)	0.1715	0.0532
CD 5%	0.5030	-
CV %	2.2661	3.3247
„F“ test	S	NS

The data recorded on pod girth of French bean is presented in Table 2 was non- significant among all the treatments. The pod girth ranges from 2.66 cm in T2 to 2.92 cm in T6. Application of different levels of NPK in combination with rhizobium and micronutrient increase the pod girth up to certain extent in almost all the treatments but from this study maximum pod girth was observed by applying 150 % RDF combined with rhizobium culture, which remain non-significant and there was no much increase in the pod girth by application of different treatments, which was the confirmations with the findings of Gharib *et al.* (2009) [4] in snap bean.

Observations on number of pods plant-1 was recorded and presented in Table 3, which ranges from 17.66 cm to 35.64 cm. The number of pods plant-1 was significantly highest in T11 (35.64) to rest of the treatments. Minimum number of pods was recorded in T1 (17.66).

Table 3: Effect of Nutrients on Yield Attribute Character of French bean (*Phaseolus vulgaris* L.)

Treatments	No. of pods / plant	Pod weight (g)	Pod yield/ plant (g)
T1	17.66	5.2	46.0
T2	22.24	5.4	59.6
T3	32.47	5.6	94.1
T4	27.39	5.5	74.7
T5	23.57	5.2	61.8
T6	34.85	5.8	100.7
T7	32.10	5.3	90.2
T8	26.31	5.6	73.2
T9	35.62	5.8	102.8
T10	31.42	5.4	89.6
T11	35.64	6.7	106.7
T12	32.22	5.4	87.1
Sem (±)	0.7711	0.164	0.941
CD 5%	2.2614	0.480	2.760
CV %	4.5599	5.096	1.983
„F“ test	S	S	S

Application of 100 % RDF with rhizobium and micronutrients significantly influenced the production of maximum number of pods per plant than other treatments in the trial. This increase may be due to the apportioning efficiency i.e. increased production of

photosynthates towards the economic part as pods and also the required hormonal balance in the plant system. Similar findings were also reported by Pandey *et al.* (1988) [12] in cowpea, Gharib *et al.* (2009) [4] in snap bean and Taura and Fatima (2008) [3] in cowpea and Kumar *et al.* (2009) [6] in French bean.

From this research trial the pod weight presented in Table 3 was found significant among different treatment combinations which range from 5.2 g to 6.7 g. However, significantly highest weight was recorded in T11 (6.7 g). T5 and T1 recorded minimum pod weight i.e. 5.2 g each. The weight on the pod was found to be significantly higher in T11. This might have favoured the production of more amount of food material and accumulation of the same in the form of pod, there by increasing the pod weight, the result is tallies with

the findings of Gharib *et al.* (2009) [4] in snap bean and Meena *et al.* (2018) [8] in French bean.

Per plant yield was significantly influenced in all the treatments taken in the experiment, which is presented in Table 3. Maximum pod yield per plant-1 was recorded in T11

(106.7 g) which was significantly superior than rest other treatments of the experiment followed by T9 (102.8g) and T6 (100.7 g) which remains at par. However, lowest yield plant-1 was recorded in T1 (46.0 g) which is significantly inferior to all other treatments.



Fig 1: Pod yield from sample plant in T11 (Left), plant growth in T11 (Right)

Pod yield ha-1 (Fig. 1) showed significant variation among the treatments in the trial. The maximum pod yield ha-1 was recorded in T11 (237.0 q), which is superior to rest of the

treatments followed by T9 (228.5 q) and T6 (223.7q), which are at par. However lowest pod yield ha-1 was recorded in T1 (102.1q) and significantly inferior to rest of the treatments.

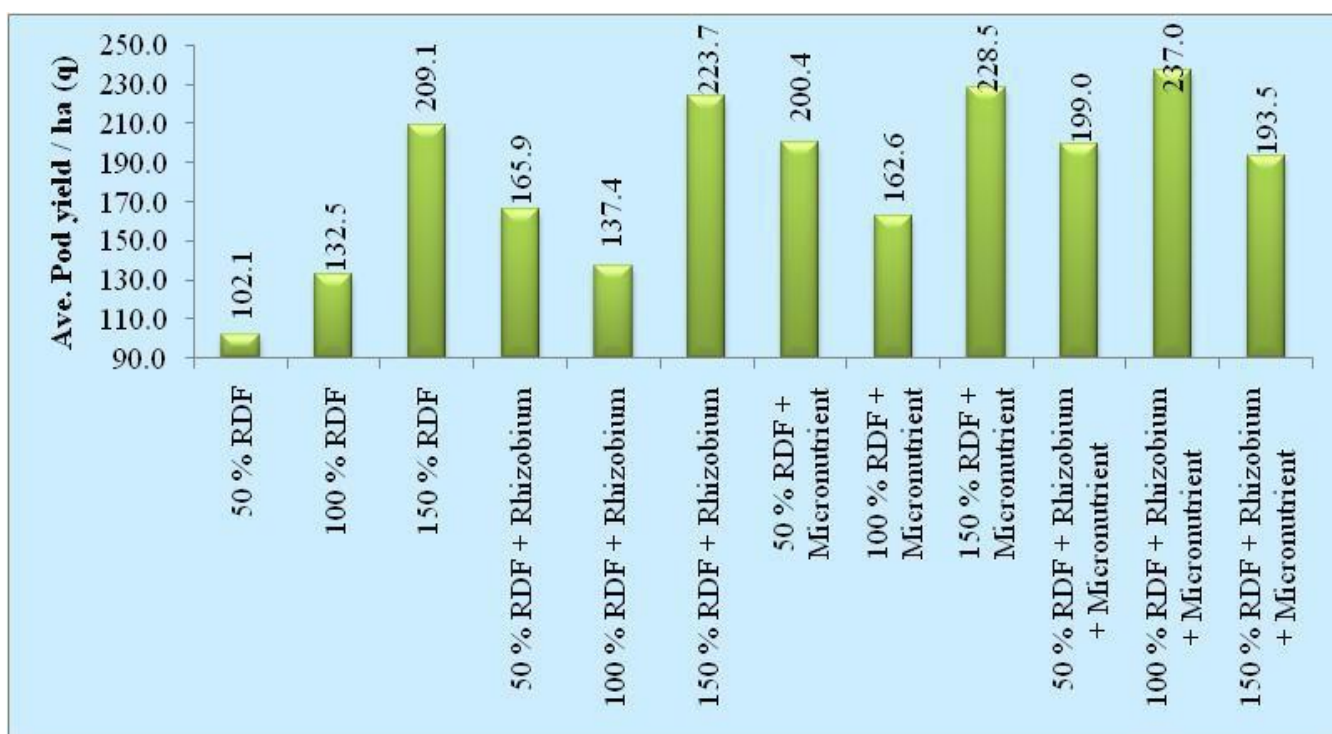


Fig 2: Effect of levels of fertilizer, rhizobium and micronutrient on average pod yield hectare-1 of French bean var. Harsh

Maximum yield (237.10q/ha) was recorded with the application of 100 % RDF with rhizobium and micronutrients which was significant higher than the other treatments including control. The increase in the yield could be due to the greater availability of nutrient in soil and inoculation resulting in the better growth and development which might be attributed to better mobilization of different nutrients and increased allocation of photosynthetes towards the economic parts and also hormonal balance on the plant system.

The findings correlate with the findings of Naagar *et al.* (2004) [9] in cluster bean; Rajput *et al.* (2004) [12] in garden pea; Jain *et al.* (1999) [5] in chick pea; Das *et al.* (2018) [2]; Meena *et al.* (2018) [7]; Ramana *et al.* (2010) [13] in French

bean; Osman *et al.* (2010) [10] in faba bean and Susheela *et al.* (2007) [14] in garden pea.

Conclusion

The salient findings of the present study, entitled “Effect of nutrients on yield attributing characters of French Bean (*Phaseolus vulgaris* L.)”, clearly reveals that significant variation having maximum pod length of 13.42 cm in T11 (100 % of RDF with Rhizobium culture and Micronutrients) which is remain at par with T9 (150 % of RDF with only Micronutrients), T6 (150 % of RDF with only Rhizobium), T12 (150 % of RDF with both Rhizobium and Micronutrients), T10 (50 % of RDF with both Rhizobium and

Micronutrients), T8 (100 % of RDF + Micronutrients) and T5 (100 % RDF + Rhizobium culture). Non significant variations on pod girth among the treatments were recorded. The pod girth ranges from 2.66 cm in T2 receiving 100 % of RDF without rhizobium and micronutrients to 2.92

cm in T6 receiving 150 % of RDF with Rhizobium only. The number of pods plant-1 was significantly highest in T11 (35.64) receiving 100 % of RDF along with Rhizobium and Micronutrients to rest of the treatments. Significantly highest pod weight was recorded in T11 (6.7g) receiving 100% RDF along with Rhizobium and Micronutrients and also highest pod yield ha-1 was recorded in T11 (237.0 q) receiving 100 % of Recommended dose of fertilizer along with Rhizobium culture and Micronutrients. Increase in yield attributing characters in treatment T11 might be the combined effect of rhizobium and micronutrients with different levels of N: P: K for better yield of french bean.

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