*Available online at* www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.6343

**ISSN: 2320 – 7051**

*Int. J. Pure App. Biosci.* **6 (1):** 1351-1355 (2018)

*Research Article*

International Journal of Pure & Applied Bioscience

OPEN ACCESS

# Efficacy of Bio-fertilizers on Vegetative Characters of French Bean (*Phaseolus vulgaris* L.) Cultivars

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Received: 12.01.2018 | Revised: 20.02.2018 | Accepted: 24.02.2018

**ABSTRACT**

*A field experiment was conducted during the rabi season 2014-15 at the Horticulture research farm 2 under the School for Bio-sciences and Biotechnology, Babasaheb Bhimrao Ambedkar University Vidya- Vihar Rae Bareli, Road, Lucknow(U.P.) India. To find out the efficacy of bio-fertilizers on vegetative character of French bean cultivars PDR-14,EC-400445and IPR 98-3-1 (Phaseolus vulgaris L.). The results revealed that the application of $V_1B_3$ (PDR-14 (Uday) + Rhizobium) Significantly increased the plant height (cm), germination (%), number of branches per plant, number of leaf, leaf length and leaf width in the variety PDR-14(V1) followed by IPR 98-3-1and EC-400445 respectively.*

***Key words:*** *French bean, PSB, Rhizobium ,VAM, Interaction.*

## INTRODUCTION

French bean (*Phaseolus vulgaris* L). is a short duration , Non-traditional legume and highly relished pulse crop of North India with a high yield potential. nutritious vegetable consumed as tender pods, shelled beans and dry beans. It is also known as snap bean, kidney bean, haricot bean and "Raj mash" in Hindi. French bean originated from Central America and Peruvian Andes in South America. It spreaded to Europe during 16 and 17 centuries and reached England by 1594. It was introduced to India during 17 century from Europe. In India, it is mainly grown in Himachal Pradesh, UKO, J&K, Punjab, Haryana, Uttar Pradesh, Bihar, Gujarat, Madhya Pradesh, Maharashtra, Karnataka, Andhra Pradesh and Tamil Nadu. Considering the nutritive value, 100 g of green pod contains 1.7 g protein, 0.1 g fat, 4.5 g carbohydrate, 1.8 g fiber and is also rich in minerals and vitamins.the seeds are highly proteinaceous.however, the lack of build up of naturally efficient rhizobium strain renders the crop to respond to high dose of nitrogen Jaiswal *et al*.,[6] It also posses medicinal properties which is useful in controlling diabetes and certain cardiac problems and it is a good natural cure for bladder burn. It has both carminative and reparative properties against constipation and diarrhoea respectively Duke[3].

**Cite this article:** Meena, J.K., Ram, R.B. and Meena, M.L., Efficacy of Bio-fertilizers on Vegetative Characters of French Bean (*Phaseolus vulgaris* L.) Cultivars, *Int. J. Pure App. Biosci.* **6(1):** 1351-1355 (2018). doi: http://dx.doi.org/10.18782/2320-7051.6343

Beans, the "meat of the poor", contribute essential protein to the undernourished people living in the hills. Being a short duration crop French bean can be grown under different cropping patterns of hills and plains of India. French bean is effected by inadequate availability of nutrients in the soil its requires large quantity of phosphorus for optimum growth and yield. To enhance the plant s capacity to utilize such nutrients effectively including in the soil, PSB and VAM inoculation has been considered to be effective. Researchers in the few decades established that VAM can improve plant growth through increased uptake of phosphorus, especially in the soil of low fertility Gerdemann[5]. Biofertilizers play a vital role in maintaining long term soil fertility and sustainability.it may increase yield of crops by10-30 percent Khandelwal *et al*[7].

## MATERIAL AND METHODS

The present investigation was carried out at the Horticulture Research Farm 2 of the Department of Horticulture, Babasaheb Bhimrao Ambedkar Central University, Vidya Vihar, Rae Bareli Road Lucknow (U. P.) India, during *Rabi* season of October, 2014 to April, 2015, in well levelled field having proper drainage. Geographically, Lucknow is situated at an elevation of 111m above the mean sea level in the subtropical tract of central U.P. at $26^0$56' North latitude and $80^0$52' East longitude. The place experiences winter and very hot summer with average rainfall. Agro-climatically, the location represent Central Zone of the state of Uttar Pradesh, India, and is characterised by sub-tropical climate. The experimental material comprising of three cultivar of French bean was collected from IIPR, Kanpur and maintained in the Horticulture Research Farm 2. All recommended package of practices were followed to raise good crop. Experimental field was laid out in randomized block design with 18 treatments and replicated thrice. Each block was further subdivided into 18 unit plots. The unit plot size was 1.80mX1.00m, and the row-row and plant –plant spacing were 30cm and 20cm, respectively. All necessary cultural operations were done as and when required during the growing period. Data was recorded on 5 randomly selected plants per entry per replication for various horticultural characters namely, germination (%), plant height (cm), primary branches/ plant, secondary branches/ plant, number of leaves /Plant and size of leaves (length and width cm), days to first flowering, and days to 50 percent flowering were recorded on plot basis. Statistical analysis of the data obtained in different set of experiments was calculated following the standard procedure as stated by Panse and sukhatme[10].

## RESULTS AND DISCUSSION

The results obtained from the present investigation are summarized in the following sub heads:

**Effect of varieties:**

The results of the present study indicate that among the treatments (PDR-14 (Uday) + Rhizobium) $V_1B_3$ recorded germination percentage, plant height (cm), number of branches per plant, number of leaves, leaf length and leaf width of plant except primary branches in IPR-98-3-1 respectively ( **Table 1**) . The increase of plant height was found in 30 DAS ,60 DAS and 90 DAS. The highest germination percentage 90.05 was recorded in varieties PDR-14. However, the maximum plant height at 30 DAS, 60 DAS and 90 DAS (19.28 cm, 32.46 and 56.89cm) respectively were recorded in varieties PDR-14. The maximum number of primary branches per plant 4.18 was recorded in varieties IPR-98-3-1. Secondary branches per plant (7.50) leaf length (9.15cm) and leaf width (8.61cm) was recorded at harvesting stage followed by $V_1B_2$ treatment PDR-14 (Uday) + Phosphate solubilizing bacteria. Such varietal differences are observed due to genetic makeup of the varieties and such differences in French bean varieties were also observed by earlier research workers Samal[11] and Maske *et al.*,[8]

**Effect of Bio-fertilizers:**

It is evident from the table 1 that the effect of bio-fertilizers on the recorded increased plant

height (cm), number of branches per plant, number of leaves, leaf length and leaf width of plant primary branches in $B_3$ (Rhizobium) except germination percentage respectively The increase of plant height was found in 30 DAS,60 DAS and 90 DAS. However, the maximum plant height at 30 DAS, 60 DAS and 90 DAS (19.84 cm,32.21 and 57.00cm) respectively was recorded in B3 (Rhizobium). The maximum number of primary branches per plant 4.42 and secondary branches per plant (7.30) leaf length (8.77cm) and leaf width (8.69cm) was recorded at harvesting stage. This increase in growth attributes might have been due to more and quick supply of NPK with heavy application of inorganic fertilization which increased photosynthetic activity, cell division, elongation and differentiation etc. resulting in higher growth attributes. The increase in growth attributes at higher fertility levels is in harmony with the findings of Shubashree *et al.,* and El-Bassiony *et al*.,[4]. Further, increased growth parameters with biofertilizers might be due to the fact that organic manures release of nutrients slowly, increases nutrient use efficiency, biological fixation and increased availability of micro-nutrients Nawalgatti *et al*.,[9] and Shubasshree *et al*.,[12].

**Interaction Effect of Varieties and Bio-fertilizers:**

The interaction effect of bio fertilizers and varieties was significant in relation to germination (%) plant height (cm), the primary branches per plant , secondary branches per plant, leaf length cm and leaf width(cm). Maximum was recorded in $V_1$ $B_3$ 91.25, 64.14, 4.57 cm, 8.50, 9.77cm. Which was significantly superior than the other treatment followed by $V_1B_2$ and $V_1B_5$. Least interaction effect was recorded in $V_2B_0$ (79.97%, 46.77cm, 3.56, 4.44, 7.18 (cm) and 7.03 cm). Increase in plant height as compared to the control might be due to the improvement in soil physical condition provided for plant growth and also due to increased availability of nutrients especially N, $P_2$ $O_5$ and $K_2$ O from the early stages of crop. Phosphorus fertilization might have improved the root system in french bean which in turn helped more assimilation of nutrients resulting in increased growth. This findings corroborates with the findings of Ramana *et al*,[14] in french bean, Zahida *et al*.,[15] in French bean. Increase in number of branches per plant, secondary branches per plant, leaf length cm and leaf width(cm), due to the proper balance of organic and inorganic nutrients and uniform moisture and temperature regimes by organic matters provided a better conducive rhizospheric condition and in turn helped the plants to boost their growth remarkably. These results show that increase in plant growth could probably be due to improvement in the physio- chemical properties of soil, increase in enzymatic activity, increase in microbial population and activity and easy availability of micro- and micro- nutrients by application of vermicompost and organic mulching, Albiach *et al*.,[1] Azarmi *et al*.,[2] in tomato and Singh *et al*.,[13] French bean.

**Table 1: Effect of varieties and bio-fertilizers on vegetative character on French bean**

| TREATMENT | Germination (%) | Plant height (cm) | | | Primary branches/plant | Secondary branches/plant | Number of leaves/ plant | | | Leaf length (cm) | Leaf width (cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30DAS | 60 DAS | 90 DAS | | | 30 DAS | 60 DAS | 90DAS | | |
| **CULTIVARS** | | | | | | | | | | | |
| $V_1$ | 90.05 | 19.28 | 32.46 | 56.89 | 4.04 | 7.50 | 15.82 | 29.33 | 56.74 | 9.15 | 8.61 |
| $V_2$ | 83.08 | 16.45 | 27.85 | 49.50 | 3.82 | 4.94 | 14.74 | 28.26 | 50.48 | 7.83 | 7.93 |
| $V_3$ | 89.27 | 18.36 | 29.97 | 53.16 | 4.18 | 6.97 | 15.47 | 27.93 | 45.37 | 8.68 | 8.48 |
| C.D | 5.287 | 0.651 | 0.915 | 1.312 | 0.175 | 0.358 | 0.595 | 0.792 | 1.259 | 0.266 | 0.338 |
| S.E.(d) | 2.601 | 0.320 | 0.450 | 0.645 | 0.086 | 0.176 | 0.293 | 0.390 | 0.619 | 0.131 | 0.166 |
| S.E.(m) | 1.839 | 0.226 | 0.318 | 0.456 | 0.061 | 0.125 | 0.207 | 0.276 | 0.438 | 0.092 | 0.118 |
| **BIOFERTILIZERS** | | | | | | | | | | | |
| $B_0$ | 83.80 | 15.47 | 27.63 | 47.53 | 3.64 | 5.33 | 13.88 | 27.29 | 45.13 | 7.85 | 7.74 |
| $B_1$ | 88.15 | 16.77 | 29.56 | 51.57 | 4.04 | 6.30 | 14.93 | 28.23 | 49.86 | 8.50 | 8.60 |
| $B_2$ | 89.38 | 18.88 | 30.53 | 55.99 | 4.09 | 6.76 | 15.81 | 28.70 | 53.84 | 8.74 | 8.42 |
| $B_3$ | 89.05 | 19.84 | 32.21 | 57.00 | 4.42 | 7.30 | 16.43 | 29.34 | 52.46 | 8.61 | 8.69 |
| $B_4$ | 87.23 | 18.53 | 30.17 | 51.57 | 3.94 | 6.45 | 15.47 | 28.76 | 51.81 | 8.77 | 8.23 |
| $B_5$ | 87.19 | 18.70 | 30.46 | 55.43 | 3.96 | 6.69 | 15.54 | 28.71 | 52.09 | 8.86 | 8.35 |
| C.D | N.S | 0.920 | 1.293 | 1.855 | 0.248 | 0.507 | 0.842 | 1.121 | 1.780 | 0.376 | 0.478 |
| S.E.(d) | 3.678 | 0.453 | 0.636 | 0.912 | 0.122 | 0.249 | 0.414 | 0.551 | 0.876 | 0.185 | 0.235 |
| S.E.(m) | 2.601 | 0.320 | 0.450 | 0.645 | 0.086 | 0.176 | 0.293 | 0.390 | 0.619 | 0.131 | 0.166 |

**Table 2: Interaction effect of varieties and bio-fertilizers (VxB) on vegetative characters on French bean**

| TREATMENT | Germination(%) | Plant height(cm) | | | Primary branches/plant | Secondary branches/plant | Number of leaves/ plant | | | Leaf length(cm) | Leaf width(cm) |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 30DAS | 60 DAS | 90DAS | | | 30 DAS | 60 DAS | 90DAS | | |
| $V_1B_0$ | 85.66 | 16.26 | 30.25 | 48.47 | 3.50 | 5.22 | 14.11 | 28.22 | 48.47 | 8.32 | 7.55 |
| $V_1B_1$ | 92.52 | 17.25 | 32.14 | 55.78 | 4.11 | 7.48 | 15.13 | 29.23 | 55.78 | 8.73 | 8.52 |
| $V_1B_2$ | 92.59 | 20.55 | 32.55 | 57.74 | 4.07 | 8.12 | 16.24 | 29.55 | 64.14 | 9.50 | 8.76 |
| $V_1B_3$ | 91.25 | 21.33 | 35.44 | 64.14 | 4.57 | 8.50 | 17.36 | 30.02 | 54.92 | 9.77 | 9.53 |
| $V_1B_4$ | 88.88 | 20.05 | 32.01 | 55.78 | 4.07 | 7.47 | 16.54 | 29.42 | 57.74 | 9.08 | 8.66 |
| $V_1B_5$ | 89.41 | 20.24 | 32.41 | 59.44 | 3.96 | 8.25 | 15.55 | 29.54 | 59.44 | 9.55 | 8.66 |
| $V_2B_0$ | 79.97 | 14.66 | 25.33 | 46.77 | 3.56 | 4.44 | 13.22 | 27.32 | 46.27 | 7.18 | 7.56 |
| $V_2B_1$ | 83.40 | 15.84 | 27.35 | 47.37 | 3.74 | 4.73 | 14.44 | 28.16 | 47.37 | 7.93 | 9.07 |
| $V_2B_2$ | 85.59 | 16.89 | 28.54 | 54.25 | 3.89 | 4.92 | 15.52 | 28.44 | 49.87 | 8.14 | 8.10 |
| $V_2B_3$ | 83.91 | 17.99 | 28.88 | 49.87 | 4.14 | 6.04 | 15.62 | 29.01 | 53.74 | 7.71 | 7.11 |
| $V_2B_4$ | 83.72 | 16.52 | 28.50 | 47.37 | 3.73 | 4.85 | 14.23 | 28.33 | 54.25 | 8.08 | 8.72 |
| $V_2B_5$ | 81.89 | 16.82 | 28.53 | 51.40 | 3.88 | 4.66 | 15.42 | 28.34 | 51.40 | 7.98 | 7.03 |
| $V_3B_0$ | 85.77 | 15.50 | 27.33 | 47.37 | 3.88 | 6.34 | 14.33 | 26.34 | 40.66 | 8.07 | 8.13 |
| $V_3B_1$ | 88.55 | 17.22 | 29.20 | 51.58 | 4.28 | 6.70 | 15.22 | 27.32 | 46.44 | 8.85 | 8.23 |
| $V_3B_2$ | 89.96 | 19.20 | 30.50 | 56.00 | 4.33 | 7.24 | 15.68 | 28.12 | 47.51 | 8.60 | 8.41 |
| $V_3B_3$ | 91.99 | 20.21 | 32.33 | 57.01 | 4.57 | 7.38 | 16.31 | 28.99 | 48.73 | 8.36 | 9.45 |
| $V_3B_4$ | 89.11 | 19.02 | 30.02 | 51.58 | 4.03 | 7.04 | 15.66 | 28.55 | 43.44 | 9.15 | 7.33 |
| $V_3B_5$ | 90.29 | 19.05 | 30.45 | 55.42 | 4.04 | 7.17 | 15.66 | 28.26 | 45.44 | 9.05 | 9.37 |
| C.D | N.S | N.S | N.S | 3.213 | N.S | 0.878 | N.S | N.S | 3.084 | N.S | 0.828 |
| S.E.(d) | 6.371 | 0.784 | 1.102 | 1.580 | 0.211 | 0.432 | 0.717 | 0.955 | 1.517 | 0.320 | 0.407 |
| S.E.(m) | 4.505 | 0.555 | 0.779 | 1.118 | 0.149 | 0.305 | 0.507 | 0.675 | 1.073 | 0.226 | 0.288 |

## REFERENCES


1. Albiach, R., Canet, R., Pomares, F. and Ingelmo, F. Microbial biomass content and enzymatic activities after application of organic amendments to a horticultural soil. *Bioresour. Technology.*, **75:** 43-48 (2000).
2. Azarmi, R., Giglou, M.T. and Taleshmikail, R.D. Influences of vermicompost on soil chemical and physical and physical properties in tomato field. *African J. Biotechnology.,* **7(14):** 2397-2401 (2008).
3. Duke, J.A., Handbook of World Economic Importance. USDA, Beltsville, Maryland, *Plenum, New York and London* (1981).
4. EL-Bassiony, A.M., Fawzy, Z.F., Abd EL-Baky, M.M.H. and Mahmoud, A.R., Response of Snep bean plants to mineral fertilizers and humic acid application. *Research Journal of Agriculture and Biological Sciences* **6(2):** 169-175 (2010).
5. Gerdemann, J W., Vescicular arbuscular mycorrhizae In: Development and function of root (Ed. By J.C. Torrey and D.T. Clarkson), London, New York pp: 575-591 (1975).
6. Jaiswal, H. K., Singh, U. P., Singh, O. N. and Rai, B., Technological basis for increasing production of French bean in plains. Indian Forming **47(1):** 15-18(1997).
7. Khandelwal, R., Choudhary, S.K., Khanga Rot, S.S., Jat, M.K., Singh, R., Effect of inorganic and bio-fertilizers on productivity and nutrients uptake in cowpea [*Vigna Unguiculata* (L.) Walp]. *Legume Research*. **35(3):** 235-238 (2012).
8. Maske, N. M., Kadam, S. B., Tidke, R. T., Pawar, S. B., Performance of French bean (*Phaseolus vulgaris* L.) genotypes under different fertility levels. *International Journal of Agricultural Scien*ces **5(1):** 134-136 (2009).
9. Nawalgatti, C.M., Ashwini, G.M., Doddamani, M.B., Chetti, M.B. and Hiremath, S.M., Infiluence of organic, nutrients and plant growth regulators on growth, yield and yield components in French bean. *Int. J. of Plant Sci.* **4(2)** 367-372 (2009).
10. Panse, V.G. and Sukhatme, P.V., Indian Council of Agricultural Research, New Delhi. 38 (1978).
11. Samal, K.M., Senapati, N. and Sahu, A., Varetial performence and genetic variability in kidney bean (*Phaseolus vulgaris* L). *Indian J. Agric. Sci.* (1997).

12. Shubhshree, K.S., Alagundagi, S.C., Hiremath, S.M., Chittapur, B.M., Hebsur, N.S. and Patil, B.C., Effect of nitrogen, phosphorus and potassium levels on growth, yield and economics of Rajmash (*Phaseolus vulgaris* L). *Karnataka journal of Agricultural Sciences* **24(3):** 283-285 (2011).
13. Singh, B.K., Pathak, K.A., Verma, A.K., Verma, V.K. and Deka, B.C. Effect of vermicompost, fertilizer and mulch on plant growth, nodulation and pod yield of French bean (*Phaseolus vulgaris* L.). *Veg. Crop Res. Bull.*, **74:** 153-165 (2011).
14. Ramana, V. Ramakrishna, M., Purushotham, K. and Reddy, K.B., Effect of biofertilizers on growth, yield attributes and yield of French bean (*Phaseolus vulgaris* L). *Legume Research*., **33(3):** 178- 183 (2010).
15. Zahida, R., Shahid, B. Dar, Mudasir, R., and Suhail Inamullah.. Productivity and quality of fench bean (*Phaseolus vulgaris* L) as influenced by integrating various sources of nutrients under temperate conditions of Kashmir. *Int. J. of Food, Agri. and Veterinary Sci*. **6(1):** pp 15-20 (2016).