



RESEARCH PAPER

Studies on effect of biofertilizers with chemical fertilizers on growth, yield and quality of fenugreek (*Trigonella foenum-graecum* L.)

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Abstract : The present investigation entitled studies on effect of bio-fertilizers with chemical fertilizers on growth, yield and quality of fenugreek (*Trigonella foenum-graecum* L.) was conducted at the Horticultural Research Farm, Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Lucknow (U.P.) during the years 2012-2013. Three bio-fertilizers viz., *Azospirillum*, PSB and *Rhizobium* were used at 2 levels of N, P and K as compared with control (recommended dose of NPK through chemical fertilizers) in the fenugreek. The result of all experiment showed that the maximum plant height (36.84 cm), number of branches (3.33), number of pods (7.20), days to 50 per cent flowering (66.33), days to 50 per cent germination (13.00) length of pods (8.53 cm), yield (15.57 q/ha), yield per plant (5.85 g) and days to maturity (145.26) were recorded under 50 per cent RDF+ 50 per cent *Rhizobium* whereas, minimum was recorded under control.

Key Words : RDF, *Azospirillum*, *Rhizobium*, Phosphate solubilizing bacteria (PSB), Fenugreek, Flowering, Maturity and yield.

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INTRODUCTION

Fenugreek (*Trigonella foenum-graecum* L.) is a cool season crop and it is fairly tolerant to frost and low temperature. It is cultivated both in tropical as well as temperate region. In India, it is mainly grown as a *Rabi* season crop but in south India, it is also grown as rainy season. It requires moderately cool and dry climate for its proper growth and favours higher seed yield production. Fenugreek is an important leafy vegetable cum condiment having several medicinal properties among the seed spices. The fenugreek belongs to the family Fabaceae, sub family Papilionaceae. It has been originated in South-Eastern Europe and South-Western Asia. Its wild form is found in North-Western India.

Argentina, Egypt, Southern France, Morocco, Spain, Turkey, China, Pakistan and Lebanon are the leading countries for fenugreek production. India occupies prime position among the fenugreek grower's country in the world, especially in areas having cool and dry climate. Rajasthan alone produces more than 80 per cent fenugreek of the country. Besides, Madhya Pradesh, Gujarat, Uttar Pradesh and Chhattisgarh for its dry seeds are used as condiment. Fresh leaves, tender pods and stem are used after boiling. The crop of fenugreek can also be taken successfully on heavy black cotton soils with adequate drainage facility. The crop thrives well with soil pH range of 6.0 to 8.2 but the soil pH of 6.0 to 7.0 was noticed suitable for better growth and development. Besides, young green tender plant and leaves are used as nutritionally rich and best

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vegetable. Fenugreek which forms the actual spice is rich source of vitamin A, B₂ and C (Aykroyd, 1963) and protein (Rao and Shanker, 2000). Seeds contain diosgenin, which is used in the preparation of contraceptive pills. The seed also contains major nutrients like P and K and minor nutrients like Ca, Fe and Na and amino acids like leucine, valine, lysine and phenylalanine besides cellulose and hemicelluloses. Its chopped leaves are mixed in flour to prepare “parantha” and grains have immense medicinal utility. It prevents constipation, removes indigestion and stimulates the digestive process. Fenugreek seeds have shown hypoglycemic and anticholesterolemic actions. They are also used for the treatment of dysentery, diarrhoea, rickets and diabetes.

The uses of various combinations of chemicals in agriculture shown much irreversible impact on the environment pollution, human health and soil health. The progressive use of fertilizers along with inorganic fertilizers may be the right answer to this. In recent years uses of microbial inoculants as source of bio-fertilizers have become a hope for most of the countries as far as economical and environmental points of view are concerned. Bio-fertilizers are economically, attractive and ecologically sound means of fertilization. Therefore, in developing countries like India, it can solve the problem at high cost of fertilizer and help in saving the economy of the country.

The bio-fertilizers, denotes all the nutrient inputs of biological origin for plant growth. They possess unique ability to enhance productivity by biological nitrogen fixation and solubilisations of insoluble phosphate or producing hormones, vitamins or other growth factors required for plant growth. The beneficial microbes which have great significances are biological nitrogen fixation, phosphate solubilising and mycorrhiza. *Azotobacter* is the bacteria which have been known to fix nitrogen biologically. Use of these microbial fertilizer cut down the quantity of nitrogenous fertilizer with some improvement in the crop.

MATERIAL AND METHODS

An investigation entitled studies on effect of biofertilizers with chemical fertilizers on growth, quality and yield of fenugreek (*Trigonella foenum-graecum* L.) was carried out at the Horticulture Research Farm of the Department of Applied Plant Science (Horticulture), Babasaheb Bhimrao Ambedkar University, Vidya - Vihar, Rae Bareli Road, Lucknow, during 2012-2013. The seeds of fenugreek were brought from the National Research Centre on Seed Spices, Tabijee, Ajmer, Rajasthan. Sowing was done in well prepared beds under open field condition which was distributed randomly in three replications. The Lucknow is characterized by subtropical climate with hot dry summer and cold winter. Soil type of the experimental site was saline alkaline (pH 6.5-7.7), low in organic matter, nitrogen, phosphorus and low in potash. An area was divided in to 39 plots having the size of 0.9m×1.0m and arranged in the three replication. The experiment was laid out in R.B.D. and line sowing was followed with proper recommended package of practices to raise a healthy crop.

The observations were recorded for days to 50 per cent germination, plant height (cm), number of branches per plant, days taken to 50 per cent flowering, number of pods per plants, length of pod (cm), number of seeds per pod, days to maturity, yield per plant (g) and seed yield (q/ha). The data on the growth, yield and quality were statistically analyzed according to the method suggested by Fisher (1959).

RESULTS AND DISCUSSION

Data from Table 1 and 2 revealed that there was significant difference in various characters among the different treatments on crop growth, yield and quality. The maximum plant height (36.84 cm) was recorded at the time of maturity of plants under treatment T₁₂ (36.84) followed by T₁₀ (36.44).

Table 1: Effect of different treatments on growth and yield parameter of fenugreek

Symbol	Treatments	Days to 50% germination	Plant height (cm)	Number of branches per plant	Seed yield (q/ha)	Yield per plant (g)
T ₀	Control	8.67	31.44	1.80	13.70	5.20
T ₁	Recommended dose of fertilizers (RDF) 100%	11.33	33.99	2.47	14.50	5.40
T ₂	75% RDF	10.67	31.46	2.43	14.37	5.38
T ₃	50% RDF	10.33	31.44	2.40	14.33	5.34
T ₄	100% phosphate solubilizing bacteria (PSB)	12.00	34.45	2.50	15.50	5.67
T ₅	100% <i>Azospirillum</i>	11.33	34.41	2.53	14.53	5.48
T ₆	100% <i>Rhizobium</i>	12.00	34.95	2.57	15.40	5.34
T ₇	75% RDF+25% PSB	12.67	35.55	2.70	15.40	5.76
T ₈	75% RDF+ 25% <i>Azospirillum</i>	12.33	35.52	2.67	15.50	5.50
T ₉	75% RDF + 25% <i>Rhizobium</i>	12.67	35.75	2.80	15.50	5.57
T ₁₀	50% RDF +50% PSB	12.67	36.44	3.00	15.53	5.72
T ₁₁	50% RDF+ 50% <i>Azospirillum</i>	12.33	36.11	1.80	15.50	5.60
T ₁₂	50% RDF+ 50% <i>Rhizobium</i>	13.00	36.84	3.33	15.57	5.85
S.E. ±		0.66	0.84	0.19	0.16	0.07
C.D. (P=0.05)		1.38	1.75	0.40	0.35	0.16

Table 2 : Effect of different treatments on quality parameter of fenugreek

Symbol	Treatments	Days taken to 50 per cent flowering	Number of pods per plants	Length of pod (cm)	Number of seeds per pod	Days to maturity
T ₀	Control	62.67	3.40	6.81	12.30	139.80
T ₁	Recommended dose of fertilizers (RDF) 100%	63.67	5.00	7.60	13.10	142.77
T ₂	75% RDF	63.67	4.47	7.54	13.07	142.18
T ₃	50% RDF	63.67	4.20	7.40	12.67	141.25
T ₄	100% phosphate solubilizing bacteria (PSB)	64.00	5.20	7.93	13.43	143.48
T ₅	100% <i>Azospirillum</i>	63.67	5.20	7.63	13.40	142.78
T ₆	100% <i>Rhizobium</i>	64.00	5.53	8.02	13.67	143.10
T ₇	75% RDF+25% PSB	64.33	5.53	8.11	13.80	143.52
T ₈	75% RDF+ 25% <i>Azospirillum</i>	65.67	5.60	8.06	14.00	143.63
T ₉	75% RDF + 25% <i>Rhizobium</i>	65.00	5.93	8.33	14.07	143.55
T ₁₀	50% RDF +50% PSB	66.00	7.13	8.47	14.33	144.15
T ₁₁	50% RDF+ 50% <i>Azospirillum</i>	65.33	6.20	8.37	14.23	143.48
T ₁₂	50% RDF+ 50% <i>Rhizobium</i>	66.33	7.20	8.53	14.67	145.26
S.E. ±		0.64	0.78	0.19	0.29	0.85
C.D. (P=0.05)		1.33	1.61	0.40	0.61	1.76

Similar findings have been reported by Kumar *et al.* (2009). Whereas the minimum plant height was observed under the control (31.44). The maximum number of branches per plant (3.33) was recorded in treatment (50 % RDF+ 50 % *Rhizobium*) while minimum branches per plant in the control. The maximum number of pods per plant (7.20) was recorded under the treatment T₁₂ (50 % RDF+ 50 % *Rhizobium*) while minimum (3.40) in the control. The maximum number of seed /pod (14.67) was recorded under the treatment T₁₂ (50 % RDF + 50 % *Rhizobium*) at time of maturity. Similar result (50 % RDF + 50 % *Rhizobium*) was found by Somnath *et al.* (2006), while minimum (12.30) in the control. The days to 50 per cent germination of seed (13.00) was recorded under the treatment T₁₂ (50 % RDF + 50 % *Rhizobium*) and minimum (8.67) in the control. The days taken 50 per cent flowering (66.33) was recorded under the treatment T₁₂ (50 % RDF + 50 % *Rhizobium*) and minimum (62.67) in the control. The maximum number of pods per plant (8.53) was recorded under the treatment T₁₂ (50 % RDF + 50 % *Rhizobium*) at 90 days after sowing while minimum (6.81) in the control. Somnath *et al.* (2006) also were found similar result in the parameters of fenugreek. The seed yield per plant was recorded at in T₁₂ (5.85g) and minimum yield was recorded in control (5.20). The maximum yield (15.57 q/h) was recorded in T₁₂ (50 % RDF + 50 % *Rhizobium*) and minimum was recorded in control (13.70 g/ha). Patil *et al.* (2008) reported that the combination of bio-fertilizers and chemical fertilizer for yield is also found in (50 % RDF + 50 % *Rhizobium*). Similar results was also obtained by Aher and Khapke (2009) and Soyam *et al.* (2012).

Conclusion :

On the basis of present investigation, it may be concluded

that the application of inoculants (50 % *Rhizobium* + RDF 50 %) is helpful for increasing the growth, quality and yield of fenugreek.

REFERENCES

- Aher, R.K. and Khapke, S.L. (2009).** Comparative study of chemical and biofertilizers on growth and yield of methi [*Trigonella foenum-graceum* (L.)]. *Internat. J. Plant Sci.*, **4** (1): 112-113.
- Aykroyd, W.R. (1963).** Composition of dolichas bean green pod. ICMR Special Report Series No.42.
- Fisher, Sir Ronald A. (1959).** Mathematical Probability in the Natural Sciences. *Technometrics*, **1** : 21-29.
- Kumar, S., Singh, D. and Nepalia, V. (2009).** Performance of fenugreek (*Trigonella foenum-graecum*) varieties at various fertilizer levels and biofertilizer inoculations. *Indian J. Agric. Sci.*, **79**(1) : 80-83.
- Patil, U.D., Dhanphule, S.S. and Arvadia, M.K. (2008).** Effect of organic manure and inorganic fertilizers application on growth and yield attributes of fenugreek (*Trigonella foenum-gracum* L.). *Internat. J. Plant Sci.*, **3**(1) : 233-234.
- Rao, P.S.S.S. and Sankar, C.R. (2000).** Effect of organic manure on growth and yield of brinjal. *South Indian Hort.*, **49** : 288-291.
- Somnath, W.D., Kamble, R.D., Lende, P.S., Thakare, S.R. and Suryapujary, S.M. (2006).** Effect of pressmud, Biofertilizers (*Rhizobium* and PSB) and chemical fertilizers on bio chemical and yield contributing parameters of pigeonpea. *J. Soils & Crops*, **16**(2) : 460-464.
- Soyam, Sonali. Ra., Wagh, A.P., Dod, V.N., Nagre, P.K. and Gade, R.M. (2012).** Effect of different biofertilizers on growth, yield and quality of fenugreek, *Asian J. Hort.*, **7** (1) : 28-30

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