

Effect of Bio-fertilizers on Bio-nutrients, Nitrogen, Total Protein, Extractable Lipid and Mineral Contents of Cultivated Variety of Fenugreek (*Trigonella foenum graecum* Linn.)

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Article Info	Summary
Article History <i>Received</i> : 21-03-2011 <i>Revised</i> : 24-05-2011 <i>Accepted</i> : 24-05-2011	<p>Green house experiments were conducted in Botany Department of Bareilly College, Bareilly during the growing season of 2003 and 2004 on a cultivated varieties of fenugreek to evaluate the effect of two selected bio-fertilizers (<i>Azotobacter</i> and <i>Azospirillum</i>) on total nitrogen, total protein, extractable lipid and some mineral contents of fenugreek seeds. The selected experimental variety was Pusa early bunching which was commonly cultivated in Bareilly region. Application of both the fertilizers either alone and in combination exhibited in general a considerable improvement in above bio-nutrient parameters of seeds as compared to their respective control. A balanced and judicious use of these bio-fertilizers is recommended to the farmers to enhance nutritive value of fenugreek seeds.</p>
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Key Words: Fenugreek, Bio-fertilizer, Growth, Bio-nutrients	

Introduction

In India the use of chemical bio-fertilizers have been largely emphasized to increase crop production by the farmers. The heavy use of chemical applications leads to adverse environmental, agricultural and healthy consequences. The use of bio-fertilizers are the ecofriendly alternate sources to meet the nutrients requirement of crops. In recent years, bio-fertilizers have emerged as a promising component of integrated nutrients supply in agriculture. Bio-fertilizers includes mainly the nitrogen fixing, phosphate solubilizing & plant growth promoting micro-organisms [1]. The bio-fertilizers benefiting the crop production are *Azotobacter*, *Azospirillum*, blue green algae, *Azolla*, PSB, *mycorrhizae* [2]. However the bio-fertilizers despite of their tremendous potential and benefits, are unpredictable & inconsistent in their performance under field condition [2].

Fenugreek (*Trigonella foenum graecum* Linn.) is one of the most widely cultivated crop in Bareilly region of U.P. (India) due to favourable condition environment of tarai area and highly medicinal uses. Almost every parts of methi edible as vegetable the seeds are most commonly uses as spices and condiments. In the present study, field experiments was conducted to determine the importance of bio-fertilizers application to improve the quality and nutrients of fenugreek seed.

Materials and Methods

The experimental crop used in this study was Methi fenugreek, (*Trigonella foenum graecum* C.V. Pusa early bunching). The seeds were collected from IARI (Indian Agricultural Research Institute-New Delhi, India). The bio-fertilizers applied (*Azotobacter* and *Azospirillum*) were also

obtained from the same source. The seeds were treated with bio-fertilizer as recommended in the pamphlet obtained from IARI. Treated seeds were classified into 4 groups. First group was treated with *Azotobacter*, second group by *Azospirillum*, third group with a combined recommended dose of the two bio-fertilizers, while the fourth group was left as control (non treated). The seeds were dried in shade before sowing. Then, they were cultivated in the soil at the green house of Botany Department, Bareilly College, Bareilly. After maturity samples of each treatment were taken for studying the above mentioned parameters. After chemical analysis all data were subjected to analysis of variance and the mean values were compared on the basis of least significant difference at 0.01 and 0.05 probability levels [3]. The representative soil samples were also analyzed in regional soil testing laboratory, Bilwa, Bareilly. The following methods were employed for analysis of chemical parameters.

- Total nitrogen was determined by conventional micro-kjeldahl method [4].
- Total protein content was determined by multiplying N-constant value with 6.25 [5].
- Total free amino acid by the method described in Hawk's physiological chemistry.
- Ether extractable lipid content by soxhlet extraction procedure using petroleum ether as described by Shankaram,[6].
- Calcium and phosphorus was estimated in the form of calcium oxalate and ammonium phosphomolybdate respectively [7].
- Iron, magnesium and zinc was estimated by Atomic Absorption Spectrophotometer (AAS).

After chemical analysis all the data were subjected to analysis of variance and the mean values were compared on the basis of least significant difference at 0.01 and 0.05 probability levels [3].

Result and Discussion

The results pertaining to the effect of two bio-fertilizers along with their respective controls were presented in Table 1. Soil of the experimental field belongs to the order inceptisols and was sandy loam in texture. The soil pH was 7.36 slightly (alkaline), organic matter 0.23%, available nitrogen 68kg/ha⁻¹ available P 18.6 kg/ha⁻¹ and available K-197.50 kg ha⁻¹.

Table 1: Effect of *Azotobacter* and *Azospirillum* on bio-nutrients and mineral contents of fenugreek seeds

Treatments	Total N ₂	Crude protein	Extractable lipid	Total free amino acid	Mineral content (in mg/100 gm) on dry matter bases					
					Ca*	P*	Fe	Zn	Mg	Mn
<i>Azotobacter</i>	-	-	↑	↓	↑↑	↑	↓	↑	-	↓
<i>Azospirillum</i>	↑↑	↑↑	↑↑	↓	-	-	↑↑	↑	↑	↓
C.D. at 5% level	0.085	0.535	0.411	NS	0.025	7.966	N.S	N.S	N.S.	N.S

All values in percentage on dry matter basis

↑↑ = Significant value

↑ = Increased value

N.S. = Non significant

* = Values on % dry matter basis

Ether extractable lipid content: The ether extract values are statistically significant as compared to control. The treatments recorded lower values in respect to control. However, combined treatment showed an increased value over control. These results are in conformity with the results obtained by Thimmegowda *et al.* [8], Sharma and Namdeo [9] who reported high oil content due to combined bio-fertilizer application on soybean crop seed. Charitha *et al.* [10] also reported the significant increase in total lipid content of ground nut plant by the application of combined bio-fertilizers.

Total nitrogen & crude protein content: Statistical analysis gave significant difference in percentage of crude protein and total nitrogen content of fenugreek seeds under two bio-fertilizer treatments. The maximum value was obtained by *Azospirillum* treatment. This is in agreement with that reported by P. Kumudha [11], Lanje *et al.* [12] and Sneha *et al.* [13]. This might be due to the fact that inoculation helps in more synthesis and utilization of the atmospheric nitrogen resulting in the increase in protein and extractable either lipid of the seed.

Total free amino acid content: The selected bio-fertilizer inoculation failed to exert their significant influence on the values of total free amino acid content in fenugreek seeds.

Calcium, copper & iron contents: Increase in calcium contents of experimental seed by the application of *Azotobacter* treatment were statistically significant. However, minor decrease in value of calcium content as compared to control was recorded in treatment with *Azospirillum* bio-fertilizer significantly negative response were also recorded in the treatment of bio-fertilizers on seeds but *Azospirillum* showed appreciably higher value in tested crop seeds

Azospirillum treatment also showed significant enhancement in seed iron content as compared to the respective control.

Phosphorus content: The percentage of phosphorus as recorded in treatment of seeds of fenugreek was not significantly affected by any of the applied bio-fertilizer treatment.

Zinc, magnesium & manganese content: No-definite trend was observed in Zn, Mg & Mn content of seed of fenugreek there was no appreciable changes recorded among the values. However *Azospirillum* treatment enhances Mg content, where as some negative response were noticed in Mn content of seed when treated by bio-fertilizers but these values are statistically not significant. Similarly Mg & Zn content seeds were not significantly affected by bio-fertilizer treatment.

The increases in values of extractable lipid N₂, P, Ca, Fe and Mn by bio-fertilizer inoculation may be ascribed to improve in available nutrient in soil and their better absorption by the plants, which ultimately results in better yield with increased nutrient quality of fenugreek seeds. Therefore a balanced and judicious use of these bio-fertilizers is recommended to farmers to enhance yield and nutritive value of fenugreek seeds.

References

- [1] Goel, A.K.; R.D. Lawa, D.V. Pathak, G. Anuratha and A. Goel, 1999. Use bio-fertilizers: potential, constraints and future strategies review. *Inter. J. Trop. Agric.* 17: 1-18.
- [2] Hegde, D.M., B.S. Dwivedi and S.N.S. Baha, 1999. Bio-fertilizers for cereal production in India-Areview. *Ind. J. Aric. Sci.* 69: 73-83.
- [3] SAS program, 1982. SAS Ind user's guide: Statistics. SAS Institute, Inc. Raleigh, NC, pp: 484.

- [4] Humphries, E.C. (1956). Mineral components and ash analysis. In: Modern method of plant analysis. Eds. K. Paech and M.V. Tracey. Springer-Verlag-Berlin. 1: 468-502.
- [5] Sadasivam, S. and A. ManicRam (1992). Biochemical methods for agriculture science. Wiley Eastern Ltd. New Delhi, 187-188.
- [6] Shankaram, A. 1965. A laboratory manual for agricultural chemistry. Asia publication, Bombay. pp-258.
- [7] AOAC, methods of analysis. Association of official analytical chemists (15th edn.) Washington D.C. (2004)
- [8] Thimmegowda, S. and N. Devakumar, 1996. Effect of phosphorus management practices on protein and oil yield of soyabean. *Indian Agric.* **40(1)**: 61-64.
- [9] Sharma, K.N. and K.N. Namdeo, 1999. Effect of bio-fertilizer and phosphorous on growth and yield of soybean (*Glycine max* (L.) Merrill)-Crop research, **17(2)**: 160-163.
- [10] M. Charitha Devi and M.N. Reddy (2003). Lipid composition of groundnut (*Arachis hypogaea*. L.) Plant inoculated with VAM Fungus & *Rhizobium*. *Legume Res.* **27(3)**: 157-163.
- [11] Kumutha, P. (2005). Studies on the effect of bio-fertilizers on the germination of *Acacia Nilotica* Linn. Seeds. Adv. in Plant Science. **18(11)**: 679-684.
- [12] Lawje, P.W., A.N. Buldeo, S.R. Zode and V.G. Gulhame (2005). The effect of *Rhizobium* and phosphorus solubilizers on nodulation, dry matter, seed protein, oil and yield of soybean. *J. Soils and Crops*, **15(1)**: 132-135.
- [13] Sneha S. Raut, C.N. Chore, R.D. Deotale, M.U. Waghmare, C.N. Hatmode and M.D. Yenprediwar, (2004). Response of seed dressing with bio-fertilizers and nutrient on chemical, biochemical, yield and yield contributory parameters of soybean. *J. Soil and crops* **14(1)**: 66-70.