

Effect of different combinations of organic and inorganic nutrient sources on productivity and profitability of fenugreek (*Trigonella-foenium-graecum*)

A.S.Godara, U.S.Gupta, Ravindra Singh* and R.S.Mehta*

Adaptive Trial Centre, Tabiji - 305206, Ajmer, Rajasthan

* Senior Scientist, NRCSS, Tabiji-305206, Ajmer, Rajasthan

ABSTRACT

A field experiment on effect of different combinations of organic and inorganic nutrient sources on productivity and profitability of fenugreek (*Trigonella-foenium-graecum*) was laid out during *rabi* season of 2010-11. The experiment comprising of absolute control and varying proportion of organic and inorganic sources viz., recommended dose of nutrient through fertilizers(40:45:0), 100 % poultry manure, 100% vermicompost, 50% RDF+50%poultry manure, 50% RDF+50%vermicompost, 25%RDF+75% poultry manure and 25%RDF+75% vermicompost was laid out in randomized block design with three replications. The organic sources and fertilizers were applied before sowing and as per standard practices, respectively. It was found that RDF and varying combinations of organic and inorganic sources produced significantly higher grain yield over absolute control. Recommended dose of nutrients produced significant higher yield over organic manures (vermicompost and poultry manures). Application of recommended dose of nutrients supplied through chemical fertilizers resulted in highest grain yield (27.75 q/ha), gross return (Rs 69375/ha), net return (Rs 50150/ha) and BCR (3.60) closely followed by 50% RDF + 50 % vermicompost /poultry manure. Thus, it can be inferred that application of 50% RDF along with 50% vermicompost /poultry manure is better for realizing good soil health and sustainable higher yield levels.

Key words : BCR, fenugreek, gross return, net return, yield

INTRODUCTION

Fenugreek is an important versatile *rabi* season seed spice crop mainly grown in Rajasthan, Gujarat, Madhya Pradesh Maharashtra and Haryana. The seeds of fenugreek are used as a condiment and seasoning agent for garnishing and flavourings dishes. Being a leguminous crop, the root nodules enrich the soil with atmospheric nitrogen. Intensive agriculture involving use of high input for increasing production resulted in heavy removal of nutrients from the soil. Thus, there is wide gap between the nutrients removed from the soil and the nutrient supplied. This gap can be bridged with use of chemical fertilizers along with organic sources. Exclusive application of inorganic fertilizers leads to deterioration in soil health and soil structure. Conjunctive use of inorganic and organic sources of nutrients not only supplies nearly all nutrients throughout the growing period of crop but also sustain soil health. Combined use of inorganic fertilizers with organic manures in general enhances microbial activity of soil and biological nitrogen fixation in particularly. Integrated use of chemical fertilizers as well as organic manures in fenugreek can be a more efficient, economical

and judicious approach than chemical fertilizers alone. Therefore, the study was undertaken to evaluate the effect of different combinations of organic and inorganic nutrient sources on productivity and profitability of fenugreek (*Trigonella-foenium-graecum*).

MATERIALS AND METHODS

The field experiments were conducted during 2010-11 sandy loam soil of research farm of Adaptive Trial Centre Tabiji, Ajmer (Rajasthan). The soil had pH of 8.2, electrical conductivity 0.32 dSm⁻¹. The soil was low in organic carbon (0.26) and available nitrogen (142 kg / ha), low in available P₂O₅ (21 kg /ha) and medium in respect to available K₂O (178 kg /ha). Eight treatments (T₁- Absolute control, T₂-100% recommended dose of fertilizers 40:45:0 (RDF), T₃-100% poultry manure(2.5 t/ha), T₄-100% vermicompost (3.0 t/ha), T₅-50% RDF +50% vermicompost, T₆-50% RDF +50% poultry manures, T₇-25% RDF +75% vermicompost and T₈-25% RDF +75% poultry manures.) were laid in randomized block design with three replications. Full dose of nitrogen and phosphorus and organic manures as per treatment was applied manually through DAP, urea, poultry manure and

vermicompost at the time of sowing. It was sown manually at 30 cm row to row spacing keeping 20 kg seeds per ha. The fenugreek variety RMT-351 was sown on 20th November during 2010-11. Standard agronomic practices were adopted for raising healthy crop. Data of growth and yield attributes were taken from 10 tagged plants. Biological and economic yields were taken from net plot. Profitability of nutrient application in fenugreek was determined by calculating economic parameters like cost of cultivation, gross return, net return and BCR.

RESULTS AND DISCUSSION

Effect on growth and yield attributes

The higher value of growth and yield attributes viz. plant height, number of branches, pod length, number of pods per plant, number of seeds per pod and 1000-seed weight in fenugreek were recorded with application of recommended dose of fertilizers (RDF) i.e. 40 kg nitrogen and 45 kg P₂O₅/ha (Table 1). Application of RDF

increased plant height, number of branches, pod length, number of pods per plant, number of seeds per pod and 1000-seed weight to magnitude of 18.8, 64.3, 41.8, 35.0, 28.4 and 14.4 Per cent, respectively over absolute control. However it was at par with integration of nutrients 50% in form of inorganic fertilizers and 50% through vermicompost or poultry manure. Application of recommended dose of nitrogen and phosphorus through inorganic fertilizers enhanced its availability which resulted in increased photosynthetic activity and translocation of photosynthates from source to sink and this might be the cause of higher growth and yield attributes at readily available nitrogen and phosphorus. Adequate supply of nitrogen and phosphorus play vital role in various metabolic processes which resulted in increased flowering and fruiting thereby improving pods per plant due to favourable effect of these nutrients on growth parameters. Seed yield of a crop is a function of yield attributes such as pods per plant, number of seeds per pod, 1000-seed weight, seed

Table 1. Growth and yield attributes of fenugreek as influenced by organic and inorganic nutrient sources

Treatments	Plant height at harvest	Number of branches	Length of pod (cm)	Pods per plant	Seeds per pod	1000 Seed weight (g)	Seed yield per plant (g)
T1- Absolute control	41.6	8.4	9.8	39.7	10.2	10.58	4.42
T2-100% RDF(40:45:0)	49.4	13.8	13.4	53.6	13.1	12.10	8.49
T3-100% poultry manure(PM)	46.8	11.6	12.6	47.2	11.9	11.30	6.44
T4-100% vermicompost(VC)	47.3	12.1	12.7	48.4	12.4	10.98	6.56
T5-50% RDF+50% vermicompost	48.7	12.9	13.1	49.8	12.7	11.55	7.54
T6-50% RDF+50% poultry manure	47.9	13.2	12.9	48.1	12.8	11.62	7.48
T7-25% RDF+75% vermicompost	48.5	12.4	12.8	46.4	12.7	11.42	7.32
T8-25% RDF+75% poultry manure	47.6	12.8	12.9	44.2	11.9	11.05	6.98
CD(P=0.05)	5.84	1.42	1.48	4.62	1.16	1.28	1.02

Table 2. Yield, return and BCR as influenced by of fenugreek as influenced by organic and inorganic nutrient sources

Treatments	Seed yield (q/ha)	Straw yield (q/ha)	Biological yield (q/ha)	Harvest Index (%)	Gross return (Rs./ha)	Cost of cultivation	Net return (Rs./ha)	BCR
T1- Absolute control	14.63	30.85	45.48	32.17	36575	17086	19489	1.05
T2-100% RDF(40:45:0)	27.75	53.24	80.99	34.26	69375	19225	50150	2.60
T3-100% poultry manure(PM)	22.57	43.56	66.13	34.13	56425	24206	32219	1.33
T4-100% vermicompost (VC)	23.23	47.12	70.45	32.97	58075	22456	35619	1.58
T5-50% RDF+50%vermicompost	26.51	51.23	77.74	34.10	66275	20841	45434	2.18
T6-50% RDF+50% poultry manure	26.11	50.40	76.51	34.13	65275	21716	43559	2.00
T7-25% RDF+75% vermicompost	25.05	49.15	74.20	33.76	62625	21649	40976	1.89
T8-25% RDF+75% poultry manure	24.55	47.36	71.91	34.14	61375	22961	38414	1.67
CD(P=0.05)	4.48	6.28	8.94	NS				

yield per plant and length of pod. Patel *et al.*(5) found higher yield attributes when RDF was applied through inorganic fertilizers in fennel. Bhunia *et al.*(1) and Nehara *et al.*(4) also observed enhanced growth and yield attributes with 40 kg and 50 kg phosphorus respectively in fenugreek.

Effect on yield and harvest index

Increase in yield attributes was recorded due to application of RDF through inorganic fertilizers followed by combination of half nutrients through inorganic fertilizers and rest half through vermicompost or poultry manure. Application of RDF through inorganics had direct and positive effect on seed, straw and biological yields of fenugreek.

Seed yield per plant as well as seed, straw and biological yields and harvest index were significantly higher with application of RDF through chemical fertilizers over absolute control (without nutrients) (Table1&2). Application of RDF through inorganic fertilizers increased seed ,straw and biological yields by 89.68, 72.58 and 78.08 per cent, respectively over absolute control and found at par with integration of 50% RDF supplied through vermicompost/poultry manure+50% through inorganic sources. However, harvest index influenced marginally with treatments. Adequate supply of nitrogen and phosphorus plays a vital role in various metabolic processes, which resulted in increased flowering and fruiting thereby improving yield. Beneficial effect of inorganic nitrogen and phosphorus fertilizers on yield attributes and yield of grain legumes is universally

accepted. Seed yield of a crop is a function of yield attributes such as number of pods per plant, number of seeds per pod, seed yield per plant and 1000-seed weight. Increase in growth and yield attributes due to enhanced nutrient uptake of chemical fertilizers will have direct and positive effect on seed, straw and biological yields of fenugreek. These results confirm the findings of Bhunia *et al.* (1). Higher net return (Rs.50150) and BCR (2.60) with application of 100% RDF were obtained on account of higher seed yield which resulted in higher net return because of less cost involved in application of inorganic fertilizers as compared to additional yield obtained. These results corroborate with the findings of Singh *et al.* (6) who reported significantly improved yield with 40kg N +40 kg P₂O₅ supplied through inorganic fertilizers in fenugreek.

Effect on economics

Sole application of RDF in form of inorganic sources fetched maximum gross return (Rs.69375),net return (Rs.50150)and B:C ratio(2.60) superior over all other combination of nutrient sources, followed by combined use of 50% RDF through chemicals +50% RDF through vermicompost or poultry manure.

Application of RDF through inorganic sources increased seed and straw yield by 89.7 and 72.6 per cent, respectively over control. This might be due to the fact that inorganic sources enhances nutrient availability resulting in vigorous plant growth and dry matter production which in turn resulted in better flowering and pod formation thereby giving higher yield attributes and yield and economics over control(Table 1 & 2). These results are

very close to the findings of Chaudhary *et al.*(2) in fenugreek, they reported maximum net return and B:C ratio with integration of 50% RDF through vermicompost+50% RDF through inorganic sources. Jat *et al.*(3) reported highest seed yield, net return and B:C ratio from 100% inorganic N alone.

Though higher seed and straw yields were obtained from 100% RDF but for realizing good soil health and sustainable production application of 50% RDF along with 50% vermicompost or poultry manure may be a better option.

REFERENCES

1. Bhunia, S. R. Chauhan, R. P. S. Yadav, B. S. and Bhati, A. S. 2006. Effect of phosphorus, irrigation and Rhizobium on productivity, water use and nutrient uptake in fenugreek (*Trigonella-foenum-graecum* L.). *Indian J. Agron* **51(3)**:239-241.
2. Chaudhary, B.R., Gupta A.K., Parihar C.M., Jat S.L. and Singh D.K. 2011. Effect of integrated nutrient management on fenugreek (*Trigonella foenum-graecum* L.) and its residual effect on fodder pearl millet. *Indian J. Agron* **56 (3)**:189-195.
3. Jat N.L., Jain N.K. and Choudhary G.R. 2006. Integrated nutrient management in fenugreek (*Trigonella-foenum-graecum* L.). *Indian J. Agron* **51(4)**:331-334.
4. Nehara K.C., Kumawat P.D. and Singh B.P. 2006. Response of fenugreek (*Trigonella-foenum-graecum*) to phosphorus, sulphur and plant growth regulators under semi arid eastern plains zone of Rajasthan. *Indian J. Agron* **51 (1)**:73-76.
5. Patel B.S., Amin A.U., Patel K.P. and Patel M.M. 2003. Influence of organic manures or in combination with inorganic fertilizers on productivity of winter drilled fennel (*Foeniculum vulgare*). *Indian J. Agron* **48 (3)**: 232-234.
6. Singh D., Nepalia V and Singh A.K. 2010. Performance of fenugreek (*Trigonella-foenum-graecum* L.) varieties at various fertilizer levels and biofertilizer inoculation. *Indian J. Agron* **55 (1)**:75-78.

Received : January 2012; Revised : March 2012;
Accepted : May 2012.