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SYNERGISTIC EFFECTS OF FERTILIZER LEVELS AND *GHANJEEVAMRIT* ON FENUGREEK (*TRIGONELLA FOENUM-GRAECUM* L.) PERFORMANCE UNDER NORTH GUJARAT CONDITION

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ABSTRACT

A field experiment entitled "Synergistic Effects of Fertilizer Levels and *Ghanjeevamrit* on Fenugreek (*Trigonella foenum-graecum* L.) Performance under North Gujarat Condition" was carried out at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Sardarkrushinagar during *rabi* season of 2024-25. Nine treatment combinations comprising three levels of fertilizer *viz*., 100%, 75% and 50% RDF and three levels of *ghanjeevamrit viz*., 500, 1000 and 1500 kg/ha and a single control were evaluated in randomized block design with factorial concept with three replications. Results depicted that varying levels of fertilizer and *ghanjeevamrit* imparted significant influence on plant height, number of branches per plant, number and fresh weight of root nodules per plant, number of pods per plant, seed and straw yield over control. Among the levels of fertilizer, significantly higher plant height at 30, 60 DAS and at harvest (16.59, 37.08 and 63.11 cm), number of branches per plant (5.51) at harvest, number and fresh weight of root nodules (11.32 and 140.63 mg) per plant at 45 DAS, number of pods (29.98) per plant, seed yield (1778 kg/ha), straw yield (3210 kg/ha), maximum net return (Rs. 64,610/ha) and benefit: cost ratio (2.10) were found with the application of 100% RDF. In case of *ghanjeevamrit*, significantly higher plant height at 30, 60 DAS and at harvest (15.96, 36.34 and 61.20 cm), number of branches (5.20) per plant at harvest, number and fresh weight of root nodules (11.22 and 138.59 mg) at 45 DAS, number of pods per plant (29.26), seed yield (1729 kg/ha), straw yield (3125 kg/ha) and maximum net return (Rs. 57,611/ha) were recorded with the application of 1500 kg/ha *ghanjeevamrit* and which was remained at par with the application of 1000 kg/ha *ghanjeevamrit*. Among different treatment combinations, 100% RDF with 1500 kg/ha *ghanjeevamrit* application showed significant influence on number of pods per plant, seed yield and straw yield, which remained at par with the application of 100% RDF with 1000 *ghanjeevamrit* or 75% RDF with 1500 kg/ha *ghanjeevamrit*. Notably higher net return was achieved with the application of 100% RDF with 1500 kg/ha *ghanjeevamrit* whereas, highest benefit: cost ratio was found with the application of 100% RDF with 1000 kg/ha *ghanjeevamrit*.

***Keywords* :** Integrated nutrient management, fenugreek, *ghanjeevamrit*, RDF, growth and yield.

Introduction

India "Land of Spices" is the world's largest producer, consumer and exporter of spices. Spices constitute an important group of horticulture commodity that is considered indispensable for flavouring food and beverage as well as used in pharmaceutical, perfumery and cosmetic industries.

Fenugreek (*Trigonella foenum-graecum* L.) is the third largest spice after coriander and cumin, locally known as 'methi' belonging to the family, Leguminosae and sub family, Papilionacea. It is a multipurpose spice crop, every part of the plant is being used as leafy vegetable, medicine, fodder and condiment (Khiriya *et al*., 2003). The biological and pharmacological actions of fenugreek are attributed to variety of its constituents, *viz*., steroids, nitrogen compounds, polyphenolic substances, volatile constituents and amino acids. (Mehrafarin *et al*., 2010).

India has significantly advanced in fertilizer production and use over the past four decades. However, reliance on chemical fertilizers, being non-renewable and expensive poses a challenge for future agriculture. Their frequent use caused significant damage to the soil biological operation, deterioration of groundwater, loss of flora-fauna, decreased soil fertility and often falls short of nutrient removal by crops. Integrated Nutrient Management (INM), combining organic and inorganic fertilizers, offers a more efficient solution. INM aims to maintain soil health, ensure sustainable yields, reduce environmental degradation and cut chemical fertilizer costs (Jat *et al*., 2006). Natural Farming (NF) is a unique chemical-free farming method which integrates crops, trees and livestock, providing functional biodiversity and is agroecology based diversified farming system (Rosset and Martinez-Torres, 2012). It is considered to markedly cut down the production cost by replacing the chemical fertilizers and pesticides with home-made products like *jeevamrit*, *ghanjeevamrit*, *beejamrit*, *neemastra*, *etc*. (Palekar, 2006). *Jeevamrit* is a natural soil fertilizer and crop growth enhancer, often called the "elixir of life" for the soil due to its richness in beneficial microorganisms. It plays a crucial role in improving soil fertility, increasing crop productivity and promoting sustainable farming practices. By enriching the soil with indigenous microorganisms, *jeevamrit* facilitates the mineralization of nutrients, leading to higher yields and better quality produce (Palekar, 2006). In situations where water and labour are scarce and cow dung is abundantly available, *ghanjeevamrit*, the dry or solid form of *jeevamrit* offers a practical alternative. It is particularly effective in enhancing microbial life in the soil and can be stored for longer periods, making it ideal for long-term use. Both *jeevamrit* and *ghanjeevamrit* contribute significantly to restoring soil health and fostering a resilient agricultural ecosystem.

Material and Methods

The field experiment was conducted at Agronomy Instructional Farm, Chimanbhai Patel College of Agriculture, Sardarkrushinagar Dantiwada Agricultural University, Banaskantha, Gujarat (24°-19' N latitude and 72°-19' E longitude with an altitude of 154.52 meter above the mean sea level) during *rabi* season of the year 2024-25. Soil of the experimental plot is loamy sand in texture, having pH 7.47 and EC 0.18 dS/m. Analysis of initial status of soil indicated that it is low in organic carbon (0.30%), available nitrogen (160.80 kg/ha), DTPA-extractable Fe (4.19 mg/kg) and Zn (0.45 mg/kg) as well as medium in soil available phosphorus (42.71 kg/ha) and potassium (250.42 kg/ha). The experiment was laid out in randomized block design with factorial concept having three levels of fertilizer (100%, 75% and 50% RDF), three levels of *ghanjeevamrit* (500, 1000 and 1500 kg/ha) and a single control with three replications. Fenugreek variety Gujarat Methi-2 was sown on 15th November 2024 by maintaining a distance of 30 cm between 2 rows and having seed rate of 20 kg/ha. Experimental plot was manured by different levels of fertilizer and *ghanjeevamrit* as per the treatments. The recommended dose of nitrogen and phosphorus were applied using urea and DAP. The fertilizer and *ghanjeevamrit* applied in soil just before the sowing of seeds in opened furrow and slightly covered with soil. *Jeevamrit* @ 1250 l/ha applied to all treatments except control through soil drenching at the time of sowing and 30 days after sowing. Various growth and yield attributes were assessed throughout the investigation to determine the effectiveness of individual treatments. Additionally, the economic viability of each treatment was evaluated by calculating net returns and benefit-cost ratio (BCR). Statistical analysis of the recorded data was performed using analysis of variance (ANOVA) and treatment means were compared by following the procedure recommended by Cohran and Cox (1957) for the experimental design adopted.

Results and Discussion

Growth attributes

The results depicted that different levels of fertilizer and *ghanjeevamrit* showed significant influence on all the growth attributes compared to control.

A persual of data (Fig. 1 & Fig. 2) indicated that 100% RDF application showed significantly higher plant height at 30, 60 DAS and at harvest (16.59, 37.08

and 63.11 cm), number of branches per plant (5.51) at harvest, number and fresh weight of root nodules (11.32 and 140.63 mg) at 45 DAS as compared to 75 and 50% RDF.

The application of fertilizers, particularly nitrogen and phosphorus, significantly improved plant growth attributes by enhancing the overall nutrient availability in the soil. Nitrogen promoted active cell division, elongation and enlargement, which stimulated meristematic activity and led to increased internode number and length, ultimately contributing to greater plant height. Phosphorus, on the other hand, supported robust root development, further aiding in nutrient uptake. The improved nitrogen (N) and phosphorus (P_2O_5) status of the soil created a favorable nutritional environment that enhanced the development of root nodules, improving the plant's ability to absorb and translocate nutrients from vegetative to reproductive parts. This efficient nutrient translocation supported the formation of more branches per plant through active cellular processes, thereby contributing to overall better growth and development.

Somdutt *et al*. (2019) reported that application of 100% RDF significantly improved the growth attributes in fenugreek over 75 and 50% RDF.

Among the different levels of *ghanjeevamrit*, higher plant height at 30, 60 DAS and at harvest (15.96, 36.34 and 61.20 cm), number of branches (5.20) per plant at harvest, number and fresh weight of root nodules (11.22 and 138.59 mg) at 45 DAS were observed with the treatment receiving 1500 kg/ha *ghanjeevamrit* and which remained at par with the application of 1000 kg/ha *ghanjeevamrit*.

Ghanjeevamrit application improved fenugreek growth by enhancing soil microbial activity and nutrient solubilization. Its rich content of beneficial microbes, enzymes and growth-promoting substances like IAA and GA_3 boosted nutrient uptake and moisture absorption. This created favourable conditions for nitrogen fixation and increased root nodulation. As a result, plant height and overall vegetative growth improved. These results are in close agreement with the findings of Nasratullah *et al*. (2021) and Veeranna *et al*. (2023),

Interaction effect of different levels of fertilizer and *ghanjeevamrit* on growth parameters found non-significant.

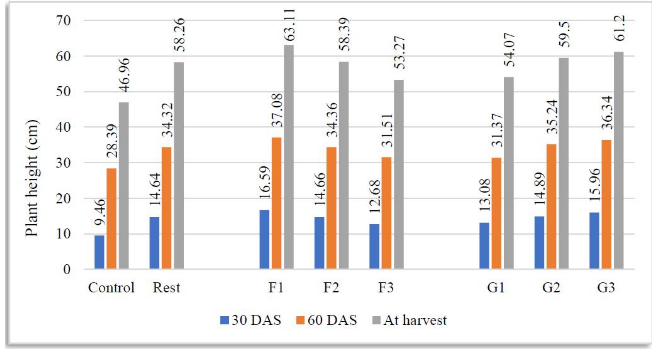

Fig. 1: Effect of different levels of fertilizer and *ghanjeevamrit* on plant height (cm) of Fenugreek

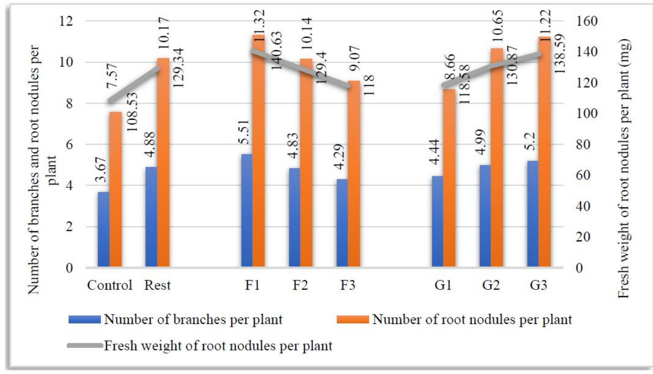

Fig. 2: Effect of different levels of fertilizer and *ghanjeevamrit* on number of branches at harvest, number and fresh weight of root nodules (mg) of Fenugreek at 45 DAS

Yield attributes and Yield

Neither the varying levels of fertilizer and *ghanjeevamrit* nor their interaction didn't exert any significant influence on pod length, number of seeds per pod, test weight and harvest index of fenugreek.

An examination of data revealed that various levels of fertilizer and *ghanjeevamrit* imparted a significant effect on number of pods per plant, seed and straw yield of fenugreek over control.

100% RDF application showed marked improvement in number of pods (29.98), seed yield (1778 kg/ha) and straw yield (3210 kg/ha) of fenugreek over 75 and 50% RDF. Similar results were observed by Deshmukh *et al*. (2020) and Talaviya and Patel (2025).

Optimum supply of nitrogen and phosphorus played crucial role in physiological processes in plant which resulted increase in flowering and fruiting, ultimately increased yield and yield attributes of plant.

Table 1: Effect of different levels of fertilizer and *ghanjeevamrit* on yield attributes and yield of fenugreek

Treatments	Number of pods	Pod length (cm)	Number of seeds per pod	Test weight (g)	Seed yield (kg/ha)	Straw yield (kg/ha)	Harvest index
Control	20.61	14.40	9.33	12.13	641	1304	33.07
Rest	26.54	16.02	10.17	13.72	1560	2879	35.05
S.Em. (±)	1.11	0.82	0.51	0.85	65.65	113.58	1.45
C.D. at 5%	3.29	NS	NS	NS	195.05	337.46	NS
[A] Levels of Fertilizer (F)							
F_1: 100% RDF	29.98	16.76	10.41	14.33	1778	3210	35.65
F_2: 75% RDF	26.51	16.09	10.32	13.83	1586	2911	35.23
F_3: 50% RDF	23.14	15.22	9.79	13.01	1317	2516	34.26
S.Em. (±)	0.62	0.46	0.29	0.48	36.89	63.83	0.82
C.D. at 5%	1.85	NS	NS	NS	109.61	189.64	NS
[B] Levels of *Ghanjeevamrit* (G)							
G_1: 500 kg/ha	22.63	15.27	9.94	13.57	1328	2505	34.45
G_2: 1000 kg/ha	27.74	16.38	10.06	13.72	1625	3007	35.11
G_3: 1500 kg/ha	29.26	16.42	10.52	13.86	1729	3125	35.58
S.Em. (±)	0.62	0.46	0.29	0.48	36.89	63.83	0.82
C.D. at 5%	1.85	NS	NS	NS	109.61	189.64	NS
Interaction (F×G)							
S.Em. (±)	1.08	0.50	0.80	0.83	63.90	110.55	1.42
C.D. at 5%	3.20	NS	NS	NS	189.85	328.46	NS
C.V.%	7.19	8.70	8.67	10.59	7.54	7.04	7.04

Data (Table 2) showed that a marked increase in number of pods per plant (29.26), seed (1729 kg/ha) and straw yield (3125 kg/ha) were detected with the application of 1500 kg/ha *ghanjeevamrit*. It was statistically at par with the application of 1000 kg/ha *ghanjeevamrit*.

Fulfilment of nutritional needs of crop and better availability of nutrients throughout the crop season improved the growth and yield contributing characters of fenugreek and hence resulted in higher seed and straw yield. These findings are in line with the results reported by Anusha *et al*. (2018) and Lima (2022). Interaction effect between different levels of fertilizer and *ghanjeevamrit* with respect to number of pods, seed and straw yield were found significant. Application of 100% RDF with 1500 kg/ha *ghanjeevamrit* gave significantly higher values and it remained at par with 100% RDF with 1000 kg/ha *ghanjeevamrit* and 75% RDF with 1500 kg/ha *ghanjeevamrit*.

Dattatraya (2021), who recorded that interaction effect of chemical fertilizer, organic manure and *jeevamrit* on number of pods per plant, seed and straw yield of chick pea found significantly higher in treatment having 100% RDF + soil and foliar application of *jeevamrit* over control.

Table 2: Interaction effect of different levels of fertilizer and *ghanjeevamrit* on number of pods per plant of fenugreek

F × G		Levels of *Ghanjeevamrit* (G)		
		G_1	**G_2**	**G_3**
Levels of Fertilizer (F)	**F_1**	27.47	30.78	31.67
	F_2	23.60	27.11	28.81
	F_3	16.80	25.33	27.79
	S.Em. (±)	1.08		
	C.D. at 5%	3.20		

Table 3: Interaction effect of different levels of fertilizer and *ghanjeevamrit* on seed yield (kg/ha) of fenugreek

F × G		Levels of *Ghanjeevamrit* (G)		
		G_1	**G_2**	**G_3**
Levels of Fertilizer (F)	**F_1**	1623	1820	1892
	F_2	1419	1632	1709
	F_3	941	1423	1585
	S.Em. ±	63.90		
	C.D. at 5%	189.85		

Table 4: Interaction effect of different levels of fertilizer and *ghanjeevamrit* on straw yield (kg/ha) of fenugreek

F × G		Levels of *Ghanjeevamrit* (G)		
		G_1	**G_2**	**G_3**
Levels of Fertilizer (F)	**F_1**	2953	3298	3378
	F_2	2666	3000	3068
	F_3	1894	2722	2930
	S.Em. ±	110.55		
	CD at 5%	328.46		

Economics

Data (Table 5) indicated that 100% RDF application showed highest net return (Rs. 64,610/ha) and benefit: cost ratio (2.10) over rest of the treatments.

In case of *ghanjeevamrit*, application of 1500 kg/ha exhibited highest net return (Rs. 57,611/ha), whereas 1000 kg/ha *ghanjeevamrit* resulted maximum benefit: cost ratio (1.95). Among different treatment combinations, highest net return (Rs. 67,988/ha) was recorded under 100% RDF with 1500 kg/ha *ghanjeevamrit*, while 100% RDF with 1000 kg/ha *ghanjeevamrit* marked highest benefit: cost ratio (2.15).

Table 5: Effect of different levels of fertilizer and *ghanjeevamrit* on economics of fenugreek.

Treatment	Gross realization (Rs./ha)	Total cost of cultivation (Rs./ha)	Net realization (Rs./ha)	BCR
Control	45675	36133	9542	1.26
Rest	108856	58248	50609	1.86
[A] Levels of Fertilizer (F)				
F_1: 100% RDF	123490	58882	64610	2.10
F_2: 75% RDF	110538	58244	52294	1.90
F_3: 50% RDF	92540	57618	34924	1.59
[B] Levels of *Ghanjeevamrit* (G)				
G_1: 500 kg/ha	93058	54028	39032	1.72
G_2: 1000 kg/ha	113432	58448	55185	1.95
G_3: 1500 kg/ha	120079	62468	57611	1.92

Conclusion

As per the results obtained from the investigation, it can be concluded that the application of 75% RDF with 1500 kg/ha *ghanjeevamrit* or 100% RDF with 1000 kg/ha *ghanjeevamrit* found to be the economically viable option for achieving higher yield, quality and profitability of fenugreek grown on loamy sand soil texture under North Gujarat condition.

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References

Anusha, O., Reddy, G. K., Sumathi, V., Reddy, P. V. and Reddy, A. P. (2018). Organic approach for sustained productivity of rabi groundnut (*Arachis hypogaea* L.). *Andhra Pradesh Journal of Agricultural Sciences*, **4**(1), 56–61.

Cochran, W. G. and Cox, G. M. (1957). *Experimental design* (2nd ed.). Wiley, New York.

Dattatraya. (2021). *Evaluation of jeevamrutha along with organic and inorganic nutrient sources and its effect on growth, soil nutrient dynamics and quality of chickpea* (M.Sc. (Agri.) Thesis, unpublished). Vasantrao Naik Marathwada Krishi Vidyapeeth, Parbhani, Maharashtra.

Deshmukh, A. A., Nagre, P. K. and Wagh, A. P. (2020). Effect of nitrogen and phosphorus levels on yield and quality of fenugreek (*Trigonella foenum-graecum*). *Journal of Pharmacognosy and Phytochemistry*, **9**(4), 1567–1571.

Jat, N. L., Jain, N. K. and Choudhary, G. R. (2006). Integrated nutrient management in fenugreek (*Trigonella foenum-graecum*). *Indian Journal of Agronomy*, **51**(4), 331–333.

Khiriya, K. D. and Singh, B. P. (2003). Effect of phosphorus and farm yard manure on yield, yield attributes and nitrogen, phosphorus and potassium uptake of fenugreek (*Trigonella foenum-graecum* L.). *Indian Journal of Agronomy*, **48**(1), 62–65.

Lima, K. P. (2022). *Influence of manurial practices on leaf and grain yield of fenugreek for enhancing spice quality* (Ph.D. Thesis, unpublished). YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP).

Mehrafarin, A., Qaderi, A., Rezazadeh, S., Naghdi Badi, H., Noormohammadi, G. and Zand, E. (2010). Bioengineering of important secondary metabolites and metabolic pathways in fenugreek (*Trigonella foenum-graecum* L.). *Journal of Medicinal Plants*, **9**(35), 1–18.

Nasratullah, Kumar, R., Manuja, S., Sharma, R. P., Sharma, G. D. and Verma, S. (2021). Evaluation of different components of natural farming in black gram (*Vigna mungo* L.) under mid hill conditions of Himachal Pradesh. *Himachal Journal of Agricultural Research*, **47**, 175–179.

Palekar, S. (2006). *Text book on shoonya bandovalada naisargika krushi*. Swamy Anand, Agri Prakashana, Bangalore.

Rosset, P. M. and Martínez-Torres, M. E. (2012). Rural social movements and agroecology: Context, theory, and process. *Ecology and Society*, **17**(3), 1–12.

Somdutt, L. N., Mundra, S. L., Choudhary, J. and Choudhary, P. (2019). Effect of inorganic and organic sources of fertilization on productivity of fenugreek (*Trigonella foenum-graecum* L.) under agro-climatic conditions of Southern Rajasthan. *Journal of Pharmacognosy and Phytochemistry*, **8**(4), 1886–1888.

Talaviya, P. L. and Patel, K. M. (2025). Effect of phosphorus levels and cutting management on growth and yield of fenugreek (*Trigonella foenum-graecum* L.). *Indian Journal of Agronomy*, **70**(1), 120–124.

Veeranna, P. D., Shilpa, H. D., Shilpa, M. E., Adarsha, S. K. and Deepa, A. G. (2023). Response of different levels of jeevamrutha and ghanjeevamrutha on pod yield and yield components of rainfed groundnut (*Arachis hypogea* L.). *Applied Ecology and Environmental Research*, **21**(2), 1219–1231.

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