



ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(9): 1628-1630
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www.thepharmajournal.com

Received: 02-06-2022

Accepted: 13-08-2022

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Influence of nitrogen levels and herb harvests on yield of fenugreek (*Trigonella foenum-graecum* L.)

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Abstract

A field experiment was conducted to study the effect of nitrogen levels and herb harvests on growth, yield and quality of fenugreek cv. Ajmer fenugreek-1 during 2014-15 at the Department of Plantation, Spices, Medicinal and Aromatic crops, College of Horticulture, UHS campus, GKVK, Bengaluru. The treatments comprised of 3 levels of nitrogen (25, 40 and 55 kg N/ha) and different harvesting Practices (no cut, single cutting at 35DAS and double cuts at 35 and 60 DAS). Among the nitrogen levels, application of nitrogen at 55 kg per hectare recorded maximum values for all the yield parameters such as number of pods per plant, pod length, number of seeds per pod, test weight, seed yield, biological yield, straw yield, harvest index, NPK content and uptake and crude protein. However, delayed flowering and maturity was observed with the same dose. Similarly, uncut plants recorded the maximum values for all the growth and yield parameters recorded and resulted in early flowering and maturity.

Highest fresh herb yield of 2710.7 kg per ha was recorded with nitrogen at 55 kg per hectare with two herb harvests. Whereas, maximum seed yield (1176.7 kg/ha) was recorded with nitrogen at 55 kg per hectare and no herb harvest. The results indicated that, fenugreek could be cultivated by applying 55 kg N per hectare with a leaf crop at 35 DAS and ultimately reaping the seed crop, as this practice gave maximum net profit with a B: C ratio of 2:11.

Keywords: *Trigonella foenum-graecum*, Nitrogen levels, Herb harvests, fresh herb yield, seed yield

Introduction

Fenugreek (*Trigonella foenum-graecum* L.) locally known as 'Methi' belongs to the family leguminosae and sub-family papilionaceae is widely used as seed spice. It is cultivated as leafy vegetable. India is one of the major producers and exporters of fenugreek seeds. Commercially it is grown on a large scale in Rajasthan, Gujarat, Madhya Pradesh, Uttar Pradesh and Uttarakhand and there is lot of scope for its cultivation in non-traditional areas. In India, fenugreek is grown on an area of 122,000 ha with an annual production of 189000 MT (NHB database, 2021-22). Its fresh and tender leaves are rich in iron, calcium, protein, vitamins and essential amino acids. Besides, it has medicinal values, as it prevents constipation, removes indigestion, and stimulates digestive process and metabolism. Seeds are used for the treatment of diabetes, dysentery, diarrhea and rickets. Diosgenin extracted from the seeds is used in synthesis of sex hormones.

Nitrogen plays a vital role in the growth and development of fenugreek. It is also known to play a significant role in leaf production and seed yield of fenugreek. In fenugreek, both leaves and seeds are the economic parts. In north India, the crop is grown for seed, while in south India, it is a green leafy vegetable. Herb harvesting gives the additional and early returns to the farmers besides seed crop (Baboo, 1997) ^[1]. Keeping in view the vital role of nitrogen in improving the herbage and seed yield of fenugreek and benefits of herb harvests, the present study was taken up, to explore the possibility of raising fenugreek as a dual purpose crop in Bengaluru with one or two herb harvests and ultimately leaving it for seed with varied levels of nitrogen.

Materials and Methods

A field experiment was conducted to study the influence of nitrogen levels and herb harvests on growth and yield of fenugreek (*Trigonella foenum-graecum* L.) during Rabi 2014-15 at College of Horticulture, University of Horticultural Sciences campus, GKVK, Bengaluru-65. The soil of the experiment site was red sandy loam with a pH of 5.8, 1.27% organic carbon and 234, 78 and 173 kg available NPK respectively per ha.

The experiment was laid out in a randomized block design with factorial concept comprising 9

Treatments and replicated four times. The treatments comprised of nitrogen levels as one factor (25, 40 and 55 kg N/ha) and herb harvests as another factor (no cut, single cutting at 35 DAS and double cuts at 35 and 60 DAS). Pure, healthy and good quality seeds of fenugreek cv. Ajmer Fenugreek⁻¹ were procured from Directorate of seed spices, Ajmer (Rajasthan) and sown on of 17th November, 2014. Seeds were treated with *Rhizobium* culture @ 15 g per kg and 3-4 seeds were sown at each spot at a depth of 2 cm by adopting a spacing of 25 cm x 15 cm, with a seed rate of 15kg per hectare. A recommended dose of FYM @ 10 t ha⁻¹ and 20 kg P₂O₅ and 20 kg K ha⁻¹ through single super phosphate and muriate of potash respectively were given as basal dose along with 50% nitrogen (12.5, 20 and 27.5 kg/ha). The remaining 50% of nitrogen was given after 35 DAS. Weeding and other intercultural practices were carried out at regular intervals to keep the plots free from weeds. The crop was irrigated with drip system using 12 mm inline drippers with 2LPH discharge with laterals in alternate rows of fenugreek.

The leaf crop was harvested when plants started flowering. Leaf cutting was done as per the treatments. After the herb harvest the plants were left for seed crop. The seed crop was harvested when majority of the plants in the plot were almost bare of leaves and pods dried and turned yellow.

Results and Discussion

Yield attributes

Yield attributes of fenugreek such as number of pods per plant, pod length, number of seeds per pod and test weight of seeds found to be significantly influenced by different nitrogen levels and herb harvests.

The highest number of pods per plant (29.2), pod length (10.8 cm), number of seeds per pod (10.82) and test weight of seeds (1.82 g) were noticed in the plants which received nitrogen at 55 kg per hectare (N₃). Whereas, in cutting practices maximum number of pods per plant (29.3), pod length (11.2 cm), number of seeds per pod (10.86) and test weight of seeds (1.84 g) were noticed in uncut plants (C₀), whereas, all these attributes showed negative tendency in plants subjected to herb harvests. The plant height, number of branches per plant, fresh and dry weight of plant, growing period and availability

of carbohydrates were comparatively more in uncut plants than plants subjected to herb harvests might be possibly responsible for maximum values of yield attributes.

Yield parameters

Nitrogen levels, herb harvests and their interaction had a profound and significant influence on fresh herb and seed yield of fenugreek.

Highest level of N at 55 kg per hectare caused for maximum fresh herb yield at 35 and 60 DAS (1285.8 and 1372.2 kg/ha fresh herb respectively). The minimum fresh herb yield was recorded at 35 and 60 DAS (936.7 and 1073.5 kg/ha respectively) with nitrogen at 25 kg/ha. This is due to the fact that, nitrogen is an essential constituent of chlorophyll, protein, structural units and as biological catalyst helps in plant growth and development. Hence, luxuriant growth of the plant with higher dose of N which is evident from higher plant height, number of branches, fresh weight and dry weight which led to the production of more fresh herbage yield. These results are in conformity with the findings of Balyan and Sobti (1990) [2] in basil, Meena *et al.* (2006) [4] in coriander and Datta *et al.* (2005) [3] in fenugreek.

The treatment combination with nitrogen at 55 kg per hectare without leaf harvest (N₃C₀) resulted in maximum seed yield (1176.7 kg/ha) which was at par with N₃C₁ (1137.6 kg/ha), while, the minimum seed yield (553.5 kg/ha) was recorded in the treatment which received nitrogen at 25 kg per hectare and harvested twice (N₁C₂). The growth and reproductive parameters such as plant height, number of branches per plant, fresh and dry weight of herb, flowering, number of pods per plant, pod length, number of seeds per pod, test weight improved with the higher dose of N, which resulted in increased seed yield. When the vegetative growth of a plant is interrupted by harvesting the herb, the reproductive growth was altered resulting in lower seed yield from plants grown for dual purpose especially when subjected to multiple harvests. Hence, maximum seed yield was observed in both N₃C₀ and N₃C₁. These results are in accordance with the findings of Parakhia *et al.* (2000) [5], Surendra Kumar *et al.* (2002) [6] in coriander and Yadav *et al.* (2006) [7] in fenugreek.

Table 1: Yield attributes of fenugreek (*Trigonella foenum -graecum*) as affected by different levels of nitrogen and harvesting practices

Treatment	Number of pods per plant				Pod length (cm)				Number of seeds per pod				Test weight of seeds (g)			
	C ₀	C ₁	C ₂	Mean	C ₀	C ₁	C ₂	Mean	C ₀	C ₁	C ₂	Mean	C ₀	C ₁	C ₂	Mean
N ₁	26.2	25.9	23.4	25.2	10.8	10.6	8.6	9.9	9.72	9.27	8.70	9.23	1.78	1.76	1.68	1.74
N ₂	29.4	28.1	23.7	27.1	11.2	10.6	9.5	10.4	11.08	10.71	9.58	10.45	1.81	1.76	1.73	1.77
N ₃	32.8	31.0	24.3	29.2	11.5	11.4	9.7	10.8	11.77	11.20	10.34	10.82	1.91	1.82	1.73	1.82
Mean	29.3	28.4	23.8		11.2	10.9	9.2		10.86	10.50	9.49		1.84	1.78	1.71	
	N	C	N×C		N	C	N×C		N	C	N×C		N	C	N×C	
S.Em±	0.36	0.3	0.62		0.1	0.1	0.2		0.17	0.17	0.29		0.02	0.02	0.03	
C.D.@5%	1.1	1.1	1.8		0.3	0.3	NS		0.49	0.49	NS		0.05	0.05	NS	

Legend

Nitrogen Levels

N₁: 25 kg nitrogen per hectare

N₂: 40kg nitrogen per hectare

N₃: 55 kg nitrogen per hectare

NS – Non significant

Herb harvests

C₀: No cut

C₁: Single cutting at 35 Days after sowing (DAS)

C₂: Two cuttings at 35 and 60 DAS

Table 2: Fresh herb and seed yield (kg/ha) of fenugreek (*Trigonella foenum-graecum*) as influenced by different levels of nitrogen and Herb harvests

35DAS				60DAS	Cumulative herb yield			Seed yield			
Treatments	C ₁	C ₂	Mean	C ₂	C ₁	C ₂	Mean	C ₀	C ₁	C ₂	Mean
N ₁	930.5	943.0	936.7	1073.2	930.5	2016.2	1473.3	836.3	776.8	553.5	722.2
N ₂	932.7	1005.2	969.0	1342.1	932.7	2347.3	1639.9	1,004.1	990.4	679.6	891.4
N ₃	1233.8	1337.8	1285.8	1372.0	1233.8	2710.7	1972.2	1,176.7	1,137.6	684.5	999.6
Mean	1032.3	1095.3		1262.0	1032.3	2358.1		1,005.7	968.3	639.2	
	N	C	N×C	N	N	C	N×C	N	C	N×C	
S.Em ±	26.3	21.5	37.2	43.3	52.4	42.8	74.1	12.9	12.8	22.3	
C.D. @ 5%	80.0	NS	NS	134.0	159.3	130.1	225.4	37.8	37.8	65.5	

Legend:

Nitrogen Levels

N₁: 25 kg nitrogen per hectareN₂: 40kg nitrogen per hectareN₃: 55 kg nitrogen per hectare

NS – Non significant

Herb harvests

C₀: No cutC₁: Single cutting at 35 Days after sowing (DAS)C₂: Two cuttings at 35 and 60 DAS**Conclusion**

It is highly remunerative to cultivate fenugreek as a dual purpose crop with the application of 55 kg N per hectare, taking a leaf crop at 35 DAS for the fresh herb and reaping the seed.

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