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Influence of nitrogen levels and herb harvests on growth 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 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 35 DAS 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 growth parameters such as plant height, number of branches per plant, fresh and dry herb, and number of days to flowering and crop maturity. However, delayed flowering and maturity was observed with the same dose. Similarly, uncut plants recorded the maximum values for all the growth parameters and resulted in early flowering and maturity.

The maximum plant height (52.7 cm) was recorded in the plants supplied with nitrogen at 55 kg per hectare and the crop left unharvested (N_3C_0). Whereas, minimum height (31.6 cm) was noticed in the plants fertilized with nitrogen at 25 kg per hectare and harvested twice for leaf (N_1C_2). Maximum number of branches per plant (6.6) and fresh weight of herb (47.01g/plant) was noticed in the plants fertilized with highest level of nitrogen (55 kg/ha) and harvested once for herb (N_3C_1). Early flowering and crop maturity (30.1 and 93.3 DAS respectively) was observed in plants applied with minimum level of nitrogen at 25kg per hectare (N_1) and the plants left without leaf harvest.

Keywords: *Trigonella foenum-graecum*, nitrogen levels, herb harvests, fresh herb 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 189,000 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, 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.

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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 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 x15 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

Growth parameters: Various levels of nitrogen and herb harvests had a significant impact on plant height, number of branches per plant, fresh and dry weight of plant at all stages of crop growth. The maximum plant height (52.7 cm) was recorded in the plants supplied with nitrogen at 55 kg per hectare and the crop left unharvest (N₃C₀). Whereas, minimum height (31.6 cm) was noticed in the plants fertilized with nitrogen at 25kg per hectare and harvested twice for leaf (N₁C₂). The positive influence of higher levels of nitrogen on plant height might be due to the increase in cell division and cell elongation, which in turn increased the plant height. Whereas, the herb cutting had a negative effect on the plant height. These findings are in agreement with Pandita and Randawa (1994)^[5], Thapa and Maity (2004)^[7] in fenugreek and Tehlan and Thakral (2008)^[6] in coriander.

Maximum number of branches per plant (6.6) was noticed in

the plants fertilized with highest level of nitrogen (55kg/ha) and harvested once for herb (N₃C₁). While, it was minimum (3.9) in plants supplied with nitrogen at 25kg/ha and harvested twice for herb (N₁C₂). It might be attributed to increased activity of lateral meristems, resulted from the uptake of more nitrogen. The number of branches increased up to first cutting and decreased in subsequent cuttings, because cutting of apical buds leads to translocation of auxins to the potential and tertiary shoot buds which in normal conditions remain dormant. Similar findings were reported by Thapa, *et al.* (2004)^[7] and Datta *et al.* (2005)^[3] in fenugreek.

The fresh weight of herb was maximum (47.01g/plant) from plants applied with nitrogen at 55 kg per hectare and harvested once for leaf purpose (N₃C₁). Whereas, the lowest fresh weight (25.23 g/plant) was recorded in the plants supplied with nitrogen at 25 kg/ha and harvested twice for fresh herb (N₁C₂). Higher level of N favour luxuriant plant growth, which is evident from the production of higher fresh weight of the herb. Similarly, cutting the plants once encouraged the branching and higher vegetative growth with more foliage. This was responsible for maximum fresh weight of herb. 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. Similar trend was observed in case of dry weight of herb.

Reproductive Parameters

The reproductive parameters such as days to first flower appearance, days to 50% flowering and maturity of the fenugreek were significantly altered by nitrogen levels, herb harvests and their interactions.

Early flowering and crop maturity (30.1 and 93.3 DAS respectively) was observed in plants applied with minimum level of nitrogen at 25 kg per hectare (N₁) and the plants left without leaf harvest. The most delayed flowering (33.8DAS) was observed in the plants supplied with highest level of nitrogen (55 kg/ha). With regard to interaction, application of 55 kg N/ha and subjecting the plants to two leaf harvests (N₃C₂) produced resulted in delayed flowering and crop maturity (55.1 and 106.8 DAS respectively). Higher level of nitrogen causes the maximum diversion of photosynthates to produce more vegetative growth, which in turn delays the reproductive phases like flowering and crop maturity. Similarly, herb harvesting practices made the plant to stay in vegetative phase for long period, hence the delayed flowering and maturity as demonstrated by Pandita and Randhawa (1994)^[5] and Vasudevan *et al.* (2008)^[8] in fenugreek.

Table 1; Influence of varied levels of nitrogen and herb harvests on plant height, number of branches, fresh and dry herb of fenugreek (*Trigonella foenum -graecum*) at 90 days after sowing

Treatment	Plant height (cm)				Number of branches per plant				Fresh herb (g/plant)				Dry herb (g/plant)			
	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	44.7	34.9	31.6	37.0	5.0	5.3	3.9	4.8	34.46	37.73	25.23	32.47	10.14	11.10	7.42	9.48
N ₂	47.1	39.3	32.4	39.6	5.9	6.2	4.4	5.4	39.54	40.77	29.22	36.51	11.63	11.99	8.59	10.74
N ₃	52.7	43.7	34.2	43.6	6.2	6.6	4.4	5.7	42.70	47.01	33.93	41.22	12.56	13.83	9.98	12.12
Mean	48.2	39.3	32.7		5.7	6.0	4.3		38.90	41.84	29.46		11.45	12.30	8.66	
	N	C	N×C		N	C	N×C		N	C	N×C		N	C	N×C	
S.Em±	0.5	0.5	0.9		0.07	0.07	0.11		0.55	0.55	0.95		0.16	0.161	0.27	0.16
C.D.@5%	1.6	1.6	2.8		0.2	0.2	0.3		1.60	1.60	NS		0.47	0.47	NS	0.47

Legend:

Nitrogen Levels Herb harvests

N₁: 25 kg nitrogen per hectare

N₂: 40kg nitrogen per hectare

N₃: 55 kg nitrogen per hectare

NS – Non significant

C₀: No cut

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

C₂: Two cuttings at 35 and 60 DAS

Table 2: Impact of varied levels of nitrogen and herb harvests on days to first flowering, 50% flowering and maturity of fenugreek (*Trigonella foenum-graecum*)

Treatments	Days to first flowering*	Days to 50% flowering			Days for maturity			
		C ₀	C ₁	Mean	C ₀	C ₁	C ₂	Mean
N ₁	30.1	41.4	53.8	47.6	93.3	97.8	104.3	98.4
N ₂	32.6	42.8	54.6	48.7	94.5	98.3	105.0	99.3
N ₃	33.8	46.3	55.1	51.0	95.6	99.0	106.8	100.3
Mean	32.2	43.2	54.4		94.3	98.3	105.3	
		N	C	N×C	N	C	N×C	
S.Em±	0.2	0.16	0.13	0.2	0.12	0.12	0.22	
C.D.@5%	0.6	0.5	0.4	0.7	0.37	0.37	0.64	

Cutting treatments were imposed at 35 DAS; Hence data is not presented for herb harvests and interactions

Legend:

Nitrogen Levels

N₁: 25 kg nitrogen per hectare

N₂: 40kg nitrogen per hectare

N₃: 55 kg nitrogen per hectare

Herb harvests

C₀: No cut

C₁: 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.

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