

Research Article

Evaluation of Fenugreek (*Trigonella Foenum-Graecum* L.) Varieties under Sub-Tropical Condition of Garhwal Himalayas

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Abstract

Field experiment was conducted at Horticultural Research Centre, H.N.B. Garhwal University, Srinagar- Garhwal, Uttarakhand (India) during rabi season 2015-16 to identify the suitable varieties for cultivation with high yield and quality traits using 15 varieties of Fenugreek (*Trigonella foenum-graecum* L.). The experiment was laid out in Randomized Block Design with three replications. The results are indicated that, the analysis of variance revealed highly significant differences among varieties for almost all the traits. The yield parameters showed that Rmt-1 variety significantly maximum plant height (70.89 cm). The maximum number of primary branches (5.67) and secondary branches (6.35) was found in JKSP variety. The maximum pod weight (13.35 g/plant), seed yield (8.51/plant) seed yield (1610 kg/ ha) were recorded in variety of Rajandera Kranti.

Keywords: Fenugreek, Growth, Variance, Variety and Yield

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Introduction

Fenugreek (*Trigonella foenum graecum* L.) called “Methi” in Hindi, is grown in India as Rabi season crop, considered to be one of the major seed spices. It belongs to the family Leguminaceae and sub family Papilionaceae. It is native to southern Europe and Asia (Rathore, 2001) [1]. India is leading in fenugreek seed production, producing about 90 % of the world fenugreek production (Acharya *et al.*, 2008) [2]. Major seed producing countries include India, Ethiopia, Egypt, and Turkey. The seeds are golden in colour and rectangular in shape, averaging 4 mm in length, 2 mm in width, and 1.5 mm in thickness (Altuntas *et al.*, 2005) [3]. The 1000-seed weight varies from 15.5 – 16.4 g to 18-22 g and bushel weight is 25-27 kg (Thamburaj and Singh, 2005) [4].

Kasuri Methi (*Trigonella corniculata*) is slow growing plant remains in a rosette condition for most part of the vegetative growth (Dhaliwal, 2012) [5]. It is mainly grown as leafy vegetable and seeds in the plains of north India. Its fresh tender leaves and pods are eaten as fried vegetable being rich in iron, calcium, protein and vitamins (Singh *et al.*, 2012) [6].

The seeds also contain major nutrients like minerals, vitamins A & B, P and K and minor nutrients like Ca, Fe and Na and amino acids like leucine, valine lysine and phenylalanine besides cellulose, hemicelluloses and oleoresin which are used in flavours. Fenugreek oil is used in butterscotch, cheese, liquorices, pickle, rum, syrup and vanilla flavours. Powdered seeds or seed extracts are used as flavor and aroma agents in the food and cosmetic industries and dyes in the textile industry (Duke *et al.*, 1981) [7].

A wide range of medicinal properties has been attributed to fenugreek such as wound-healing, bust enhancement, enhanced lactation in weaning mothers, as an aphrodisiac, anti-diabetic, antihyperthyroidism, anticancer, gastro-protective, antioxidant, antipyretic, antimicrobial, anthelmintic, antisterility, anti-allergy and anti-inflammatory effects (Acharya *et al.*, 2008) [2].

Fenugreek cultivar performs differently under different agro-climatic conditions and various cultivars of same species grown even in same environment often have yield differences because, yield and quality of crop are very complex characteristics depending on certain biological alignments between environment and heredity. The characteristics of a cultivar as well as combination of traits differ according to climate condition of the localities.

Materials and Methods

The experimental materials constituted a collection of 15 varieties of radish (*Raphanus sativus* L.) namely, AFG-1, AFG-2, AFG-3, K-25, Kasuri Methi, JKSP, Local-1, Local-2, Local-3, Local-4, Local-5, Local-6, Rajandera Kranti, Rmt-1 and T-1 varieties were collected from N.R.C.S.S. Ajmer (Rajasthan), Jaipur (Rajasthan), Nagaur (Rajasthan), Srinagar (U.K.), Rishikesh (U.K.), Jobner (Rajasthan), Kota (Rajasthan), Alwar (Rajasthan), S.K.N. jobner, Jaipur (Rajasthan). The experiment was conducted in rabi season, 2015-16 at Horticultural Research Centre of H.N.B. Garhwal University, Srinagar (Garhwal) situated in the Alaknanda valley (78° 47' 30" E longitude and 30° 13' 0" N latitude and at an elevation of 550 m above MSL), a semiarid, sub-tropical climate with dry summer and rigorous winters with occasional dense fog in the morning hours from mid December to mid February. The experiment was laid out in Randomized Block Design with three replications. The entire experimental field was divided into three blocks of equal size and each block possessed 15 plots. Each plot measured 5 X 1 m² area. The varieties were sowed at spacing of plant to plant is 30 cm and row to row 15 cm and seed are sown 1.5 to 3cm deep in the soil. All the recommended agronomic practices were followed to raise a healthy crop. Observations were recorded on quantitative and qualitative traits viz., Days taken to germination, Plant height (cm), Number of leaves per plant, Days taken to 50% flowering, No. of pod/ plant, Pod length(cm.), Pod weight/plant (g), Seed yield /plot (g), Seed yield/ha. (kg), on five randomly selected plants. The data obtained from selected plants were subjected to analysis of variance (Panse and Sukhatma, 1967) [8].

Results and discussion

The analysis of variance revealed highly significant differences for all the characters. The data presented in **Table 1** and **Figure 1**. showed that significant differences were recorded among the radish varieties. The maximum germination percentage (81.36) was recorded in Rajendra Kranti, whereas the minimum (64.70) germination percentage was observed in Local-5 variety. The variation in germination among the varieties might be attributed to a climatic factor viz., temperature, rainfall and relative humidity which can enhance seed germination. The similar results obtained are in accordance with the findings of Vasudevan *et al.* (2008) [9] in fenugreek.

Table 1 Mean performance of fenugreek varieties for germination percent plant height and number of leaves

S. N.	Name of varieties	Germination (%)	Plant height (cm)	Number of leaves
1.	AFG-1	72.19	67.60	76.67
2.	AFG-2	69.57	67.11	71.67
3.	AFG-3	69.23	67.37	70.00
4.	K-25	69.71	60.40	109.33
5.	Kasuri Methi	69.30	59.49	106.67
6.	JKSP	70.25	60.52	108.00
7.	Local-1	70.25	65.40	52.33
8.	Local-2	66.28	63.68	49.33
9.	Local-3	64.61	62.39	43.67
10.	Local-4(Kasuri)	66.29	61.36	106.67
11.	Local-5	64.70	64.57	49.00
12.	Local-6	66.63	62.61	49.00
13.	Rajandera Kranti	81.36	68.52	103.33
14.	Rmt-1	80.99	70.89	87.67
15.	T-1	72.32	62.44	61.33
S.Em±		0.29	0.13	1.92
CD at 5%		0.84	0.38	5.56

The maximum plant height (70.89 cm) was recorded under the variety of Rmt-1, whereas the minimum plant height (59.49cm) was recorded under the variety Kasuri methi. Different responses to plant height might be due to genetic characteristic of genotypes and adaptability to a particular environment. These findings confirm the result obtained by Aggrwal *et al.*, (2013) [10]; Chowdhury *et al.*, (2014) [11] and Singh *et al.*, (2015) [12] in fenugreek. The maximum number of leaves (109.33/ plant) was recorded in the variety K-25, whereas the minimum number of leaves after harvest 43.67 was recorded under the variety Local-3. The number of leaves is an important character as the leaves are the plant factories for manufacturing photosynthesis. Therefore, the cultivar with more number of leaves

generally gives high yields. These results obtained are accordance with the finding of Aggrwal *et al.*, (2013) [10] in fenugreek and Magashi *et al.*, (2014) [13] in cowpea.

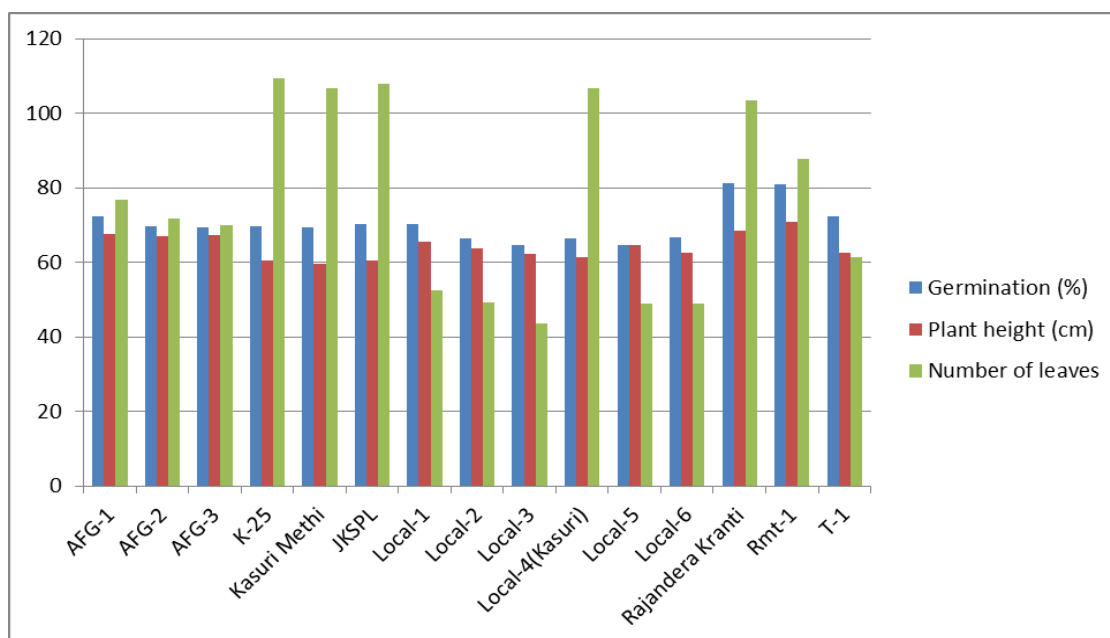


Figure 1 Mean performance of fenugreek varieties for germination percent plant height and number of leaves

Yield parameters

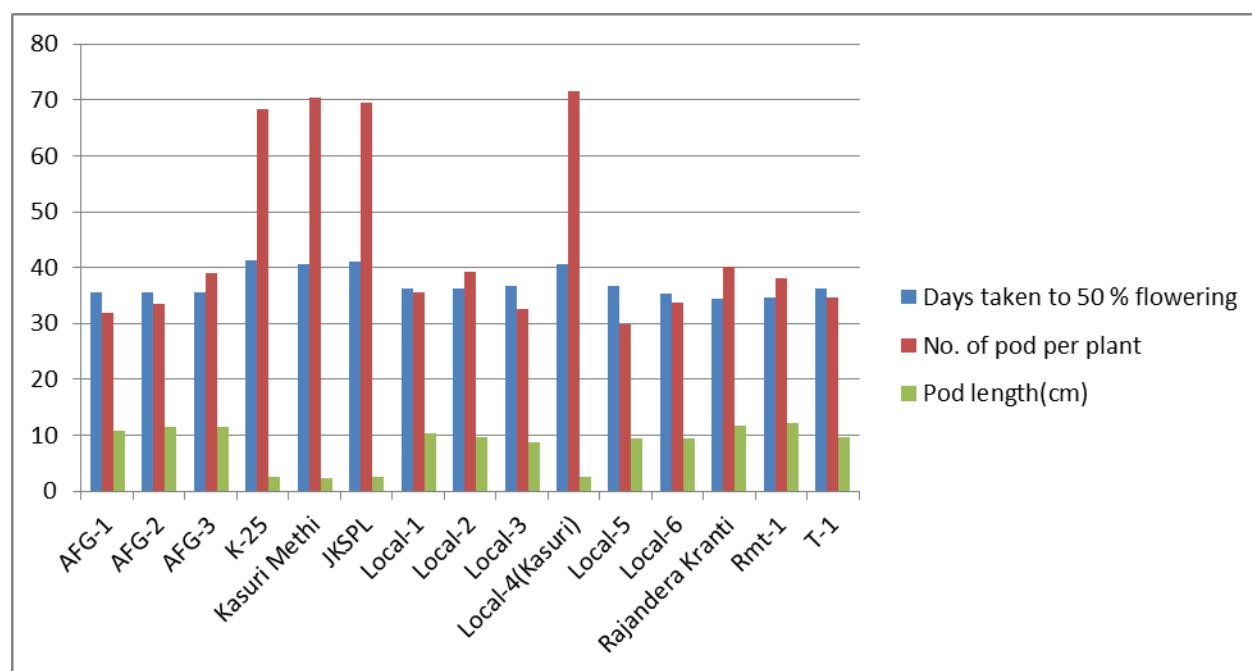
Performance of various treatments with respect to days taken to 50% flowering was found to have significant variation (**Tables 2 and 3, Figures 2 and 3**). The minimum number of days 34.33 taken to 50% flowering was recorded under Rajandera Kranti, whereas the maximum days 41.33 taken to 50% flowering was recorded under K-25. The possible reason of early flowering in certain genotypes indicated adaptability of these genotypes in a particular environment, better and efficient utilization of nutrients in a relatively hostile environment which might have resulted in early termination of vegetative phase and initiation of reproductive stage as compared to genotypes which took longer time to flowering. Similar results have also been reported by Pushpa *et al.*, (2012) [14] and Singh *et al.*, (2015) [12] in fenugreek.

Table 2 Mean performance of fenugreek varieties for Days taken to 50 % flowering, No. of pod per plant and Pod length (cm)

S. N.	Name of varieties	Days taken to 50 % flowering	No. of pod per plant	Pod length (cm)
1.	AFG-1	35.67	31.89	10.86
2.	AFG-2	35.67	33.56	11.48
3.	AFG-3	35.67	39.06	11.52
4.	K-25	41.33	68.29	2.62
5.	Kasuri Methi	40.67	70.39	2.28
6.	JKSP	41.00	69.44	2.52
7.	Local-1	36.33	35.56	10.42
8.	Local-2	36.33	39.33	9.63
9.	Local-3	36.67	32.50	8.67
10.	Local-4(Kasuri)	40.67	71.51	2.62
11.	Local-5	36.67	29.78	9.51
12.	Local-6	35.33	33.80	9.46
13.	Rajandera Kranti	34.33	40.22	11.74
14.	Rmt-1	34.67	38.17	12.25
15.	T-1	36.33	34.56	9.62
S.Em±		0.33	0.65	0.28
CD at 5%		0.96	1.89	0.81

Table 3 Mean performance of fenugreek varieties for Pod wt per plant(g), Seed yield per plot(g) and Seed yield/ ha(kg)

S.N.	Name of Varieties	Pod wt per plant(g)	Seed yield per plot(g)	Seed yield/ ha(kg)
1.	AFG-1	12.47	476.33	952.66
2	AFG-2	13.13	604.33	1208.66
3	AFG-3	13.30	524.00	1048.00
4	K-25	12.48	302.33	604.00
5	Kasuri Methi	12.99	287.33	574.66
6	JKSPL	13.23	297.33	594.66
7	Local-1	13.19	523.67	1047.34
8	Local-2	13.21	481.33	962.68
9	Local-3	8.53	497.33	994.67
10	Local-4 (Kasuri)	11.62	292.33	584.68
11	Local-5	12.49	578.00	1156.00
12	Local-6	13.14	527.67	1055.34
13	Rajandera Kranti	13.35	805.00	1610.00
14	Rmt-1	9.22	770.33	1540.66
15	T-1	11.47	511.33	1022.66
S.Em±		0.14	3.11	0.21
CD at 5%		0.41	9.01	0.60

**Figure 2** Mean performance of fenugreek varieties for Days taken to 50 % flowering, No. of pod per plant and Pod length

The maximum number of pod 71.51 per plant was recorded under the variety Local-4 and Kasuri methi, whereas the minimum number of pod 29.78 per plant was recorded under the variety Local-5. This might be due to congenial climatic condition like cool relative humidity, low temperature and optimum photoperiod for luxuriant vegetative growth and flowering which favors better pods production. This may possibly due to its good plant growth and comparatively more number of primary branches causing greater assimilation of the photosynthate which ultimately resulted into higher yield. These similar results were agreement with the findings of Chowdhury *et al.*, (2014) [11]; Thakral *et al.*, (2006) [15] and Malik and Tehlan (2009) [16] in fenugreek. The maximum length of pod 12.25cm was recorded under the variety Rmt-1, whereas, the minimum length of pod 2.28cm was recorded under the variety Kasuri methi. The reason behind the variations of pod might be due to the genetic makeup of variety by Datta & Chatterjee (2004) [17]; Pushpa *et al.*, (2012) [14] and Malik and Tehlan (2009) [16] in fenugreek.

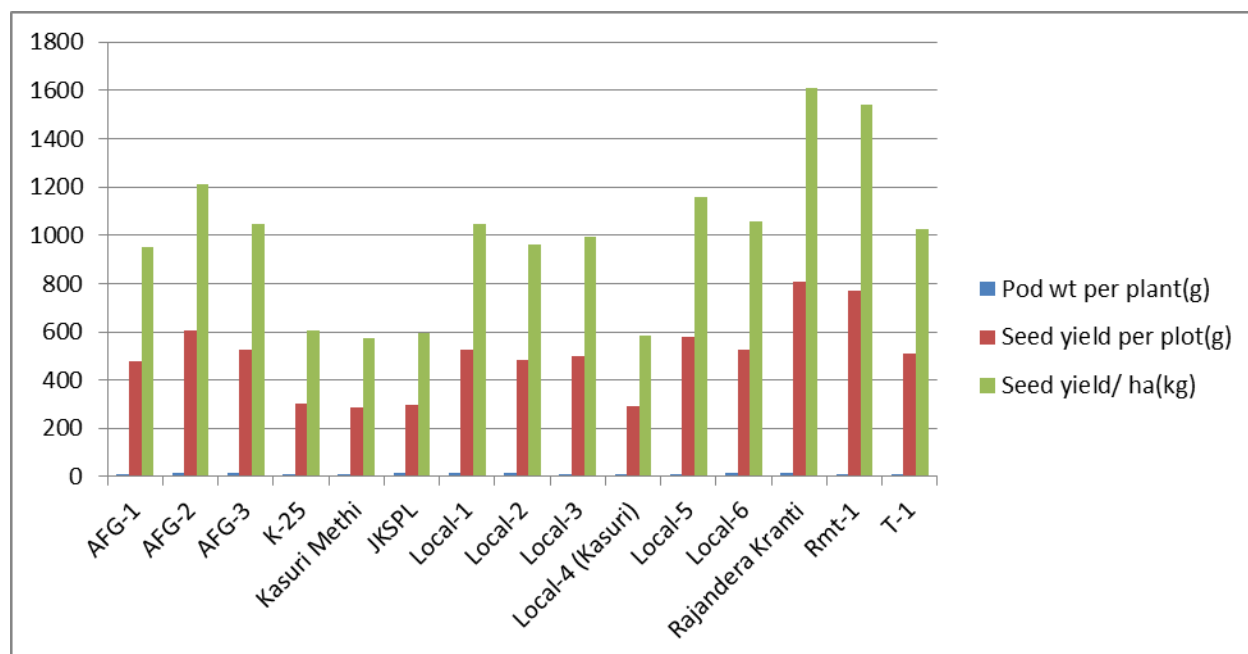


Figure 3 Mean performance of fenugreek varieties for Pod wt per plant, Seed yield per plot and Seed yield/ ha

The variety Rajandera Kranti (V_{13}) significantly highest total weight of pod per plant 13.35 g, whereas the minimum total weight of pod per plant 8.53 g. was recorded under the variety Local-3 (V_9). These similar results were agreement with the findings of Pushpa *et al.*, (2012) [14] in fenugreek. The maximum seed yield per plot 805.00 g and seed yield 1610.00kg/ha were recorded under the variety Rajandera Kranti, whereas, the minimum seed yield per plot 287.33g and seed yield 574.66 kg/ha were recorded under the variety Kasuri methi. The increase in seed yield might be due to favorable climatic conditions like temperature, high relative humidity and optimum sunshine hours. The similar results were founded by Datta & Chatterjee (2004) [17]; Pushpa *et al.*, (2012) [14]; Thakral *et al.* (2006) [15] and Singh *et al.*, (2015) [12] in fenugreek.

References

- [1] Rathore, P. S. ed. 2001: Techniques and Management of Field Crop Production; Agrobois (India). pp. 382-384.
- [2] Acharya, S. N.; Thomas, J. E.; and Basu, S. K. 2008. Fenugreek, an alternative crop for semi-arid regions of North America. *Crop Sci.*, 48(3): 841-853.
- [3] Altuntas, E.; Ozgoz, E.; and Faruk T. O.; 2005. Some physical properties of fenugreek (*Trigonella foenum-graecum* L.) seeds. *J. Food Eng.*, 71: 36-43.
- [4] Thamburaj, S. and Singh, N. 2005. Text Book of Vegetable, Tuber Crops and Spices, Directorate of Information and Publication of Agriculture ICAR New Delhi, pp: 364-371.
- [5] Dhaliwal, M.S. 2012. Hand Book of Vegetable Crops. 2nd edition, Kalyani publishers. pp: 308-310.
- [6] Singh, S., Choudhary, M. R., Garhwal, O. P., Jakhar, M. L. and Yadav, B. L. 2012. Effect of biofertilizers and inorganic sources of Nitrogen and Phosphorus on quality production of kasuri methi (*Trigonella corniculata*). *Int. J. Seed Spices*, 2(2): 38-40.
- [7] Duke, J. A, Reed, C. F. and P. Weder, 1981. *Trigonella foenum-graecum* L. In: J.A. Duke, Handbook of Legumes of World Economic Importance. (ed.). Plenum Press: New York pp. 268-271.
- [8] Panse, V.G. and Sukhatme, P.V. 1961. Statistical Methods for Agriculture Workers. II ed. ICAR New Delhi.
- [9] Vasudevan, S. N., Sudarshan, J. S., Kurdikeri, M. B., and Dharmatti, P. R., 2008. Influence of harvesting stages on seed yield and quality in fenugreek. *Karnataka J. Agric. Sci.*, 21 (1): 122-124
- [10] Aggrwal, K. B.; Ranjan, J. K.; Rathore, S. S.; Saxena, S. N.; and Mishra, B. K. 2013. Changes in physical and biochemical properties of fenugreek (*Trigonella sp. L.*) leaf during different growth stages. *Int. J. Seed Spices* 3(1): 31-35.
- [11] Chowdhury, M. M. U., Bhowal, S. K., Farhad, I. S. M., Choudhury, A. K. and Khan, A. S. M. M. R. 2014. Productivity of fenugreek varieties (*Trigonella foenum-graecum* L.) in the Coastal Saline areas of Noakhali. *The Agriculturists*, 12(2): 18-23.

- [12] Singh, K. P., Singh, B., Tomar, B. S. and Naidu, A. K. 2015. Trait variation in fenugreek. *SABRAO J. Breeding and Genetics*, 47(4): 413-423
- [13] Magashi, Ibrahim, A., Musa, Fulani, S. and Ibrahim, M. 2014. Evaluation of cowpea genotypes *Vigna Unguiculata* (L.) for some yield and root parameters and their usage in Breeding programme for drought tolerance. *Int. J. Advances in Agri. & Environmental Engg.*, (IJAAEE) 1(1): 34-37.
- [14] Pushpa, T. N., Chandregowda, M., Srikantaprasad, D. and Gowda, A. P. M. 2012. Evaluation of fenugreek (*Trigonella foenum-graecum* L.) genotypes for growth and seed yield. *Crop Res.*, 43 (1, 2 & 3): 238-244.
- [15] Thakral, K. K., Tehlan, S. K. and Partap, P. S. 2006. Varietal evaluation in fenugreek for growth and seed yield. *Harayana J. hort. Sci.*, 35(3&4): 344-345.
- [16] Malik, T. P. and Tehlan, S. K. 2009. Performance of fenugreek (*Trigonella foenum-graecum*) genotypes for growth and seed yield. *Annals of Hort.*, 2(2): 237-239.
- [17] Datta, S. and Chatterjee, R. 2004. Performance of fenugreek (*Trigonella foenum-graecum* L.) genotypes under new alluvial zone of West Bengal. *J. Spices and Aromatic Crops*, 13 (2): 132-134.

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