Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2320-7051.2979

ISSN: 2320 – 7051

Int. J. Pure App. Biosci. **5 (3):** 1075-1079 (2017)

Research Article

International Journal of Pure & Applied Bioscience

OPEN ACCESS

Variability Studies for Yield and Its Attributing Traits in Fenugreek (*Trigonella foenum-graecum* L.) Genotypes

Mamatha, N. C.*, Tehlan, S. K., Srikanth, M., Ravikumar, T., Batra, V. K. Karthik Reddy, P. and Mukesh Kumar

Department of Vegetable Science, CCS Haryana Agricultural University, Hisar-125 004

*Corresponding Author E-mail: mamatha.hortico@gmail.com

Received: 15.05.2017 | Revised: 25.05.2017 | Accepted: 26.05.2017

ABSTRACT

The study was conducted to reveal the presence of genetic diversity among 150 fenugreek genotypes which were collected from different geographical regions of India. The mean of sum of squares due to genotypes were highly significant for all the characters under study indicating sufficient genetic variation among the genotypes assessed. The genetic improvement of any crop covers mainly on the substantial magnitude of variability in the genotypes. Mean and range values indicated ample variability for most of the characters evaluated. High estimates of PCV and GCV were observed for traits like primary branches per plant, secondary branches per plant, number of pods per axis, number of pods per plant, yield per plant and test weight. This indicates the presence wide range of genetic variability for yield and its attributing traits. A narrow difference between PCV and GCV values were reported for number of pods per plant and yield per plant indicating less environmental influence. High heritability coupled with high genetic advance over mean was observed for traits like plant height, primary branches per plant, secondary branches per plant, number of pods per axis, number of pods per plant, number of seeds per pod, yield per plant and test weight which indicated the existence of additive gene action and these traits could be improved by direct selection.

Key words: *Fenugreek, Variability, PCV, GCV and Heritability.*

INTRODUCTION

Fenugreek [*Trigonella foenum-graecum* L.], an annual herb of Leguminosae family, is popularly known by its vernacular name '*methi*'. This small-seeded, self-pollinated diploid annual legume plant and is grown majorly as a spice crop in India. Fenugreek is rich in minerals, protein, vitamin A and C. In the Ayurvedic and Unani system of medicine, fenugreek is known to treat epilepsy, paralysis, gout, dropsy, chronic cough and piles. This crop has the additionally recognized potential of oleoresin and steroid production for oral contraceptives. Fenugreek seed contains saponins which have many flavoring, sweetening, antioxidant, foaming, complexing, anti-carcinogenic and antimicrobial properties. Oral intake of its seed powder also controls blood sugar and thereby checks diabetes in human beings[10].

Cite this article: Mamatha, N.C., Tehlan, S.K., Srikanth, M., Ravikumar, T., Batra, V.K., Reddy, K.P. and Kumar, M., Variability Studies for Yield and Its Attributing Traits in Fenugreek (*Trigonella foenum-graecum* L.) Genotypes, *Int. J. Pure App. Biosci.* **5(3):** 1075-1079 (2017). doi: http://dx.doi.org/10.18782/2320-7051.2979

Fenugreek has two centers of origin, the Indian sub-continent, and the Eastern Mediterranean region. It is considered to have originated in the Mediterranean region of the "Old World"[15] or in parts of Asia[3].

Fenugreek can be grown under a wide range of climatic conditions extending widely to the warm temperate and tropical regions of the Mediterranean, Europe and Asia. India is one of the major producers and exporters of fenugreek. The value-added products of fenugreek such as its seeds, powder and oleoresins are exported to Europe, North America, South Africa and other Asian countries[9]. In India, the major fenugreek growing states are Rajasthan, Gujarat, Tamil Nadu, Uttar Pradesh, Haryana, Madhya Pradesh, Andhra Pradesh and Punjab. In India, during 2011-12 this crop occupied an area of 0.97 lakh hectares and produced 1.10 lakh MT seed spice with the productivity of 1.14 MT per hectare[1].

However, in view of the low production potential of traditional fenugreek varieties, there is dire need of improvement in this crop and the major objective lies in the development of new varieties with high yield and improved yield attributing traits.

The genetic improvement of any crop covers mainly on the substantial magnitude of variability in the genotypes which calls for its evaluation. The phenotypic expression of the plant is mainly controlled by the genetic makeup of the plant and the environment where it is growing. To understand the extent to which the observed variations are due to genetic factors, genetic variability estimates including genotype mean, genotypic and phenotypic coefficient of variation, heritability in broad sense and genetic advance over mean.

MATERIALS AND METHODS

The study was conducted at Research Farm of the Department of Vegetable Science, Chaudhary Charan Singh Haryana Agricultural University, Hisar during winter season of 2014-15. The experimental material consisted of 150 fenugreek genotypes in a Randomized block design replicated thrice. Each genotype is planted at a spacing of 50 cm x 10 cm (two rows of 3.0 m length for each genotype). The data on daysto 50 % flowering and days to 75 % maturity was recorded on plot basis, while five plants weretagged at random in all three replications to record the data on other nine morphological and yield attributing traits, which were analyzed by the standard statistical methods. ANOVA was worked out as per the procedure given by Panse and Sukhatme[11]. The phenotypic and genotypic coefficient of variation (PCV & GCV) were calculated using the formula given by Burton and Devane[2]. Heritability (h^2) in broad sense was calculated according to the method suggested by Hanson *et al*[5]., and the formula given by Johnson *et al*[7]., was used to compute genetic advance over mean (GAM).

RESULTS AND DISCUSSION

The analysis of variance for 11 characters is presented in **Table 1**. The mean of sum of squares due to genotypes were highly significant for all the characters under study indicating sufficient genetic variation among the genotypes assessed, which suggested that the breeder could proceed for selection in the present material.

The data pertaining to genetic parameters are presented in **Table 2.** Plant height, which was recorded at peak harvest stage, varied from 67.06 cm (HM-281-7-2) to 121.23 cm (HM-242), showing that there was a significant difference among the genotypes. Plant height had moderate phenotypic and genotypic coefficients of variation, indicating that there was a broad genetic variability for this character.The plant height exhibited high heritability coupled with high genetic advance over mean, indicating that the selection of genotype for plant height in early generations would be effective. These results confirm the results of Gangopadhyay*et al*[4]., and Singh *et al*[14].

Primary branches per plant ranged from 1.06 (HM-535) to 6.067(HM-242) with overall mean 2.90. High phenotypic and genotypic coefficients of variation were recorded, indicating that there was a broad

genetic variability for this character. High heritability coupled with high genetic advance as percent of mean suggested additive gene action for this trait, thus, for improving this trait, the selection could be effective in early generations. Similar results have also been reported by Pushpa*et al*[12]., Singh *et al*[14]., and Jain *et al*[6].

The maximum number of secondary branches was recorded in genotype (HM-307) and (HM-242), while the minimum number of secondary branches was recorded in genotype (HM-549) and (HM-514). The number of secondary branches per plant was found to have high phenotypic and genotypic coefficients of variation, indicating that there was a broad genetic variability for this character. High heritability coupled with high genetic advance as percent of mean suggested additive gene action for this character, thus, for improving this trait, the selection could be effective in early generations. Similar results have also been reported by Pushpa*et al*[12]., Singh *et al*[14]., Jain *et al*[6]., and Verma *et al*[16].

The character days to 50 per cent flowering was recorded when the maximum number of plants in a genotype showed fifty per cent flowering and it ranged from 60 to 66 days with the overall mean 62.23. Low phenotypic and genotypic coefficients of variation were observed, indicating that there was a less genetic diversity for this trait. High heritability coupled with low genetic advance as percent of mean was observed for days to 50 per cent flowering, indicating that this trait could be improved through heterosis breeding since direct selection is not effective. These results are in confirmation with the findings of Kumar and Chaudhary[8].

The mean of pod length ranged from 7.34 to 14.42 cm with mean value 9.79 cm. Moderate phenotypic and genotypic coefficients of variation were recorded for pod length, indicating moderate amount of variability for pod length. High heritability coupled with moderate genetic advance as percent of mean was observed for this trait, suggesting that minimum improvement could be achieved through direct selection. These results corroborate the findings of Kumar and Chaudhary[8] and Yadav *et al*[17].

The number of pods per axis ranged from 1 to 2 with an overall mean of 1.22. The estimates of phenotypic and genotypic coefficients of variation were high, indicating the occurrence of maximum diversity for this trait. High heritability coupled with high genetic advance as per cent of mean showed the existence of additive gene action and this trait could be improved by direct selection. These results are in confirmation with the findings of Jain *et al*[6].

The data pertaining to number of pods per plant, which ranged from 40.7 to 164.4 with mean value 101.14, showed significant difference among the genotypes. The phenotypic and genotypic coefficients of variation were high, indicating existence of broad genetic base for this trait. The estimate of heritability was high coupled with high genetic advance as percent of mean. This suggests that it could be improved through direct selection. The results are in agreement with the findings of Saha and Kole[13], Singh *et al*[14]., and Verma *et al*[16].

There was a significant difference among the genotypes for number of seeds per pod, which ranged from 7.06 to 12.60 with mean value 8.99. The estimates of phenotypic and genotypic coefficients of variation were moderate with higher heritability and high genetic advance as per cent of mean, indicating the existence of moderate genetic diversity and prevalence of additive gene action. This trait could be improved through direct selection. The results confirm the findings of Saha and Kole[13], Kumar and Chaudhary[8] and Verma *et al*[16].

The trait days to 75 per cent maturity ranged from 84.66 to 127.33 days with overall mean value of 115.90. Low phenotypic and genotypic coefficients of variation, with moderate heritability and low genetic advance as percent of mean were observed for days to 75% maturity, showing the existence of low genetic diversity for this trait, which could be improved through heterosis breeding since direct selection is not efficient. These results

confirm the findings of Kumar and Chaudhary[8].

The yield per plant ranged from 8.49 to 26.20 g with overall mean of 15.21 g. High phenotypic and genotypic coefficients of variation with high heritability and genetic advance as percent of mean were observed for yield per plant, indicating that there was a broad genetic variability for this character and selection for yield per plant in early generations would be effective. These results are in agreement with the results of Gangopadhyay *et al*[4]., Singh *et al*[14]., and Yadav *et al*[17].

There was a significant difference among the genotypes for test weight, which ranged from 4.86 to 14.53 g with overall mean of 8.75 g. High phenotypic and genotypic coefficients of variation with high heritability and genetic advance as percent of mean were observed for test weight, indicating that variability was due to genetic factors and selection for yield per plant in early generations would be effective. These results are in agreement with the results of Saha and Kole[13], Kumar and Chaudhary[8], Gangopadhyay *et al*[4]., and Verma *et al*[16].

Table 1: Analysis of variance for different characters in fenugreek

Sr. No.	Source of variation	Replications	Treatments	Error
	Characters	d. f.		
		2	149	298
1.	Plant height (cm)	0.605	841.67**	8.060
2.	Primary branches per plant	0.169	5.264**	0.069
3.	Secondary branches per plant	0.024	14.057**	0.240
4.	Days to 50% flowering	1.02	10.41**	0.31
5.	Pod length (cm)	32.66	3.24**	0.25
6.	Number of pods per axis	0.08	0.58**	0.08
7.	Number of pods per plant	2.29	16.62**	0.49
8.	Number of seeds per pod	0.94	6.18**	0.24
9.	Days to 75% maturity	19.69	142.78**	28.56
10.	Yield per plant (g)	1.24	89.97**	0.95
11.	Test weight (g)	2.135	28.284**	2.496

** significant at 1% * significant at 5%.

Table 2: Genetic parameters for different characters in 150 fenugreek genotypes

Characters	Mean	Range	PCV (%)	GCV (%)	h^2 (%)	GAM
Plant height (cm)	88.70	67.06-121.23	19.06	18.79	97.18	38.16
Primary branches/plant	2.90	1.07-6.067	46.14	45.25	96.17	91.42
Secondary branches/plant	8.80	6.23-12.53	25.00	24.38	95.05	48.96
Days to 50% flowering	62.23	60-66	3.08	2.94	91.43	5.80
Pod length (cm)	9.79	7.34-14.42	11.43	10.22	79.53	18.72
Number of pods per axis	1.22	1-2	40.28	33.15	67.60	68.97
Number of pods per plant	101.14	40.7-164.4	23.27	23.26	98.12	47.91
Number of seeds per pod	8.99	7.06-12.6	16.58	15.64	89.01	30.41
Days to 75% maturity	115.90	84.66-127.33	7.04	5.32	57.13	8.28
Yield per plant (g)	15.21	8.49-26.20	36.37	35.81	96.89	72.61
Test weight (g)	8.75	4.86-14.53	37.43	32.95	77.49	59.76

Where, GCV= Genotypic coefficient of variation, PCV= Phenotypic coefficient of variation

h^2 – Broad sense heritability, GAM –Genetic advance as percent mean

CONCLUSION

From the present study it was concluded that there is a wide range of genetic diversity for yield and its attributing traits in 150 fenugreek genotypes evaluated under field conditions. The genotypes used in the present study can be utilized in further crop improvement programme.

REFERENCES

1. Anonymous, Indian Horticulture Database2014. *www.nhb.gov.in* (2014).
2. Burton, G.W. and Devane, E.M., Estimating heritability in tall fescue (*Feshicacircnclinae*) from replicated clonal-material. *Agron. J.*, **45:** 478-481 (1953).
3. De Candolle, A., Origin of cultivated plants. *Halfner*, New York. (1964).
4. Gangopadhyay, K.K., Yadav, S.K., Meena, G.K.B.L., Mahajan, R.K., Mishra, S.K. and Sharma, S.K., Correlation, path-coefficient and genetic diversity pattern in fenugreek (*Trigonellafoenum-graecum*). *Indian J. Agric. Res*., **79(7):** 521-526 (2009).
5. Hanson, C.H., Robinson, H.F. and Comstock, Biometrical studies of yield in segregating population of Koreulespedeza. *Agronomy Journal*, **48:** 268-272 (1956).
6. Jain, A., Singh, B., Solanki, R.K., Saxena, S.N. and Kakani, R.K., Genetic variability and character association in fenugreek (*Trigonellafoenum-graecum* L.). *International J. Seed Spices*, **3(2):** 22-28 (2013).
7. Johnson, H.W., Robinson, H.F. and Comstock, R.E., Estimation of genetic and environmental variability in soybean. *Agron. J.*, **47:** 477-483 (1955).
8. Kumar, M. and Choudhary, B.M., Studies on genetic variability in fenugreek (*Trigonellafoenumgraecum* L.). *Orissa J. Hort*., **31(1):** 37-39 (2003).
9. Malhotra, S.K. and Vashishtha, B.B., Organic production of seed spices. *National Research Centre for Seed Spices*, Ajmer, India. *p*. 90 (2008).
10. Murlidhar, M. and Goswami, T.K., A review on the functional properties, nutritional content, medicinal utilization and potential application of fenugreek. *J Food Process Technol*., **3:** 1-10 (2012).
11. Panse, V.G. and Sukhtme, P.V., Statistical methods for agricultural workers. *Indian Council of Agricultural Research*, New Delhi, *p*.145 (1967).
12. Pushpa, T.N., Chandregowda, M., Gouda, M.A.P., Srikantaprasad, D. and Anupa, T., Genetic evaluation of fenugreek (*Trigonellafoenum-graecum L*.) for growth and seed yield attributes. *J. Asian Hort*., **6(2):** 33-37 (2010).
13. Saha, A. and Kole, P.C., Genetic variability in fenugreek grown in sub-humid lateritic belt of West Bengal. *Madras Agri. J*., **88(4/6):** 345-348 (2001).
14. Singh, K.P., Jain, P.K., Sengupta, S.K., Mehta, A.K. and Nair, B., Variability, heritability and genetic advance in fenugreek (*Trigonellafoenum-graecum*L.) germplasms. *JNKVV, Research Journal*, **46(3):** 328-332 (2012).
15. Vavilov, N.I., Studies on the origin of cultivated plants. *Bull. Applied Bot.,* **16:** 2 (1926).
16. Verma, P., Solanki, R.K., Dhasora, A. and Kakani, R.K., Genetic variability in Fenugreek (*Trigonellafoenum-graecum*L) as expressed under South Eastern region of Rajasthan State. *International J. Seed Spices*, **6(1):** 93-95 (2016).
17. Yadav, Y., Yadava, P.S., Pandey, V.P. and Kumar, A., Genetic variability, correlation and path co-efficient analysis studies in fenugreek (*Trigonellafoenum-graecum*L.). *The Asian Journal of Horticulture*, **8(2):** 456-459 (2013).