Indian J. Pl. Genet. Resources 2 (2) : 131-135, 1989

Studies on Genetic Variability, Correlation and Path-Analysis for Some Qualitative and Quantitative Characters in Fenugreek Germplasm

R. N. ARORA, G. P. LODHI AND S. L. MEHTA

Haryana Agricultural University, Hisar

Eighty eight indigenous and exotic germplasm accessions of fenugreek (Trigonella foenum- graecum) *obtained from NBPGR, New Delhi, IGFRI, Jhansi and different parts of Haryana were evaluated for qualitative and quantitative attributes of grain yield. Considerable variability was present for component characters like plant height, branches, clusters, pods per plant, pod length, seeds per pod and days to maturity. These were correlated with grain yield and clusters per plant, plant height, pod length and 100-seed weight. A few lines, namely HFM 39, 65, 78, 187, 193 and IL 356 were better in seed yield and HFM 15, 65, 65-1, EC 18737, 26175 and NLM possessed the genetic marker traits and other desirable attributes. Their use in breeding programmes to develop ideal plant types in fenugreek has been discussed.*

Collection, maintenance and evaluation of germplasm for economically important traits is one of the most essential and useful step for initiating breeding programme for genetic improvement of any crop. In fenugreek, which has many diversified uses, reports on systematic evaluation of germplasm are very scanty. Accordingly, the available germplasm of 88 accessions of fenugreek maintained at Haryana Agricultural University was evaluated and the results are reported and discussed in this paper.

MATERIALS AND METHODS

The 88 fenugreek accessions collected from National Bureau of Plant Genetic Resources, New Delhi (11 accessions), Indian Grassland and Fodder Research Institute, Jhansi (8 accessions) and different parts of Haryana (69 accessions) were grown in *rabi* 1987-88 at the experimental farm of Department of Plant Breeding, Haryana Agricultural University, Hisar, in an augmented randomised block design with three checks, namely, Pusa Early Bunching, NIM and T8. Each accession was represented in a single row of 2.8 m length. The distances between and within rows were kept at 45 and 10 cm, respectively. Every eight accessions were followed by the three checks to constitute one block. Normal cultural practices were followed. Observations were recorded on five competitive and randomly selected plants from each cultivar including

checks on some qualitative and quantitative characters like colour of leaf and leaf margins, days to flowering, days to maturity, plant height, branch number, cluster number, pod number, pod length, seeds per pod, seed yield per plant and 100-seed weight.

Mean and range of variation for each character was worked out and germplasm lines were categorised as per their variation for leaf and other characters.

RESULTS AND DISCUSSION

Qualitative Characters

The observations on contrasting and distinguishing morphological attributes like colour of leaf and leaf margins were recorded. These characters could successfully be used as a marker trait for characterisation and identification of genotypes in fenugreek. Five types were observed with regard to leaf colour and leaf margins. Maximum germplasm accessions (63) possessed green or dull/dark green leaf with red margins; whereas minimum number of germplasm lines (2, 3 and 5) had bright green, green or light green leaf with green margins. The rest of the germplasm accessions (15) had purplish pigmented leaf and margins. On the basis of colour of leaf and leaf margins, the distinction between fenugreek genotypes can be made even at first solitary true leaf stage. It was observed that the first solitary leaf was green with red margins in the genotypes having green or dark green leaf with red margins; bright green or light green leaf with green leaf margins in the case of genotypes having bright green, green or light green with green margins and purplish pigmented leaf and margins in the case of genotypes having purplish pigmented leaf and margins.

Quantitative Characters

Mean, range and coefficient of genetic variation and number of accessions below/ at par/ above the best check are given in Table 1. The highest coefficient of variation (43.79%) was observed for seed yield/plant followed by branch number (38.65%), pod number (35.34%), cluster number (32.25%), 100-seed weight (21.45%), days to flowering (17.72%) and plant height (16.81%), whereas the lowest coefficient of variation was recorded for pod length (9.10%) followed by days to maturity (3.06%). The range of variation for days to flowering and maturity was from 46 (HFM 65-2) to 90 (HFM 169) and 140 (HFM 116, HFM 134, HFM 152) to 158 (EC 26175, EC 33904 and EC 33906), respectively. The variation from 37.6 cm (HFM 56) to 93.0 cm (IL 326) for plant height was recorded. The range for branch number was from 3.6 (HFM 107) to 25.0 (EC 33906), for cluster number from 12.0 (HFM 56) to 86.8 (HFM 39) and for number of pods from 13.4 (HFM 56) to 109.6 (HFM 16). The characters like seeds per pod and pod length ranged from 13.6 (HFM 23) to 20.6 (PLMe-46) and 9.1 (HFM 99) to 14.1 cm (HFM 15), respectively. The range of variation for 100-seed weight was from 0.6g (HFM 120) to 1.8 g (EC 26175). Seed yield is the ultimate objective in any crop and it was found to vary from 1.29 (HFM 187) to 16.0 g (HMF 187) in

TABLE 1. MEAN, RANGE AND COEFFICIENT OF VARIATION FOR VARIOUS CHARACTERS IN FENUGREEK

Sl. No.	Character	Mean value	Range of variation		Coefficient of variation (Cv%)	No. of accessions below/at par/above the best check variety				
			Minimum	Maximum		Below	At par	Above	Best	Mean value of best check
A	*Quantitative Characters*									
1.	Seed yield/plant (g)	6.92 ± 0.32	1.2 (HFM 56)	16.0 (HFM 187)	43.79	72	1	17	T8	9.1
2.	100-seed weight (g)	1.02 ± 0.02	0.6 (HFM 120)	1.8 (EC 26175)	21.45	75	6	9	NLM	1.3
3.	Days to maturity	148.63 ± 0.48	140 (HFM 116, 134 152)	158 (EC 26175, 33904, 33906)	3.06	34	2	54	NLM	147
4.	Days to flowering	66.75 ± 1.25	46 (HFM 65-2)	90 (HFM 169)	17.72	3	—	87	Pusa Early Bunching	50
5.	Seeds/pod	17.14 ± 0.25	13.6 (HFM 23)	20.6 (PLM 46)	13.67	53	2	35	T8	17.8
6.	Pod length (cm)	11.42 ± 0.11	9.1 (HFM 99)	14.1 (HFM 15)	9.10	59	2	29	T8	11.8
7.	Pods/plant	54.69 ± 2.03	13.4 (HFM 56)	109.6 (HFM 16)	35.34	71	—	19	T8	69.8
8.	Clusters/plant	47.64 ± 1.61	12.0 (HFM 56)	86.8 (HFM 39)	32.25	68	—	22	T8	58.4
9.	Branches/plant	9.03 ± 0.37	3.6 (HFM 107)	25.0 (EC 33906)	38.65	75	—	15	T8	11.3
10.	Plant height (cm)	66.28 ± 1.17	37.6 (HFM 56)	93.0 (IL 326)	16.81	68	—	22	Pusa Early Bunching	74.3
B.	*Qualitative characters*									
1	Colour of leaf and leaf margins.					63 germplasm accessions were of green or dull/dark green leaf with red margins (G, or DG + RM) 15 germplasm accessions were of purplish pigmented leaf and their margins (PP) 5 germplasm accessions were of light green leaf with green margins (LG + G) 3 germplasm accessions were of green leaf with green margins (G + G) 2 germplasm accessions were of bright green leaf with green margins (BG + G)				

G = Green, DG = Dull/dark green, RM = Red margins, PP = Purplish pigmentation, LG = Light green, BG = Bright green

TABLE 2. CORRELATION COEFFICIENT IN FENUGREEK GERMPLASM

	Branches/ plant	Clusters/ plant	Pods/ plant	Pod length	Seeds/ pod	Seed yield/ plant	100-seed weight	Days to flowering	Days to maturity
Plant height	— 0.0994	0.1884	0.1903	— 0.1358	0.0410	0.5003**	0.3488**	— 0.3813**	0.6264**
Branches/plant	—	0.6750**	0.6210**	0.2136*	0.1672	0.3710**	— 0.0464	0.3603**	0.0892
Clusters/plant	—	—	0.9261**	0.3330**	0.2113*	0.6846**	— 0.0063	0.0002	0.1865
Pods/plant	—	—	—	0.3554**	0.2011	0.6589**	— 0.0104	0.0315	0.1415
Pod length	—	—	—	—	0.3201**	0.3341**	0.0519	0.1413	— 0.0828
Seeds/pod	—	—	—	—	—	0.2944**	0.1249	0.0750	0.1674
Seed yield/plant	—	—	—	—	—	—	0.3652**	—0.2373*	0.4378**
100-seed weight	—	—	—	—	—	—	—	—0.4657**	0.4422**
Days to flowering	—	—	—	—	—	—	—	—	— 0.2189*

*P < 0.05; **P < 0.01

TABLE 3. DIRECT (DIAGONAL) AND INDIRECT EFFECTS OF GRAIN YIELD COMPONENTS IN FENUGREEK GERMPLASM

Characters	Plant height	Branches/ plant	Clusters/ plant	Pods/ plant	Pod length	Seeds/ pod	100-seed weight	Days to flower-ing	Days to maturity	Correlations with seed yield
Plant height	0.2880	— 0.0012	0.0810	0.0227	— 0.0219	0.0035	0.0684	0.0233	0.0365	0.5003**
Branches/plant	— 0.0286	0.0124	0.2903	0.0742	0.0344	0.0141	— 0.0091	— 0.0220	0.0052	0.3710**
Clusters/plant	0.0543	0.0084	0.4301	0.1107	0.0537	0.0178	— 0.0012	— 0.0000	0.0109	0.6846**
Pods/plant	0.0548	0.0077	0.3983	0.1195	0.0573	0.0170	— 0.0020	— 0.0019	0.0082	0.6589**
Pod length	— 0.0391	0.0026	0.1432	0.0425	0.1611	0.0270	0.0102	— 0.0087	— 0.0048	0.3341**
Seeds/pod	0.0118	0.0021	0.0909	0.0240	0.0516	0.0844	0.0245	— 0.0046	0.0098	0.2944**
100-seed weight	0.1004	— 0.0006	— 0.0027	—0.0012	0.0084	0.0105	0.1962	0.0284	0.0258	0.3652**
Days to flowering	— 0.1098	0.0045	0.0001	0.0038	0.0230	0.0063	— 0.0914	— 0.0611	— 0.0128	— 0.2373**
Days to maturity	0.1804	0.0011	0.0802	0.0169	— 0.0133	0.0141	0.0868	0.0134	0.0583	0.4378**

Residual effect : 0.2878

fenugreek germplasm lines studied. Pant *et al.* (1983, 1984); Raghuvanshi and Singh (1982); and Shukla and Sharma (1978) also reported a wide range of variability for yield and related characters in native and exotic collection of fenugreek.

Correlation and Path Coefficient Analysis

Correlation analysis (Table 2) revealed that all the characters, except days to flowering showed significant positive correlation with grain yield. Similar associations have also been recorded by various workers (Singh and Raghuvanshi, 1984; Pant *et al.*, 1984; Ivanova and Levandovskii, 1980). It was also interesting to note that branches, clusters, pods and pod length showed positive and significant association among themselves.

The direct and indirect effects of nine quantitative characters (Table 3) revealed that clusters/plant had the maximum direct as well as indirect effect on seed yield *via* pods/plant, branches/plant, pod length and seeds/pod. The other major components of the yield were plant height and 100-seed weight. Similar results have been reported by Singh and Raghuvanshi, (1984), Pant *et al.* (1984), Shukla and Sharma, (1978). Therefore, selection for yield improvement should be based on these characters.

On the basis of qualitative attributes, some of the lines, viz., HFM 65, HFM 15, EC 26175, EC 18820, and NLM may be utilized to study the inheritance of qualitative traits and in seed production programme. Some of the best genotypes like HFM 187 for high grain yield, EC 26175 for high grain weight, HFM 134 for early maturity, PLMe-46 for high seed number/pod, HFM 15 for longest pods, HFM 16 for highest pod number, HFM 39 for highest cluster number, EC 33906 for maximum branch number and IL 326 for tall plant types could be utilized in crossing programme to study the genetics of seed yield and other related characters and to evolve high seed yielding genotypes.

REFERENCES

Ivanova, R. M. and G. S. Levandovskii. 1980. Pattern of correlations of morphological and biological indices in fenugreek (*Trigonella foennm-graecum*). *Khimiko-Farmatsevticheskii Zhurnal*, **14** (3) : 71-74.

Pant, K. C., K. P. S. Chandel, and D. C. Pant. 1984. Variability and path coefficient analysis analysis in fenugreek. *Indian J. agric. Sci.*, **54** (8) : 655-658.

Pant, K. C., K. P. S. Chandel, B. M. Singh and S. N. Saha. 1983. Diversity in the genetic material of *Trigonella foenum-graecum* and *T. corniculata*. *Indian J. agric. Sci.*, **53** (7) : 537-543.

Raghuvanshi, S. S. and R. R. Singh. 1982. Genetic variability in fenugreek. *Indian J. Hort.*, **39** (1-2) : 134-138.

Shukla, G. P. and R. K. Sharma. 1978. Genetic variability, correlation and path analysis in fenugreek. *Indian J. agric. Sci.*, **48** (9) : 518-521.

Singh, R. R. and S. S. Raghuvanshi. 1984. Correlation and path coefficient analysis in fenugreek. *Indian J. Hort.*, **41** (3/4) : 294-298.