

Genetic Variability, Correlation and Path Coefficient Analysis in Fenugreek (*Trigonella foenum-graecum* L.)

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ABSTRACT

Forty genotypes of fenugreek (*Trigonella foenum-graecum* L.) were evaluated for genetic variability, correlation and path coefficient analysis at Navsari Agricultural University, Navsari (Gujarat) during the *rabi* 2010-11. The highest genotypic and phenotypic coefficient of variances were observed for seed yield per plant (g) followed by number of pods per plant. The highest genetic advance with high heritability was observed for seed yield per plant (g) followed by number of pods per plant, number of primary branches per plant, number of seeds per pod, protein content (%), number of secondary branches per plant, days to 50% flowering and 100-seed weight (g). Seed yield per plant showed significant and positive correlation with number of seeds per pod, number of pods per plant, plant height (cm), pod length (cm) and protein content (%). Path coefficient analysis indicated the highest positive direct effect of plant height (cm) on seed yield per plant (g) followed by number of seeds per pod and protein content (%). It was concluded that improvement of seed yield in fenugreek is possible through selection for plant height (cm), number of seeds per pod, number of pods per plant, pod length (cm) and 100-seed weight (g).

Key words Fenugreek, variability, correlation, path coefficient analysis.

Fenugreek (*Trigonella foenum-graecum* L.) is an important spices crop in India, particularly in the states of Rajasthan, Gujarat, Tamil Nadu, Andhra Pradesh, Uttar Pradesh. The low productivity of fenugreek (*Trigonella foenum-graecum* L.) in India is mainly due to non-availability of suitable high yielding varieties for various agro climatic region and poor crop husbandry. The productivity of any crop is mainly attributed to the contribution of the yield components. For any selection, programme aimed at yield improvement, a clear understanding and knowledge about these component is very essential. As more variables are included in correlation studies, the indirect association become complex and path coefficient is useful for evaluating relative contributions of each component.

MATERIALS AND METHODS

The present study carried out to assess the variability and character in 40 diverse genotypes (collected from Jagudan and Pant nagar) of fenugreek. The 40 genotypes

under study were grown in a RBD design with three replications at Navsari Agricultural University, Navsari (Gujarat) during the *rabi* 2010-11. Observations were recorded on five randomly selected plants from each of the plot for 11 characters. The phenotypic and genotypic coefficients of variation were worked out as per Burton, 1952 and heritability and genetic advance were determined following the methodology Johnson, *et al.*, 1955. Phenotypic and genotypic correlation coefficient for seed yield were calculated following Panse and Sukhatme (1978) while path coefficient analysis was determined following Dewey and Lu, 1959.

RESULTS AND DISCUSSION

The analysis of variance revealed significant differences among the genotypes for all the 11 characters studied. The highest genotypic and phenotypic coefficient of variances were observed for seed yield per plant (g) followed by number of pods per plant, number of primary branches per plant and number of seeds per pod (Table 1). These results are in agreement with earlier reports for number of pods per plant and number of branches per plant by Prajapati, *et al.*, 2010. Moderate genotypic and high phenotypic variances were observed for number of primary branches per plant and number of seeds per pod. The PCV in general, was higher than GCV for all the characters. This indicates considerable effect of environment on the expression of these characters. The characters *viz.*, number of pods per plant, number of primary branches per plant, number of seeds per pod, days to 50 per cent flowering, plant height (cm), number of secondary branches per plant, pod length (cm), 100-seed weight (g) and protein content (%) had highest magnitude of PCV and GCV which indicates the presence of high amount of variability for these characters. These results are agreement with the earlier findings for number of pods per plant by Prajapati, *et al.*, 2010. The highest genetic advance with high heritability was observed for seed yield per plant (g) followed by number of pods per plant, number of primary branches per plant, number of seeds per pod, protein content (%), number of secondary branches per plant and days to 50% flowering. Similar results reported for seed yield per plant (g) by Datta, *et al.*, 2005 and Balai, *et al.*, 2006. The results of PCV, GCV, heritability and

Table 1. Range, mean and components of variance, Genotypic and phenotypic coefficients of variation, heritability and genetic advance as per cent of mean for eleven characters in forty genotypes of fenugreek

Characters	Phenotypic range	General mean	σ^2 (G)	σ^2 (P)	σ^2 (E)	GCV (%)	PCV (%)	Heritability (%)	GA% of mean
Days to 50 % flowering	34-57	44.69	30.58	32.09	1.51	12.37	12.68	95.29	24.88
Days to maturity	81-90	86.33	5.43	6.34	0.91	2.70	2.92	85.61	5.15
Plant height (cm)	32.7-56.8	41.45	14.15	23.18	9.03	9.08	11.62	61.06	14.61
Number of Primary Branches per plant	3.66-8.16	5.72	1.11	1.15	0.44	18.38	21.72	71.58	32.04
Number of Secondary branches per plant	5.9-11.58	8.26	1.45	1.89	0.44	14.58	16.66	76.56	26.27
Number of Pods per plant	8.49-31.29	20.67	27.59	30.96	3.37	25.41	26.92	89.12	49.41
Number of Seeds per pod	9-25	17.34	9.8	13.36	3.56	18.05	21.08	73.36	31.85
Pod length (cm)	5.61-12.21	9.33	1.18	2.00	0.82	11.64	15.13	59.14	18.42
100-seed weight (gm)	0.51-1.69	1.05	0.02	0.04	0.01	14.44	18.48	61.05	23.18
Protein content (%)	7.98-14.62	11.45	2.54	2.58	0.04	13.93	14.03	98.62	28.49
Seed yield per plant (gm)	2.97-10.02	6.33	3.54	4.25	0.71	29.73	32.60	83.21	55.88

GCV= Genotypic coefficient of variation; PCV= Phenotypic coefficient of variation

Table 2. Genotypic and phenotypic correlation of seed yield with other characters in forty genotypes of fenugreek

Characters	Days to maturity	Plant height (cm)	Number of Primary branches per plant	Number of Secondary branches per plant	Number of Pods per plant	Number of Seeds per pod	Pod length (cm)	100-seed weight (gm)	Protein content (%)	Seed yield per plant (gm)
Days to 50 % flowering	rg 0.533**	0.341*	-0.478**	0.075	-0.176	0.075	0.138	0.197	-0.075	-0.273
Days to maturity	rp 0.480**	0.240	-0.371*	0.074	-0.177	0.045	0.121	0.139	-0.075	-0.224
Plant height (cm)	rg 0.291	0.248	-0.224	-0.080	0.110	0.031	0.009	0.090	0.051	-0.029
Number of Primary Branches per plant	rp 0.248		-0.166	-0.088	0.094	0.049	-0.007	0.049	0.047	-0.037
Number of Secondary branches per plant	rg 0.227		0.227	0.203	0.245	0.138	0.337*	0.031	0.222	0.339*
Number of Pods per plant	rp 0.064		0.064	0.143	0.198	0.126	0.189	0.097	0.186	0.183
Number of Seeds per pod	rg -0.291		-0.291	-0.208	0.134	0.121	-0.040	-0.312*	0.369**	0.298
Pod length (cm)	rp -0.208		-0.208		0.098	0.057	-0.003	-0.240	0.296	0.284
100-seed weight (gm)	rg 0.238		0.238		0.238	0.342*	0.417**	0.031	-0.101	0.250
Protein content (%)	rp 0.176		0.176		0.176	0.262	0.224	0.037	-0.100	0.267
Seed yield per plant (gm)	rg 0.125		0.125		0.125	0.202	-0.081	0.149	0.365*	
	rp 0.120		0.120		0.120	0.176	-0.047	0.141	0.289	
	rg 0.092		0.092		0.092	0.089	0.226	0.402**		
	rp 0.030		0.030		0.030	0.014	0.191	0.294		
	rg -0.465**		-0.465**		-0.465**	0.111	-0.319*	0.361*		
	rp -0.319*		-0.319*		-0.319*	0.088	-0.015	-0.317*		
	rg -0.015		-0.015		-0.015	-0.009	-0.154	0.304*		
	rp -0.009		-0.009		-0.009			0.251		

*, ** Significant at 5% and 1% levels, respectively; Upper diagonal shows genotypic (G) and lower diagonal shows phenotypic (P) correlation.

Table 3. Direct and Indirect effects of ten causal variables on seed yield in forty twelve ngenotypes of fenugreek

Characters	Direct effect	Days to 50 % flowering	Days to maturity	Plant height (cm)	Number of Primary Branches per plant	Number of Secondary branches per plant	Number of Pods per plant	Number of Seeds per pod	Pod length (cm)	100-seed weight (gm)	Protein content (%)	Correlation coefficient (r _g)
Days to 50 % flowering	-0.532	-	-0.284	-0.181	0.254	-0.040	0.093	-0.039	-0.073	-0.105	0.038	-0.273
Days to maturity	0.063	0.034	-	0.018	-0.014	-0.005	0.006	0.001	0.0006	0.005	0.003	-0.029
Plant height (cm)	0.441	0.150	0.128	-	0.100	0.089	0.107	0.060	0.148	0.014	0.098	0.339*
Number of Primary Branches per plant	-0.252	0.120	0.056	-0.057	-	0.073	-0.033	-0.030	0.009	0.078	-0.092	0.298
Number of Secondary branches per plant	-0.034	-0.003	0.002	-0.006	0.009	-	-0.008	-0.011	-0.014	-0.001	0.003	0.250
Number of Pods per plant	0.088	-0.015	0.009	0.021	0.011	0.020	-	0.010	0.017	-0.007	0.013	0.365*
Number of Seeds per pod	0.398	0.029	0.012	0.054	0.047	0.135	0.049	-	0.036	0.034	0.089	0.402**
Pod length (cm)	0.082	0.011	0.0008	0.027	-0.003	0.034	0.016	0.007	-	-0.038	0.009	0.361*
100-seed weight (gm)	-0.297	-0.059	-0.026	-0.009	0.092	-0.009	0.024	-0.026	0.138	-	0.004	-0.317*
Protein content (%)	0.136	-0.009	0.006	0.030	0.050	-0.013	0.020	0.030	0.015	-0.002	-	0.304*

Residual effect: 0.433; Bold Figures Shows direct effect; *, ** Significant at 5% and 1% levels, respectively

genetic advance revealed that the selection of characters like number of pods per plant, number of primary branches per plant, number of seeds per pod, protein content (%), number of secondary branches per plant, pod length (cm) and 100-seed weight (g) would be effective for improvement of seed yield in this crop.

Seed yield per plant (g) showed highly significant and positive correlation with number of seeds per pod, number of pods per plant, plant height (cm), pod length (cm) and protein content (%). These results are agreement with Panesar and Jadeja, 2008, Meena, *et al.*, 2010 and Prajapati, *et al.*, 2010. Therefore, the genetic correlation point out relatively strong association of seed yield per plant with number of seeds per pod, number of pods per plant, plant height (cm), pod length (cm) and protein content (%) (Table 2). Hence, these traits can be used as selection criteria.

Path coefficient analysis at genotypic level was carried out taking ten characters as independent variable and seed yield per plant as dependent variable (Table 3). Plant height (cm) had highest positive direct effect on seed yield per plant (g) followed by number of seeds per pod and protein content (%). These results are in agreement with earlier reports for plant height by Panesar and Jadeja, 2008 and Meena, *et al.*, 2010. Hence, selection through these three characters will be rewarding for obtaining high yielding lines.

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