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VARIABILITY AND CHARACTER ASSOCIATION STUDIES IN FABA BEAN

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Germplasm comprising of 203 accessions (exotic as well as indigenous) on faba bean was evaluated with an objective to study the genetic variability, association between the yield and yield contributing traits and to identify the promising accessions in respect of various quantitative traits. The characters seed yield, pods/plant, branches from basal node and higher nodes showed a variation of over 32% whereas days to maturity and days to flowering showed a poor variation to the tune of 5% only. Multiple correlation and regression analysis revealed that plant height was significantly negatively correlated with the seed yield. However, the multiple linear regression model could account for only 8.0% of the variation in seed yield suggesting that the linear model is not an appropriate choice in this case. based on the phenotypic performance, promising accessions were also identified.

Key words : Faba bean, *Vicia faba*, variability, character association

Vicia faba commonly known as broadbean, belongs to the family Fabaceae tribe Viciae. The primary areas of diversity for this crop are reported to be in Asia (Central and Eastern) and the Mediterranean. It possesses high genetic potential to produce seed yield greater than cereal crops (Bean, 1967). It has been identified as a high yielding protein rich crop for the human and farm animals. In view of its high potential as a food and feed crop, concerted efforts are required for its improvement.

Collection, maintenance and evaluation of germplasm form economically important traits is one of the basic step for initiating breeding programme for genetic improvement of any crop. In this crop, reports on systematic evaluation of the germplasm are very scanty. A study on genetic divergence using D^2 and metroglyph analyses has been done on 84 exotic lines from West Germany and 9 indigenous lines by Chhabra *et al.* (1989). The present investigations deals with the diverse genetic material procured from different countries viz., Syria, USA and Italy.

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MATERIALS AND METHODS

The germplasm under study comprised of 199 accessions mainly from exotic sources viz. Syria, USA and Italy and 4 accessions from India. The preliminary evaluation trial was conducted at Issapur Farm, Delhi during rabi, 1992. The experiment was laid out in an augmented randomized complete block design (Federer, 1956) using two checks. The average values of five plants were used for statistical analysis. MSTATC statistical package was used for analysing the data and to study the genetic variability, association behaviour between yield and yield contributing traits and to identify the promising accessions in respect of various traits. The promising accessions were identified using dBASE III PLUS software package. The data were recorded on 12 quantitative characters : plant height (cm), branches from basal node and higher nodes, height of lowest pod bearing node (cm), pods per node; stem thickness (cm), pods per plant, seeds per pod, pod length (cm), days to flowering, days to maturity and seed yield (g).

RESULTS AND DISCUSSION

Variability analysis

Higher coefficient of variation ranging from 32 to 37 per cent was observed for the characters seed yield (32.55%), pods per plant (33.20%), branches from higher node (46.79%) and branches from basal node (37.10%) indicating that there is enough potential for exploiting this high variability present in these characters. The characters days to flowering and days to maturity showed a very poor variation indicating that most of the accessions flowered and matured almost at the same time. The vegetative character viz., plant height, pod length, seeds/pod, pods per node and height of lowest pod bearing nodes showed a medium range of variation (13.15% to 25.06%). Table-5 gives a list of promising accessions identified in respect of early maturity, higher pod potential, longer pods, dwarfness and higher seed yielding capacity.

Association analysis

The seed yield was found to be negatively correlated with the plant height indicating that the dwarf accessions are high yielding in nature as compared to the taller ones. However, on the contrary, the plant height was positively correlated with the pods per plant, seeds per pod, pod length and days to flowering. This reveals that taller plants, in general, were late flowering and having high pod bearing potential. Though taller accessions had longer pods containing more number of seeds, yet their seed yield was low. One of the reason for this phenomenon could be attributed owing to smaller seed size in case of taller accessions as compared to those of dwarf accessions.

The correlation between branches from basal nodes and branches from higher nodes was the highest, i.e., 0.73 (Table-2). The reason for this high association is due to the fact that the accessions which had higher number of basal branches also had higher number of branches from higher nodes. Branches from basal nodes showed a negative correlation with the seeds per pod indicating that the number of seeds per pod was comparatively higher for accessions having poor number of branches. The negative association between stem thickness and the height of lowest pod bearing node showed that accessions bearing pods at lower height had thicker stems.

Table 1: Mean, range and coefficient of variation for different traits in faba bean

Descriptor	Mean	SD	Range	C.V.
Days to flowering	60.4	3.84	53.0 - 68.0	6.37
Days to matury	134.8	5.35	124.0 - 164.0	4.10
Plant height (cm)	33.9	5.25	21.6 - 47.5	15.50
Branches from basal node	4.7	1.73	2.0 - 8.0	37.10
Branches from higher node	4.1	1.50	1.0 - 8.0	36.79
Height of lowest pod bearing node(cm)	11.6	1.80	6.7 - 19.5	15.53
Pods per node	2.4	0.59	1.0 - 3.0	25.06
Stem thickness (cm)	0.6	0.08	0.4 - 0.9	13.77
Pods per plant	7.7	2.57	1.0 - 15.0	33.20
Seeds per pod	2.9	0.41	2.0 - 6.0	14.13
Pod length (cm)	4.1	0.53	2.5 - 5.5	13.15
Seed yield (g)	13.5	4.40	10.0 - 30.0	32.55

Multiple regression analysis

The multiple linear regression analysis of the data was done by taking seed yield as the dependent character and rest of the characters as independent ones. Table-3 indicated that the regression sum of squares was not significant at 95 per cent level of significance. The linear model could account for only 8 per cent of the total variation in the seed yield. Thus the linear model does not seed to be an appropriate choice in this case. Some of the relationships among the traits may be non-linear ones. The negative contribution of plant height towards seed yield (Table-2) was also confirmed by the regression model (Table 4). The contribution of pods per plant positive and significant in plaining the variation in yield.

Table 2. Correlation coefficients among quantitative traits

	1	2	3	4	5	6	7	8	9	10	11	12
1.	1.00	-										
2.	–0.10	1.00										
3.	0.12	0.73**	1.00									
4.	0.10	–0.02	–0.06	1.00								
5.	0.06	–0.04	–0.02	0.03	1.00							
6.	0.11	–0.02	0.04	–0.15*	–0.04	1.00						
7.	0.24*	0.08	0.13	–0.02	0.02	0.06	1.00					
8.	0.15*	–0.15*	–0.09	0.09	0.04	0.06	0.04	1.00				
9.	0.30**	–0.06	0.17*	–0.22*	–0.03	0.09	0.25*	0.07	1.00			
10.	0.19*	–0.02	0.06	–0.06	0.20*	–0.01	0.17*	0.04	0.09	1.00		
11.	0.03	–0.06	0.02	0.04	–0.02	0.03	0.12	–0.01	0.06	0.01	1.00	
12.	–0.15*	0.07	0.01	0.10	0.11	–0.08	0.10	–0.04	–0.06	–0.06	–0.09	1.00

1. Plant Height 2. Branches from basal nodes 3. Branches from higher nodes 4. height of lowest pod bearing node 5. Pods per node 6. Stem thickness 7. Pods per plant 8. Seeds per pod 9. Pod length 10. Days to flowering 11. Days to maturity 12. Seed yield

Table 3. Analysis of Variance for regression

Source	Sum of Squares	df	mean Square	F	Significant
Regression	310.31	11	28.21	1.50	0.134
Residual	3592.44	191	18.81		
Total	3902.75	202			

Table 4. Regression coefficient of various traits on seed yield

S. No.	Trait	Regression coefficient	Student T value
1.	Plant height	–1.4558e - 001	–2.215
2.	Branches from basal nodes	1.1677e - 001	0.426
3.	Branches from higher nodes	–5. 7180e - 002	–179
4.	Height of lowest pod bearing node	2.6672e - 001	1.480
5.	Pods per node	8.4188e - 001	1.585
6.	Stem thickness	–2.3598e - 001	–0.639
7.	Pods per plant	2.6873e - 001	2.109
8.	Seeds per pod	–2.4420e -001	–0.320
9.	Pod length	–2.0166e-002	–0.029
10.	Days to flowering	–2.0166e- 002	– 0.241
11.	Days to maturity	–7. 3187e - 002	– 1.264

Table 5. List of promising accessions

Traits	Promising Accessions
Early maturity	EC 143706, EC 243729, EC243828, EC 117750 A, EC 117810 A
High pod number	EC 243584, EC 243592, IC 10720, EC 117760, EC 117772
Long pods	EC 243744, EC 243626 A, EC 243633, EC 243825
Dwarfness	EC 243707, EC 243610, EC 243819, EC 243714, EC 243614
High grain yield	EC 117810 A, EC 117750 A, EC 243611, EC 243706, EC 243828

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