Research Note

Inter-correlation and path analysis in faba bean (*Vicia faba* L.)

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Abstract
Present investigation was carried out in 65 genotypes was grown in 2014-15 cropping season in a randomized block design with three replications. Analysis of variance indicated that genotypes differed significantly for all of the studied traits. Correlation coefficient analysis indicated that all the traits had positive significant correlation coefficient with seed yield except plant height. Path coefficient analysis revealed that 100-seed weight, number of pods per plant, pod length, number of seeds per pod, number of branches per plant days to maturity had positive and direct effects on seed yield, while the characters, days to flowering, plant height, clusters per plant recorded direct negative effects. Selection based on 100 seed weight, number of clusters per plant, number of pods per plant, number of branches per plant and days to 50% flowering for the improvement of seed yield in faba bean.

Pulses contain 22-24 per cent protein, which is almost twice of the protein in wheat and thrice of rice. Faba bean (*Vicia faba* L.) is a major grain legume crop having diploid chromosome number (2n = 2x = 12). It is known globally in various names as broad bean, hoarse bean, pigeon bean, fava bean, faba bean, field bean, bell bean, or tic bean, etc., In ayurvedic terms; it is also called "Anturi" (Singh *et al.,* 2013). Main faba bean producers are China (1.65 Mt), Ethiopia (0.61Mt), France and Australia (0.19 Mt) (FAOSTAT, 2009). It is grown as *rabi* crop in diverse agro-ecological situations from hills to plain. In India, it is grown in a sizeable acreage in Bihar, Madhya Pradesh and some part of Uttar Pradesh. Seeds of faba bean greatly varied in size, shape, specific gravity, bulk density etc., As like other beans, faba beans, is a good source of calories, protein, carbohydrates, and fibre they are also rich in phosphorus, iron, potassium, and vitamin B complex. It is used as a source of protein in the human diet, as fodder and forage crop for animals, and for available nitrogen in the biosphere. India's population would reach 1.68 billion by 2030 from the present level of 1.21 billion. Accordingly, the projected pulse requirement for the year 2030 is 32 million tons with an anticipated required growth rate of 4.2 per cent (IIPR Vision 2030). Information on association of yield attributes and their direct and indirect effects on grain yield are of paramount significance. Correlation in combination with path analysis would give a better insight into cause and effect relationship between different pairs of characters.

The experimental material consists of 65 genotypes of faba bean collected from different sources were sown in randomized block design with three replications during 2014-15 cropping season at HAU, Hissar All the recommended

cultural practices were followed to raise a healthy crop. Seeds of each genotype were sown in rows at spacing of 30 × 10cm. Treatments were allotted at random in rows of each replication. Five plants were selected at random from each experimental plot for recording observations were such as: Days to 50% flowering, days to maturity, plant height, number of branches/plant, number of cluster per plant, number of pods/ plant, pod length, number of seeds/pod, 100-seed weight (g), seed yield/plant (g). Estimation of correlation coefficient was done following Al-Jibouri *et al.* (1958). Path coefficient analysis was done as suggested by Dewey and Lu (1959).

Seed yield per plant showed highly significant and positive correlation with 100 seed weight, while positive correlation with days to 50% flowering, days to maturity, number of branches, number of pods per plant, seeds per pod (Table 1). Seed yield/plant showed non-significant and positive correlation with plant height. Days to 50% flowering exhibited highly significant and positive correlation with all traits except number of pods per plant and plant height (Chaubey *et al.,* 2012). Days to maturity is positively correlated with number of branches per plant, number of clusters per plant, pod length, number of seeds per pod and 100 seed weight. Plant height recorded negative significant association with number of branches per plant and positive significant association with number of clusters per plant, pod length and 100 seed weight.

Number of branches showed significant positive correlation with pod length, number of seeds per pod, 100 seed weight and seed yield. Pod length showed positive correlation with days to 50% flowering, days to maturity, plant height. Seed per pod showed positive correlation with days to 50%

flowering, days to maturity and branches per plant. Hundred seed weight positively correlated with days to 50% flowering, days to maturity, branches per plant and plant height. Similar results also reported by Chaubey *et al*. (2012), Mulualem *et al.* (2013) and Sharifi and Aminpana, (2014). Number of pods per plant is negative non-significant correlation with days to 50% flowering and plant height and positive non-significant correlation with days to maturity and number of branches per plant. Number of clusters per plant showed positive and significant correlation with days to 50% flowering, days to maturity, plant height and non-significant correlation with branches per plant. Days to 50% flowering, days to maturity, plant height, number of branches per plant shower positive and significant correlation with pod length and negative correlation with cluster per plant and pods per plant.

Path coefficient analysis provides more realistic picture of the relationship among the characters and reveals whether the association of each individual character with yield is due to its direct effect on yield or due to of indirect effects *via* other component characters. In the present study, path coefficient analysis was done on the basis of genotypic correlation coefficients and the results are presented in table 2. Hundred seed weight had very high direct and positive effect on seed yield per plant, followed by number of pods per plant, days to maturity, number of branches per plant, number of seeds per pod and pod length. High direct negative effects were observed for days to 50% flowering whereas, plant height and clusters per plant recorded negligible negative effects on seed yield. Similar results were also given by Verma *et al.* (2013) and Cokkizgin *et al.* (2013).

Days to 50 % flowering showed high and positive indirect effect through number of seeds per pod, 100 seed weight whereas, negative high indirect effect through days to maturity and moderate indirect effect through number of branches per plant on seed yield per plant. Pods per plant had positive moderate indirect effect through days to 50 per cent flowering on seed yield. Hundred seed weight exhibited high indirect effect through days to 50 per cent flowering, days to maturity, number of branches per plant, clusters per plant, pod length and number of seeds per pod on seed yield per plant. All other traits exhibited low and negligible indirect effects on seed yield. The residual effect (0.09241) indicated that the component characters under study were responsible for about 90 % of variability in seed yield per plant.

Based on correlation and path analysis, the traits *viz*., 100-seed weight, number of cluster per plant, number of pods per plant, number of branches per plant and days to flowering should be given consideration while performing selection for the improvement of seed yield in faba bean.

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Table 1. Correlation between yield and its component traits in faba bean

Characters	Days to 50% flowering	Days to maturity	Plant height	Branches per plant	Clusters per plant	Pods per plant	Pod length	Seed per pod	100 seed weight
Days to maturity	0.915**								
Plant height (cm)	-0.020	-0.218**							
Branches per plant	0.506**	0.471**	-0.210**						
Cluster per plant	0.219**	0.216**	0.167*	0.096					
Pods per plant	-0.041	0.092	-0.004	0.037	0.585**				
Pod length (cm)	0.551**	0.277**	0.337**	0.143*	-0.025	-0.253**			
Seeds per pod	0.682**	0.526**	0.108	0.196**	0.261**	-0.101	0.787**		
100 seed weight (g)	0.891**	0.761**	0.174*	0.467**	0.314**	-0.006	0.640**	0.649**	
Seed yield per plant (g)	0.798**	0.731**	0.070	0.541**	0.385**	0.216**	0.525**	0.587**	0.910**

*, ** significant at 5 and 1 per cent level, respectively.

Table 2. Direct and indirect effects on seed yield through its component traits in faba bean

Characters	Days to 50% flowering	Days to maturity	Plant height	Branches per plant	Clusters per plant	Pods per plant	Pod length	Seed per pod	100 seed weight
Days to 50% flowering	**-0.444**	-0.406	0.009	-0.225	-0.097	0.018	-0.245	0.303	-0.396
Days to maturity	0.201	**0.201**	-0.044	0.095	0.043	0.018	0.056	0.105	0.153
Plant height	-0.048	0.010	**-0.048**	0.010	-0.008	0.000	-0.016	-0.005	-0.008
Branches per plant	0.159	0.075	-0.033	**0.159**	0.015	0.006	0.023	0.031	0.074
Cluster per plant	-0.051	-0.011	-0.009	-0.005	**-0.051**	-0.030	0.001	-0.013	-0.016
Pods per plant	0.226	0.021	-0.001	0.008	0.132	**0.226**	-0.057	-0.023	-0.001
Pod length	0.017	0.005	0.006	0.002	0.000	-0.004	**0.017**	0.013	0.011
Seeds per pod	0.125	0.066	0.013	0.024	0.033	-0.013	0.098	**0.125**	0.081
100 seed weight	1.013	0.771	0.176	0.472	0.318	-0.006	0.648	0.657	**1.013**
Correlation with seed yield	0.798**	0.731**	0.070[NS]	0.541**	0.385**	0.216**	0.525**	0.587**	**0.910****

Bold figures are direct effects