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Research article

CORRELATION AND PATH COEFFICIENT ANALYSIS FOR YIELD AND YIELD COMPONENTS IN SEGREGATING (F_4) GENERATION OF LABLAB BEAN (*LABABPERPUREUS* L. SWEET)

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ABSTRACT: The genotypic correlation coefficients were slightly higher than phenotypic coefficients. Seed yield per plant was highly significant and positively correlated with number of pods per plant, primary branches per plant, hundred seed weight, days to maturity and number of peduncles per plant at both genotypic and phenotypic level, whereas it was significantly and positively correlated with days to first flowering at genotypic level only. Path analysis revealed that, number of pods per plant, hundred seed weight and number of primary branches recorded the highest direct effects in desirable direction. Their association with seed yield was also significant and positive indicating true and perfect association between these traits. Therefore direct selection for these characters would help in isolating high yielding genotypes.

Key Words: Lablab bean, Genetic variability, heritability, Genetic advance, Genotypic and Phenotypic coefficient of variance.

INTRODUCTION

Lablab bean [*Lablab purpureus* L. (Sweet)] commonly known as field bean, hyacinth bean, Indian bean, Country bean or locally in Marathi- 'Wal' or 'pavta' and in Hindi as 'sem', is an important proteineous grain legume and vegetable crop grown throughout the country and widely distributed in Madhya Pradesh, Maharashtra, Andhra Pradesh, Tamil Nadu and Karnataka. In Maharashtra, especially in coastal konkan zone it is taken on residual moisture immediately after paddy harvesting. Great range of variation exists in the plant, morphological and yield traits among the cultivars grown all over the country. Despite many good attributes, the crop has remained unexploited owing to low productivity, long duration, photosensitivity and an indeterminate growth habit. Yield is a complex quantitative trait governed by several polygene's and greatly influenced by environment. Hence, selection of superior genotypes based on yield as such may not be effective. For an effective approach towards the enhancement of yield selection has to be made for the components of yield as well. Correlation of yield and yield components thus assumes an unique prominence as the basis for selecting desirable genotypes with high grain yield potential. It is known that correlation coefficients for a given pair of traits vary with the genotypes studied and the environment where the test is carried out. In lablab bean numbers of findings based on fixed genotypes have been reported but such information are lacking in segregating generations. Therefore, present investigation was undertaken to obtain information on correlation as well as direct and indirect effect of eleven quantitative traits in F_4 generation of lablab bean.

MATERIAL AND METHODS

The material for the present study comprised of ninety one progenies in F_4 generation derived from different ten crosses of lablab bean and one check 'Konkan Wal-2'. The experiment was conducted in randomized block design with three replications during rabi 2014-2015 at research farm, Department of Agril. Botany, college of Agriculture, Dapoli. Each progeny had single row of 3 meters length with spacing of 45 x 30 cm. Recommended package of practices and plant protection measures were followed so as to keep healthy crop condition.

Observations were recorded on five randomly selected plants for eleven characters *viz*., days to first flowering, days to 50 per cent flowering, days to maturity, plant height (cm), number of primary branches per plant, number of peduncles per plant, number of pods per plant, pod length (cm), number of seeds per pod, hundred seed weight (g), and seed yield per plant (g). Mean values from each treatment in each replication were used for statistical analysis. The phenotypic and genotypic correlation coefficients were estimated according to methods suggested by Singh and Choudhary (1985) and Path coefficient analysis was carried out as per Dewey and Lu (1959).

RESULTS AND DISCUSSION

Analysis of variance revealed that, highly significant differences were observed for yield and yield components indicating presence of high amount of genetic variability. Phenotypic and genotypic correlations of eleven characters in all possible combinations were calculated to know the relationship among them. In general genotypic correlation coefficients were higher than corresponding phenotypic correlation coefficient (Table-1). Similar findings were also reported by Lal *et al*. (2005). The seed yield per plant exhibited highly significant and positive association with number of pods per plant, number of primary branches per plant, hundred seed weight, days to maturity and number of peduncles per plant at both phenotypic and genotypic levels. It implied that these characters strongly influenced the seed yield and hence the seed yield in lablab bean could be improved by making selection for this trait. These findings were in agreement with the results reported by Desai *et al*. (2003) in dolichos bean. The seed yield per plant also showed highly significant positive association with days to first flowering at phenotypic level only while seed yield per plant had significant but negative association with number of seeds per pod. Similar finding were also reported by Lal *et al.* (2005) and Rai *et al*. (2008). The rest of characters exhibited either positive or negative but non-significant association with seed yield per plant at both phenotypic and genotypic level.

Table-1.Estimation of Phenotypic correlation coefficient between different characters of lablab bean.

Characters	Days to first flowering	Days to 50% flowering	Days to maturity	No. of primary branches/ plant	Plant height (cm)	No. of peduncles/ plant	Pod length (cm)	No. of pods per plant	No. of seeds per pod(g)	Hundred seed weight (g)	Seed Yield per plant (g)
Days to first flowering	1.000	0.546**	0.130*	0.137*	-0.044	-0.081	0.061	-0.131*	-0.094	0.348**	0.013
Days to 50% flowering		1.000	0.030	-0.024	-0.065	-0.090	-0.006	-0.178**	-0.192**	0.220**	-0.116
Days to maturity			1.000	0.122*	-0.011	0.060	-0.099	0.120*	-0.008	0.092	0.136*
Primary branches per plant				1.000	-0.120	0.229**	-0.040	0.251**	-0.214**	0.256**	0.332**
Plant height (cm)					1.000	-0.191**	0.588**	-0.275**	0.481**	0.075	0.052
Peduncles per plant						1.000	-0.112	0.460**	-0.163**	-0.138*	0.264**
Pod length (cm)							1.000	-0.267**	0.470**	0.115	0.031
Pods per plant								1.000	-0.199**	-0.199**	0.750**
Seeds per pod									1.000	-0.134*	-0.090
Hundred seed weight (g)										1.000	0.235**

*, ** Significant at 5 and 1 % levels of significance respectively.

Table 2. Estimates of genotypic correlation coefficient between different characters in lablab bean.

Characters	Days to first flowering	Days to 50 % flowering	Days to maturity	Primary branches/ plant	Plant height (cm)	Peduncles/ plant	Pod length (cm)	Pods/ plant	Seeds/ pod(g)	Hundred seed weight (g)	Seed yield/ plant (g)
Days to 1st flowering	1.000	1.081**	0.314**	0.790**	-0.031	-0.088	0.140*	-0.154*	-0.532**	0.731**	0.298**
Days to 50% flowering		1.000	0.326**	0.540**	-0.037	-0.180**	0.0190	-0.265**	-0.384**	0.550**	0.018
Days to maturity			1.000	0.381**	0.010	-0.001	-0.212**	0.309**	-0.284**	0.187**	0.380**
Primary branches/plant				1.000	-0.220**	0.511**	-0.238**	0.293**	-0.660**	0.403**	0.446**
Plant height (cm)					1.000	-0.415**	0.826**	-0.444**	0.808**	0.010	0.036
Peduncles/plant						1.000	-0.444**	0.565**	-0.430**	-0.170**	0.219**
Pod length (cm)							1.000	-0.587**	0.738**	0.210**	0.008
Pods/plant								1.000	-0.457**	-0.269**	0.625**
Seeds/pod.									1.000	-0.212**	-0.252**
Hundred seed weight (g)										1.000	0.333**

*, ** Significant at 5 and 1 % levels of significance respectively.

Among the component characters, days to first flowering with number of primary branches, hundred seed weight, days to maturity and days to fifty per cent flowering at both genotypic and phenotypic levels; days to fifty per cent flowering with hundred seed weight, number of primary branches and days to maturity; days to maturity with number of primary branches, number of pods per plant and hundred seed weight; number of primary branches with number of peduncles per plant, number of pods per plant; plant height with number of seeds per pod and pod length; number of peduncles per plant with number of pods per plant; pod length with number of seeds per pod and hundred seed weight were positively significant suggesting the interdependence of these traits on each other. Similar results were also reported by Magalingam *et al.* (2013).

Table 3. Path coefficient for direct and indirect effects for different characters in lablab bean

Characters	Days to 1st flowering	Days to 50% flowering	Days to maturity	Primary branches/ plant	Plant height (cm)	Peduncles per plant	Pod length (cm)	Pods/ plant	Seeds/ pod(g)	Hundred seed weight (g)	Seed Yield/ plant (g)
Days to 1st flowering	**0.0599**	0.0647	0.0188	0.0473	-0.0018	-0.0052	0.0084	-0.0092	-0.0319	0.0438	0.298**
Days to fifty %flowering	-0.2579	**-0.2387**	-0.0777	-0.1289	0.0088	0.0431	-0.0045	0.0633	0.0917	-0.1312	0.0179
Days to maturity	0.0076	0.0079	**0.0242**	0.0092	0.0002	0.0000	-0.0051	0.0075	-0.0069	0.0045	0.380**
Primary branches/plant	0.1145	0.0783	0.0553	**0.1450**	-0.0319	0.0741	-0.0344	0.0424	-0.0956	0.0584	0.446**
Plant height (cm)	-0.0059	-0.0070	0.0018	-0.0418	**0.1900**	-0.0780	0.1569	-0.0845	0.1535	0.0189	0.0356
Peduncles/plant	0.0181	0.0373	0.0002	-0.1058	0.0850	**-0.2069**	0.0920	-0.1170	0.0888	0.0351	0.219**
Pod length (cm)	0.0700	0.0095	-0.1061	-0.1188	0.4128	-0.2222	**0.5001**	-0.2935	0.3691	0.1052	0.0079
Pods/plant	-0.1537	-0.2647	0.3083	0.2923	-0.4437	0.5645	-0.5859	**0.9984**	-0.4566	-0.2681	0.625**
Seeds/pod.	0.1479	0.1067	0.0790	0.1831	-0.2244	0.1193	-0.2050	0.1270	**-0.2778**	0.0588	-0.252**
Hundred seed weight (g)	0.2975	0.2237	0.0762	0.1640	0.0406	-0.0691	0.0857	-0.1093	-0.0861	**0.4071**	0.333**

*, ** Significant at 5 and 1 % levels of significance respectively.
Residual effect = 0.341

Path coefficient is an important method for estimating the association between cause and effect i.e. the direct and indirect basis of association. The genotypic path coefficient analysis (Table 2) revealed that number of pods per plant, hundred seed weight , number of primary branches per plant exhibited maximum significant direct effect indicating perfect relation between seed yield and these characters, hence direct selection based on these characters would help in selecting high yielding progenies in lablab bean. These results were in agreement with the earlier finding of Biju *et.al*. (2001) and Lal *et al*. (2005). The direct effect of number of seeds per pod was negative though they were significantly and positively associated with seed yield per plant indicating that, they played their role via indirect effect. Number of seeds per plant played its role via hundred seed weight.

The residual effect determines how best the causal factor accounts for the variability of the dependent factor that is yield in this study. In the present investigation the residual effect of path coefficient analysis was 0.341, which clearly indicated that eleven characters taken for this investigation were sufficient for genetic analysis in lablab bean. Only 34 % of the variability was controlled by other traits besides these 11 characters.

CONCLUSION

From the forgoing discussion it can be inferred that, number of pods per plant, hundred seed weight and number of primary branches were the major yield contributing characters which had positive and significant association with seed yield and also exhibited high direct effect on seed yield per plant. Therefore, due emphasis should be given on these character in the selection of high yielding progenies to improve yield potential of lablab bean.

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