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Research Note

Genetic divergence in Indian bean (*Lablab purpureus* L. Sweet)

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Abstract
Fifty eight diverse genotypes of lablab bean **(***Lablab purpureus* L. Sweet) were evaluated for their genetic divergence for grain yield and yield contributing characters. The genotypes were grouped into seven clusters on the basis of relative magnitude of D^2 values. The maximum genetic distance was observed between cluster IV and cluster VII (45.798) followed by cluster IV and cluster VI (42.723) and cluster III and cluster VII (40.680). Cluster II and cluster III displayed lowest degree of divergence. The maximum intra cluster distance was exhibited by cluster I (22.432) followed by cluster VI (17.807) and cluster V (16.872), whereas minimum was recorded by cluster III. The maximum mean value for grain yield per plant was recorded in cluster III due to maximum number of inflorescences per plant. Protein content followed days to 50% flowering and days to maturity contributed maximum towards total divergence.

Key words: Indian bean, *Lablab purpureus*, Genetic divergence, D^2, Cluster analysis

The knowledge of nature and degree of divergence in existing germplasm is the basic pre-requisite in breeding programme of any crop for the effective selection of superior parents. Success through hybridization followed by selection primarily depends on the use of parents having more genetic divergence for different characters (Murthy and Arunachalam, 1966). Mahalanobis D^2 statistic which is based on the multivariate analysis of quantitative traits is a powerful tool for the assessment of degree of divergence and helps the plant breeder in choosing suitable parents for hybridization programme. Hence, the present investigation was undertaken to provide information on nature and magnitude of genetic divergence among promising genotypes of Indian bean so as to formulate breeding strategies to improve the yield and yield contributing traits.

Fifty eight genotypes of Indian bean were evaluated in a randomized block design with three replications during *rabi* 2006-07 at Regional Pulse Research Station, Navsari. Each genotype was planted in single row plot of 3.0 m length with 60 x 30 cm row to row and plant to plant distance, respectively. Recommended fertilizer dose and cultural practices including need based plant protection measures were followed to raise a good crop. Observations from five randomly selected plants of each genotype in each replication were recorded on twelve quantitative traits viz., days to 50% flowering, days to maturity, plant height, number of branches per plant, number of inflorescences per plant, number of pods per plant, number of seeds per pod, pod length, 100-seed weight, protein content, harvest index and grain yield per plant. Genetic diversity was estimated by calculating Mahalanobis (1936) D^2 statistic. The genotypes were further grouped into different clusters as per Tocher's method (Rao, 1952).

The analysis of variance revealed significant differences among the genotypes for all the characters studied indicating adequate genetic variability in the experimental material. On the basis of D^2 values, 58 genotypes were grouped into seven clusters (Table 1). Among the seven clusters, cluster I had maximum number of genotypes (12), cluster II, cluster III and cluster V had nine genotypes each, Cluster IV and Cluster VII had seven genotypes each, while cluster VI had five genotypes. The clustering pattern in the present study showed that genotypes of different geographical areas were clubbed in one group and also the genotypes of the same geographical area were grouped in different clusters indicating that there is no formal relationship between geographical diversity and genetic diversity. Therefore, selection of genotypes for hybridization to generate diverse new gene combinations should be based on genetic diversity rather than geographic diversity. This finding is in conformity with the findings of Birari and Ghanekar (1992), Biju *et al*. (2001), and Ganesh *et al*. (2007).

The intra and inter cluster distances are presented in Table 2. The maximum genetic distance was found between cluster IV and cluster VII (45.798) followed by cluster IV and cluster VI (42.723) and cluster III and cluster VII (40.680). Cluster VII was highly diverse from cluster IV and III and cluster VI from cluster IV. Birari and Ghanekar (1992), Golani *et al.* (2006) and Ganesh *et al*. (2007) also reported considerable diversity in Indian bean. In heterosis breeding genotypes of diverse clusters are known to play an important role of potential parents and they are likely to produce heterotic combinations. On the other hand, Cluster II and cluster III displayed lowest degree of divergence suggesting close genetic makeup of the genotypes included in these groups. The maximum intra-cluster distance was observed in

cluster I (22.432) followed by cluster VI (17.807) and cluster V (16.872) indicating that the genotypes grouped in these clusters were diverse for most of the characters. On the contrary, the minimum intra-cluster distance was observed in cluster III (8.925) suggesting that the genotypes included in this cluster were less diverse from each other. In general, less intra-cluster distance than inter cluster distance suggested homogenous and heterogeneous nature of the genotypes within and between the clusters, respectively.

The mean values of clusters for various characters are presented in Table 3. The cluster III exhibited the highest grain yield per plant (35.000 g) due to maximum number of inflorescences per plant (17.881). Cluster IV showed maximum number of branches per plant (7.276), highest 100-seed weight (28.340 g) and prolonged days to 50% flowering (63.990) and days to maturity (122.238), while the cluster V had maximum plant height (113.489 cm) and number of pods per plant (57.339). Cluster VI exhibited its superiority for number of seeds per pod (4.040), pod length (7.257 cm) and harvest index (41.459 %), whereas it contains earlier and dwarf genotypes. The cluster I was unique for its superiority for protein content (25.065 %). Among the yield contributing characters studied, the maximum contribution towards total divergence was made by protein content (35.82 %) followed by days to 50% flowering (34.36 %) and days to maturity (16.76 %). On the other hand Baswana *et al*. (1980) and Biju *et al*. (2001) reported that number of pods per plant contributed more towards divergence than any other yield attributes in Indian bean.

On the basis of results, it can be concluded that more emphasis should be given to improve number of inflorescences per plant, number of pods per plant, number of branches per plant, plant height and days to flowering and maturity while making selection of high yielding genotypes in Indian bean. Moreover, it will be effective to intercross genotypes belonging to more diverse clusters like cluster IV and VII, cluster IV and VI and cluster III and VII to create wide spectrum of variability and to produce transgressive segregants for grain yield and yield contributing traits.

References

Baswana, K. S., Pandita, M. L., Pratap, P. S. and Dhankhar, B. S. *et al.* (1980). Genetic divergence for yield and its components in Indian bean (*Dolichos lablab* var. lignosus L.). *Haryana J. Horti. Sci.,* **9** (3-4): 184-187.

Biju, M. G., Prasanna, K. P. and Rajan, S. (2001). Genetic divergence in hyacinth bean. *Veg. Sci.,***28** (2): 163-164.

Birari, S. P. and Ghanekar, S. L. (1992). Genetic diversity in lablab bean. *J. Maharashtra agric. Univ.,* **17** (2): 257-260.

Ganesh, B. N., Reddi Sekhar, M., Raja Reddy, K., Reddy, P. V. and Eswara Reddy, N. P. (2007). Genetic divergence studies in field bean (*Lablab purpureus* L. Sweet). *GEOBIOS,* **34**: 37-40.

Golani, I. J., Naliyadhara, M. V., Mehta, D. R., Purohit, V. L. and Pandya, H. M. (2006). Genetic divergence in Indian bean (*Lablab purpureus* L.). *Legume Res.,* **29** (4): 286-288.

Mahalanobis, P. C. (1936). On the generalized distance in statistics. *Proc. Nat. Acad. Sci. (India),* **2:** 49-55.

Murthy, B. R. and Arunachalam, V., (1966). The nature of divergence in relation to breeding system in crop plants. *Indian J. Genet.,* **26**: 188-189.

Rao, C. R. (1952). Advanced statistical methods in biometrical research. John Wiley and Sons, New York.

Table 1. Distribution of 58 genotypes of lablab bean in different clusters on the basis of D^2 statistic

Clusters	Number of genotypes	Name of the genotypes
I	12	Collection-1, Collection-2, DPL-2, ACCW-19, ACCW-21, ACCW-61, ACCW-148, NV-111, NV-106, NV-42, NV-31, ND-18.
II	9	Hebbal-3, Konkan Wal-2, Kelshi Wal, ACCW-18, ACCW-22, NV-134, ND-3, ND-4, ND-15.
III	9	Jawale-1, Wal-125-33, Konkan Wal-1, ACCW-113, ACCW-147, NV-102, Red Paria, ND-10, ND-14.
IV	7	Palgad local, Murud local, ACCW-116, ACCW-164, ACCW-165, NVS-61, Pavta.
V	9	ACCW-36, ACCW-104, ACCW-161, NV-121, NV-50, NVS-62, Wal-125-36, ND-11, ND-1.
VI	5	DPL-1, DPL-3, Konkan Bhushan, AKW-9306, AKW-9311.
VII	7	AKW-9301, AKW-9303, AKW-9304, AKW-9305, AKW-9312, ND-13, ND-16.

Table 2. Average intra and inter cluster distances (D^2) for 58 genotypes in lablab bean

Clusters	I	II	III	IV	V	VI	VII
I	22.432	22.626	25.625	27.631	34.934	38.573	35.700
II		11.793	13.513	20.695	21.393	32.354	33.086
III			8.925	14.724	20.051	37.899	40.680
IV				12.452	25.848	42.723	45.798
V					16.872	32.115	38.386
VI						17.807	19.204
VII							12.106

Table 3. Cluster means for 12 characters in lablab bean.

Cluster	Days to 50% flowering	Days to maturity	Plant height (cm)	No. of branches / plant	No. of inflorescences / plant	No. of pods / plant	No. of seeds / pod	Pod length (cm)	100-seed weight (g)	Harvest index (%)	Protein content (%)	Grain yield / plant (g)
I	56.072	113.361	102.418	5.606	14.650	48.645	3.924	6.134	26.121	37.727	25.065	31.969
II	56.356	117.444	106.813	5.481	14.852	56.097	3.763	5.216	23.118	39.417	22.771	34.637
III	60.378	122.037	112.259	5.748	17.881	56.084	3.667	5.019	23.263	37.351	22.377	35.000
IV	63.990	122.238	101.829	7.276	16.829	54.590	3.390	5.083	28.340	34.170	22.913	34.412
V	57.785	118.630	113.489	5.356	16.119	57.339	3.778	5.718	25.624	37.400	19.885	34.578
VI	49.240	95.400	72.696	5.973	8.653	31.073	4.040	7.257	27.192	41.459	20.387	19.822
VII	45.776	93.381	72.566	5.867	7.581	38.986	3.829	6.737	26.622	40.487	22.421	21.332
Mean	56.657	111.784	97.439	5.901	13.795	48.973	3.770	5.881	25.754	38.287	22.260	30.250
S.Em.±	2.199	4.293	6.128	0.225	1.416	3.566	0.072	0.304	0.682	0.846	0.602	2.343
C.V.%	10.242	10.160	16.639	10.088	27.152	19.265	5.065	13.692	7.010	5.849	7.152	20.496
%Contribution	34.36	16.76	1.33	0.06	1.21	1.39	0.00	2.48	4.90	0.18	35.82	1.51