Research Paper

Genetic divergence in dolichos bean (*Dolichos lablab* L. var. typicus) genotypes for yield and yield contributing traits

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ABSTRACT : Mahalanobis D^2 statistics was used to study the genetic divergence for 19 characters among 48 genotypes of Indian bean. Genotypes were grouped in to eight clusters on the basis of relative magnitude of D^2 values. The highest number of genotypes (14) appeared in cluster III. The maximum inter cluster distance was observed between cluster IV and cluster VI followed by cluster IV and VIII. The minimum inter cluster distance was observed between cluster I and cluster IV. Maximum intra cluster distance was in cluster V followed by cluster III. The mean value for most of the traits was highest in cluster VIII. Among the yield contributing characters, the maximum contribution towards divergence was made by protein content followed by number of flowers per inflorescence, pod length and number of pods per plant. Hybridization between cluster IV and VI could be utilized for getting the superior recombinants or transgress segregants in segregating generations.

KEY WORDS : Dolichos bean, Genetic diversity, Hybridization

Indian bean (*Dolichos lablab* L. var. *typicus*) is commonly known as hyacinth bean. Dolichos bean is an important vegetable crop of Indian origin. It occupies a unique position for vegetable purpose among the legume vegetables (Biju *et al.*, 2001; Rai *et al.*, 2009). Despite its importance, practically no efforts have been made to improve this crop. The knowledge of nature and degree of divergence in existing germplasm are basic pre-requisite in breeding programme of any crop including Indian bean for effective selection of superior genotypes. Hence, the present study was undertaken to provide information on nature and magnitude of genetic diversity among promising Indian bean genotypes.

RESEARCH METHODS

The field experiment comprised of 48 genotypes of Indian bean was conducted during *Rabi* season of 2010-11 at NBPGR Regional Station, Hyderabad in Randomized Block Design with three replications. Ten plants of each genotype grown with the row length of 5m accommodating with a spacing of 2x1m with three replications. The plants were trained on to a pandal. All the recommended package of practices and necessary plant protection measures were followed timely to raise a good crop. Five plants were randomly taken from each plot to record observations on nineteen yield and yield contributing components except days to 50 per cent flowering and 100 seed weight which were recorded on whole plot basis. Genetic diversity was estimated as per Mahalanobis (1936) D^2 statistics between different pairs of genotypes. While method of cluster composition was done as per Tocher's method as described by Rao (1952).

RESEARCH FINDINGS AND DISCUSSION

The analysis of variance revealed significant differences

among the genotypes for all the traits studied. Distance between all pairs of genotypes was calculated using squared Euclidean distance method and genotypes were clustered based on Tocher's method. Based on this 48 genotypes of dolichos bean were classified into 8 clusters. Among the eight clusters, cluster III had maximum number of genotypes (14), cluster I had 12 genotypes, cluster II had 10 genotypes, cluster V had 8 genotypes and the clusters IV, VI, VII and VIII were solitary with only one genotype in each cluster. From clustering behavior of genotypes in the present study (Table 1), it is obvious that the selection of different diverse genotypes have played a greater role in the total divergence between the clusters than the geographical diversity *i.e.* the genotypes have grouped in to different clusters irrespective of their geographical origins. It means that the genetic constitution of the varieties was more dominant than their geographical origin while forming a cluster in Indian bean. Similar finding was reported by Rai *et al.* (2009).

The intra and inter cluster distances were presented in Table 2. The Maximum genetic distance was observed between cluster VI and IV (407.75) followed by cluster IV and cluster VIII (392.32) as well as cluster V and VIII (336.77). On the other hand cluster I and IV (65.11) displayed the lowest degree of divergence suggesting close genetic makeup of the genotypes included in these groups. A good scope for selection within the clusters was indicated

by the magnitude of intra cluster distance among the clusters *viz.*, exhibited maximum distance in cluster V (150.33) followed by cluster III (88.46). The clusters IV, VI, VII and VIII were solitary with one genotype each indicated their independent identity and importance due to various unique characters possessed by them. Intra cluster distance being much lesser than inter cluster ones, suggested homogenous and heterogeneous nature of the genotypes within and between the clusters, respectively.

Almost all the clusters were highly distinct to each other with respect to all the characters (Table 3). The cluster VIII exhibited more or less average values for most of the traits. The cluster V exhibited the higher marketable pod yield per plant (317.62). Cluster I had maximum plant height, higher pod weight and 100 seed weight. Cluster II had maximum pod length and number of seeds per pod. Cluster IV exhibited higher protein content, number of pods per inflorescence and lowest inter node length. Cluster VI had maximum number of inflorescences per plant and minimum pod width. Cluster VII exhibited more number of primary branches per plant, length of inflorescence, number of flowers per inflorescence and number of pods per plant. On the other hand, cluster VIII had lowest number days taken to first flowering, 50 per cent flowering, first pod harvest and maximum days taken to last pod harvest. The per cent contribution of different characters towards diversity was

Table 1 : Clustering pattern of 48 genotypes of dolichos bean (Tocher's method)		
Clusters	No. of genotypes	Genotypes
I	12	NAIP-BD-ADB-10, RJR-03-1, PSRJ-12980, RJR-54-2, RJR-54, PSRJ-13026-1, NSJ-194-1, PSRJ-13026-2, BSBS-151, PSRJ-12953, PSRJ-13114-2, NAIP-BD-ADB-01.
II	10	PSRJ-13021-2, NSJ-194, PUSA EARLY PROLIFIC, RND-1, PSRJ-13039, MR-04/62, PSRJ-13026, NSJ-192, RJR-104-1, VKG-28/88.
III	14	PSRJ-13008, NSJ-169, RJR-82-1, PSRJ-13142-1, RJR-03, PSRJ-13008-1, NSJ-87, RJR-54-1, PSRJ-12947-1, PSRJ-X-1, PSRJ-13118, NAIP-BD-ADB 14, PSRJ-13021-1, PSRJ-X.
IV	1	NSJ-87-2
V	8	JBT-38/36, VKG-28/32, PSRJ-13057-1, VKG-28/78, NSJ-178-1, RJR-150, NSJ-87-1, PSRJ-13057.
VI	1	NSJ-87-1/A
VII	1	NSB-2010/029
VIII	1	ARKA JAY

Table 2 : Average intra (bold) and inter-cluster D^2 values for eight clusters in 48 genotypes of dolichos bean. (Tocher's method)							
Clusters	I	II	III	IV	V	VI	VII	VIII
I	38.87	79.41	154.49	65.11	116.58	321.58	214.10	324.99
II		66.72	139.87	97.63	119.13	259.26	152.34	223.84
III			88.46	221.47	181.73	141.57	237.25	232.72
IV				0.000	118.30	407.75	216.45	392.32
V					150.33	276.67	225.88	336.77
VI						0.000	290.82	210.84
VII							0.000	98.13
VIII								0.000

*Bold diagonal values indicate intra cluster distance, rest of the values show the inter cluster distances.

Table 3 : Mean values of clusters for nineteen characters in 48 genotypes of dolichos bean (Tocher's method)

Clusters	Plant height (cm)	No. of primary branches per plant	Days to first flowering	Days to 50% flowering	Length of inflorescence (cm)	Inter node length (cm)	No. of flowers per inflorescence	No. of pods per inflorescence	No. of inflorescences per plant	Days to first pod harvest	Days to last pod harvest	Pod length (cm)	Pod width (cm)	Pod weight (g)	No. of seeds per pod	No. of pods per plant	100 seed weight (g)	Protein content (%)	Marketable pod yield per plant (g)
I	308.88	3.05	79.00	80.86	10.84	2.90	13.44	4.02	13.91	103.74	158.20	10.06	1.70	5.80	4.55	28.69	27.06	27.10	165.41
II	284.92	3.17	66.14	68.13	12.65	2.79	15.14	5.38	16.18	91.97	170.51	10.49	1.78	5.27	4.73	58.23	26.51	26.01	308.36
III	292.31	3.25	72.39	74.00	10.25	2.67	13.13	4.06	12.96	97.99	155.09	9.18	1.77	5.32	4.48	37.94	25.16	20.05	213.25
IV	263.46	3.16	75.93	79.33	10.60	1.93	14.53	6.33	19.56	99.30	146.06	6.97	1.68	3.90	4.52	28.60	23.56	28.32	117.33
V	302.75	3.26	81.35	83.37	12.12	2.84	14.25	5.51	19.89	107.80	179.10	7.90	1.81	4.95	4.20	62.62	24.61	26.06	317.62
VI	292.76	3.50	79.06	81.66	17.53	3.92	15.91	7.40	20.60	103.36	182.64	7.23	1.65	4.52	3.83	32.13	21.61	16.82	144.95
VII	62.66	3.58	54.60	56.33	20.63	2.83	28.13	6.00	11.16	84.76	142.53	6.48	2.11	2.74	4.11	72.50	21.33	26.72	193.42
VIII	67.10	3.40	43.60	44.66	19.76	3.43	27.90	5.96	13.26	71.40	193.73	8.92	1.76	4.96	4.48	35.23	21.50	22.80	174.88

Table 4 : Per cent contribution of different characters towards diversity in dolichos bean germplasm

Sr. No.	Character	No. of times ranked 1st	Per cent contribution
1.	Plant height (cm)	2	0.18
2.	Primary branches per plant	6	0.53
3.	Days to first flowering	44	3.90
4.	Days to 50% flowering	0	0.00
5.	Length of inflorescence	31	2.75
6.	Inter node length (cm)	55	4.88
7.	No. of flowers per inflorescence	105	9.31
8.	No. of pods per inflorescence	56	4.96
9.	No. of inflorescences per plant	7	0.62
10.	Days to first pod harvest	0	0.00
11.	Days to last pod harvest	24	2.13
12.	Pod length (cm)	73	6.47
13.	Pod width (cm)	12	1.06
14.	Pod weight (g)	34	3.01
15.	Number of seeds per pod	27	2.39
16.	Number of pods per plant	67	5.94
17.	100 seed weight (g)	13	1.15
18.	Protein content (%)	507	44.95
19.	Pod yield per plant (g)	65	5.76

represented in Table 4. Similar results in dolichos bean have been reported by Pandey *et al.* (1983) and Ganesh (2005). Among the yield contributing characters, the maximum contribution towards divergence was made by protein content (44.95 %) followed by number of flowers per inflorescence (9.31 %), pod length (6.47%) and number of pods per plant (5.94%). On the other hand, Patil *et al.* (2008) reported protein content and Sureja and Sharma (2001) reported pod length contributed more towards divergence than other yield attributes in Indian bean.

From the study it can be concluded that more emphasis should be given to improve protein content and number of flowers per inflorescence while making selection of high yielding genotypes of dolichos bean. The maximum D^2 values existed between cluster IV and VI followed by cluster IV and VIII indicated that the genotypes included in these clusters may give useful transgressive segregants in segregating generations.

REFERENCES

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

Ganesh, B.N. (2005). Genetic variability and divergence studies by D^2 statistics and RAPD analysis in field bean [*Lablab purpureus* (L.) Sweet]. M.Sc. (Ag.) Thesis, Acharya N.G. Ranga Agriculture University, S.V. Agri. College, Tirupati, A.P. (INDIA).

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

Pandey, R.P., Aswana, B.M. and Tiwari, J.P. (1983). Genetic divergence in Dolichos bean (*Dolichos lablab*. Linn). *JNKVV Res. J.,* **17**(1-2) : 66-70.

Patil, S.C., Patil, H.E. and Jambhale, V.M. (2008). Genetic divergence studies in Moth bean (*Vigna aconitifolia*). *J. Maharashtra Agric. Univ.*, **33**(2): 161-164.

Rai, N., Asati, B.S. and Singh, A. K. (2009). Genetic divergence in Indian bean. *Legume Res.,* **32**(2) : 166-172.

Rao, C.R.V. (1952). *Advanced statistical methods in biometrical research*. Jhon Wiley and Sons Inc. NewYork, pp. 236-272.

Sureja, A.K. and Sharma, R. R. (2001). Genetic divergence in garden pea (*Pisum sativum* L.sub.sp.*hortense* Asch and Graebn). *Veg. Sci.,* **28** (1): 63-64.

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