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Research Note

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

V. Chaitanya[1], R.V.S.K Reddy[2], S.R Pandravada[3] and M. Sujatha[4]
[1]College of Horticulture, Dr.Y.S.R.H.U, Rajendranagar, Hyderabad-30.
[2]Vegetable Research Station, Dr.Y.S.R.H.U, Rajendranagar, Hyderabad-30.
[3]NBPGR Regional Station, Hyderabad-30.
[4]College of Agriculture, Rajendranagar, ANGRAU, Hyderabad-30.
Email: chaitanya.hortico@ gamil.com

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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. Hence, hybridization between cluster IV (NSJ-87-2) and VI (NSJ-87-1/A) followed by cluster IV (NSF 87-2) and VIII (ARKA JAY) could be utilized for getting the superior recombinants or transgress segregants in segregating generations.

Keywords: Dolichos bean, Indian bean, variability, genetic diversity.

Dolichos bean or Indian bean (*Dolichos lablab* L. var. *typicus*) 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 is undertaken to provide information on nature and magnitude of genetic diversity among promising Indian bean genotypes.

The field experiment comprised of 48 genotypes of Indian bean conducted during *rabi* season of 2010-11 at NBPGR Regional Station, Hyderabad in Randomized Block Design with three replications. 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 19 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).

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. 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 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. 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 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 percent flowering, first pod harvest and maximum days taken to last pod harvest. The percent contribution of different characters towards diversity was represented in Table 4. 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 (5.97%). Similar results in dolichos bean have been reported by Pandey *et al*. (1983) and Ganesh (2005). On the other hand, Patil *et al*. (2008) and Sureja and Sharma (2001) reported protein content and pod length respectively 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 (NSJ-87-2) and VI (NSJ-87-1/A) followed by cluster IV (NSF 87-2) and VIII (ARKA JAY) indicated that the genotypes included in these clusters may give useful transgressive segregants in segregating generations.

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Table 1. Clustering pattern of 48 genotypes of dolichos bean (Tocher's method)

Cluster	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

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

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

Cluster	I	II	III	IV	V	VI	VII	VIII
Plant height (cm)	308.88	284.92	292.31	263.46	302.75	292.76	62.66	67.1
No. of primary branches per plant	3.05	3.17	3.25	3.16	3.26	3.5	3.58	3.4
Days to first flowering	79	66.14	72.39	75.93	81.35	79.06	54.6	43.6
Days to 50 % flowering	80.86	68.13	74	79.33	83.37	81.66	56.33	44.66
Length of inflorescence (cm)	10.84	12.65	10.25	10.6	12.12	17.53	20.63	19.76
Inter node length (cm)	2.9	2.79	2.67	1.93	2.84	3.92	2.83	3.43
No. of flowers per inflorescence	13.44	15.14	13.13	14.53	14.25	15.91	28.13	27.9
No. of pods per inflorescence	4.02	5.38	4.06	6.33	5.51	7.4	6	5.96
No. of inflorescences per plant	13.91	16.18	12.96	19.56	19.89	20.6	11.16	13.26
Days to first pod harvest	103.74	91.97	97.99	99.3	107.8	103.36	84.76	71.4
Days to last pod harvest	158.2	170.51	155.09	146.06	179.1	182.64	142.53	193.73
Pod length (cm)	10.06	10.49	9.18	6.97	7.9	7.23	6.48	8.92
Pod width (cm)	1.7	1.78	1.77	1.68	1.81	1.65	2.11	1.76
Pod weight (g)	5.8	5.27	5.52	3.9	4.95	4.52	2.74	4.96
No. of seeds per pod	4.55	4.73	4.48	4.52	4.2	3.83	4.11	4.48
No. of pods per plant	28.69	58.23	37.94	28.6	62.62	32.13	72.5	35.23
100 seed weight (g)	27.06	26.51	25.16	23.56	24.61	21.61	21.33	21.5
Protein content (%)	27.1	26.01	20.05	28.32	26.06	16.82	26.72	22.8
Marketable pod yield per plant (g)	165.41	308.36	213.25	117.33	317.62	144.95	193.42	174.88

Table 4. Percent contribution of different characters towards diversity in dolichos bean germplasm

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