Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2018; 7(4): 1392-1395
Received: 01-05-2018
Accepted: 05-06-2018

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Genetic divergence studies in Dolichos bean (*Lablab purpureus* L.) genotypes

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Abstract
Studies was carried out to assess the genetic divergence among 38 dolichos bean genotypes using Mahalanobis D^2. 38 genotypes were grouped into seven clusters. Cluster I had highest number of genotypes (11) followed by cluster VII (9), cluster V (7), cluster VI (4), cluster II and cluster III (3), cluster IV (2) having 1 genotype. The maximum inter cluster distance was observed between cluster no. III and VII (62168.95) and cluster no. IV and V (2078.16) showed minimum inter cluster distance. The highest intra cluster distance was recorded for cluster no. III (1903.00) and cluster no. V (1176.59) showed minimum intra cluster distance.

Keywords: dolichos bean, genetic divergence, mahalanobis d^2, tocher's method, clusters distance, cluster mean value

Introduction
Dolichos bean (*Lablab purpureus* L.) is an important leguminous vegetable crop grown throughout the country and distributed in Madhya Pradesh, Maharastra, Andhra Pradesh, Tamil Nadu and North Eastern states. It is potentially a herbaceous perennial but cultivated as an annual with bushy, erect or climbing races. Sem is primarily grown for green pods and is rich in protein (3.8%, green pod basis). The dry seeds are also used for various vegetable preparations and foliage of the crop provides hay, silage and green manures (Bose *et al*., 1993) [2]. The green pods are eaten after cooking and has very good nutritive value. The one hundred grams of edible portion contains carbohydrates: 6.7g; Protein: 3.8g; fat: 0.7g; fibre: 1.8 g; Calcium: 210mg; Magnesium: 34mg; Sodium: 55.4mg; Phosphorus: 68.0mg; Iron: 1.7mg; Potassium: 74mg; Sulphur: 40mg; Carotene: 3121 I.U.; Thiamin: 0.1 mg; Riboflavin: 0.06mg; Vitamin C: 9.0 mg and nicotinic acid: 0.7mg (Aykroyd, 1963). According to Venkatachalam *et al.* (2002) [10] on dry weight basis, it contains 30% protein. Out of which albumin, globulin, prolamin and glutein respectively accounted for approximately 20%, 48%, 1% and 31% of the total proteins. Genetic diversity is one of the criteria of parent selection in the hybridization programme. The availability of transgressive segregant in any breeding program depends upon the diversity between the parents involves. The quantification of genetic diversity through biometrical procedures such as Mahahanobis's D^{2-} statistic which may be an efficient tool in the quanitative estimation of genetic diversity (Mahalanobis, 1936) [5]. The divergence analysis has a definite role to play in an efficient choice of divergent parents for hybridization to exploit maximum heterosis.

Materals and Methods
The experiment was carried out at the Horticulture Research Farm, Department of Horticulture, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences Allahabad. The experimental material (38 genotypes) of dolichos bean was collected from different sources given information below in (Table 1).

Table 1: Source of Genotypes of Dolichos Bean

S.No.	Genotypes	No. of genotypes	Source of Genotypes
1.	CG 1, CG 2,CG 5,CG 6	4	Lundra Surguja CG
2.	CG 7, CG 8, CG 9	3	Ambikapur Surguja CG
3.	CG 3, CG 4.	2	Bilha, Bilashpur, CG
4.	CG 10, CG 11, CG 12, CG 13, CG 14, CG 15, CG 16.	7	Udaipur Surguja CG
5	CG. 17, CG 18.	2	Udagi Surajpur CG
6	CG 19, CG 28,	2	Lailunga Raigarh, CG

7	CG 20, CG 21, CG 22,	3	Ramanujnagar Surajpur CG
8	CG 23.	1	Bhaiyathan Surajpur CG
9	CG 24, CG 25, CG 26, CG 27.	4	Pathalgaon Jashpur CG
10	CG 29, CG 30,CG 31,CG 32,CG 33,CG 34,CG 35,CG 36	8	Reewagahan, Rajnandgaon CG
11	VRSEM-186	1	IIVR Varanasi, U.P.
12	PUSA SEM-2	1	IARI, Delhi

Results and Discussion

The multivariate analysis (D^2) is a powerful tool to measure the genetic divergence within a set of genotypes. the concept of D^2statistics was originally developed by Mahalonobis (1936) [5]. Then Rao (1952) [7] suggested the application of this technique for the arrangement of genetic diversity in plant breeding. Now, this technique is being extensively used in vegetable breeding to study the selection of different parents.

The analysis of variance showed that significant difference among the genotypes for all 17 characters studied. on the basis of D2 analysis 38 genotype were grouped into seven cluster are presented in (Table 2). Maximum number of genotypes 11 were grouped into cluster no. I (CG-2, CG-4, CG-8, CG-19, CG-22, CG24, CG-27, CG-28, CG-29, CG-30, CG-34) followed by cluster no. VII having 9 genotypes (CG-1, CG-3, CG-7, CG-9, CG-12, CG-23, CG-32, CG-33, VRSEM-186), cluster no. V having 7 genotypes (CG-5, CG-11, CG-17, CG-25, CG-31, CG-35, Pusa Sem-2), cluster no. VI having 4 genotypes (CG-6, CG-13, CG-14, CG-21), cluster no. II having 3 genotypes (CG-10, CG-20, CG-36), cluster no. III having 3 genotypes (CG-15, CG-16, CG-18) and cluster no. IV having 1 genotype (CG-26).

Table 2: Distribution of dolichos bean genotypes into different clusters

Cluster number	Number of genotypes included	Genotypes
1 Cluster	11	CG-2,CG-4,CG-8,CG-22,CG-24,CG-27,CG-28,CG-29,CG-30,CG-34
2 Cluster	3	CG-10,CG-20,CG-36
3 Cluster	3	CG-15,CG-16,CG-18
4 Cluster	1	CG-26
5 Cluster	7	CG-5,CG-11,CG-17,CG-25,CG-31,CG-35, Pusa sem-2
6 Cluster	4	CG-6,CG-13,CG-14,CG-21
7 Cluster	9	CG-1,CG-3,CG-7,CG-9,CG-12,CG-23,CG-32,CG-33,VRSEM -186

It is vivid the (table 3) that maximum intra cluster distance was recorded for cluster no. III (1903.00) followed by cluster no.VI (1691.61), cluster no. I (1462.58), cluster no. II (1363.38), cluster no. IV (1198.58) and cluster no. V (1176.59) while showed minimum intra cluster distance was recorded for cluster no.VII (0.00).

Maximum inter cluster distance was observed between cluster no. III and VII (62168.95) followed by cluster no. II and VII (37474.39), cluster no. I and VII (35942.41), cluster no. VI and VII (23462.54), cluster no. III and IV (21923.66), cluster no. V and VII (18548.10), cluster no. III and V (15048.50), cluster no. IV and VII (11563.00), cluster no. III and VI (11457.34), cluster no. II and IV (8662.23), cluster no. I and IV (8396.18), cluster no. I and III (5201.62), cluster II and III (5136.38), cluster no. I and V (5092.37), cluster no

Table 3: Intra and inter cluster distance (D^2) in dolichos bean

	1 Cluster	2 Cluster	3 Cluster	4 Cluster	5 Cluster	6 Cluster	7 Cluster
1 Cluster	1462.589	2211.401	5201.626	8396.18	5092.377	3055.825	35942.410
2 Cluster		1363.383	5136.383	8662.237	4598.22	4376.546	37474.390
3 Cluster			1903.005	21923.66	15048.5	11457.340	62168.950
4 Cluster				1198.581	2078.165	3874.647	11563.000
5 Cluster					1176.597	3011.917	18548.100
6 Cluster						1691.614	23462.540
7 Cluster							0.000

II and V (4598.22), cluster no. II and VI (4376.54), cluster no. IV and VI (3874.64), cluster no. I and VI (3055.82), cluster no. V and VI (3011.91), cluster no. I and II (2211.40) and cluster no. IV and V (2078.16) showed minimum inter cluster distance.

Cluster mean values are presented in (Table 4). Cluster mean for Inflorescence length was recorded highest in cluster no. V (24.20 cm) and lowest in cluster no.VI (12.14 cm) whereas the cluster mean performance for Inflorescence length was (19.13 cm). Cluster mean for number of flower per inflorescence was recorded highest in cluster no. II (15.77) and lowest in cluster no.VI (11.93) whereas the cluster mean performance for number of flower per inflorescence was 13.52. Cluster mean for number of pod formation per inflorescence was recorded highest in cluster no. II (7.70) and lowest in cluster no.VII (5.93) whereas the cluster mean performance for number of pod formation per inflorescence was 6.91. Cluster mean for days to first pod harvest was recorded highest in cluster no. III (128.81) and the lowest in cluster no. IV (60.66) whereas the cluster mean performance for days to first pod harvest was 109.00. Cluster mean for days to last pod harvest was recorded highest in cluster no. II (195.81) and lowest in cluster VII (185.66) whereas the cluster mean performance for days to last pod harvest was 194.52 days. Cluster mean for number of green pod pickings was recorded highest in cluster VII (6.66) and lowest cluster no. V (5.72) whereas the cluster mean performance for number of green pod pickings was 6.07. Cluster mean for pod length was recorded highest in cluster no. VI (11.23 cm) and lowest in cluster no. III (7.93 cm) whereas the cluster mean performance for pod length was 9.42 cm. Cluster mean for pod width was recorded highest in cluster no. VI (2.14 cm) and lowest in cluster no. I (1.71 cm) whereas the cluster mean performance for pod width was 1.96 cm. Cluster mean for pod weight was recorded highest in cluster no. IV (8.90 g) and lowest in cluster no. I (6.25 g) whereas the cluster mean

performance for pod weight was 7.23 g. Cluster mean for seeds per pod was recorded highest in cluster no. IV (5.57) and lowest in cluster no. III (4.85) whereas the cluster mean performance for seeds per pod was 5.11. Cluster mean for vine length was recorded highest in cluster no. IV (6.39 m) and lowest in cluster no. VI (5.33) whereas the cluster mean performance for vine length was 5.80 m. Cluster mean for 100 seed weight was recorded highest in cluster no. VI (39.59) and lowest in cluster no. I (29.06 g) whereas the cluster mean performance for 100 seed weight was 32.26 g. Cluster mean for green pod yield per plant was recorded highest in cluster no. VII (2.07 kg) and lowest in cluster no. V (1.58 kg) whereas the cluster mean performance for green pod yield per plant was 1.71 kg. Cluster mean for green pod yield per plot was recorded highest in cluster no. VII (12.44 kg) and lowest in cluster no. V (9.48 kg) whereas the cluster mean performance for green pod yield per plot was 10.27 kg. Cluster mean for green pod yield per hectare was recorded highest in cluster no. VII (138.22 q) and lowest in cluster no. V (105.40 kg) whereas the cluster mean performance for green pod yield per hectare 114.19 q.

Table 4: Cluster mean value for different characters in dolichos bean

Cluster	Days of First Flowering	Days of 50% Flowering	Inflorescence Length (cm.)	Flowers/ Inflorescence	Pod Formations/ Inflorescence	Days to First Pod harvest	Days of Last Green Pod harvest	Number of Green Pod Picking	Pod Length (cm.)	Pod Width (cm)	Pod Weight (g)	Seeds/ Pod	Vine Length (m)	Seed Index (g)	Green Pod Yield Per Plant (kg)	Green Pod Yield Per Plot (kg)	Pod Yield (q/ha)
1 Cluster	97.06	101.18	15.85	12.41	6.36	112.00	193.83	6.07	8.52	1.71	6.25	4.88	5.75	29.06	1.59	9.544	106.086
2 Cluster	97.86	101.23	23.63	15.77	7.70	114.00	195.81	6.14	10.50	2.06	7.95	5.55	6.03	32.47	1.86	11.163	124.043
3 Cluster	113.64	117.09	18.10	14.13	7.19	128.81	195.43	6.05	7.94	2.04	6.74	4.85	5.80	31.40	1.65	9.911	110.124
4 Cluster	74.65	78.02	19.53	13.42	7.34	89.00	195.00	6.50	10.69	2.08	8.91	5.57	6.40	31.95	1.89	11.340	125.997
5 Cluster	81.61	84.93	24.21	13.12	6.58	100.39	193.78	5.72	9.51	2.02	6.92	5.01	5.48	33.82	1.58	9.487	105.403
6 Cluster	88.02	91.60	12.14	11.93	6.73	101.11	195.56	6.00	11.23	2.15	8.06	5.11	5.33	39.59	1.82	10.947	121.627
7 Cluster	46.20	49.80	16.87	12.20	5.93	60.67	185.67	6.67	10.30	1.81	8.36	5.11	5.93	38.71	2.07	12.440	138.220
Mean	93.41	97.01	19.14	13.52	6.92	109.00	194.53	6.08	9.42	1.96	7.24	5.12	5.81	32.26	1.71	10.277	114.198

Thus while planning hybridization programme for the development of better transgressive segregant one should select genotypes CG-14, CG-21 for the earliest flowering, days to 50% flowering, earliest days to first green pod harvest, maximum number of green pod picking, maximum number of seeds per pod, whereas PUSA SEM-2 number of flowers per inflorescence, pod weight, green pod yield per plant, CG-17, CG-5, CG-15, CG-27, CG-20, CG-12, CG-16, VRSEM-186, CG-19, CG-28, CG-9, CG-27, CG-16, PUSA SEM-2 for inflorescence length, maximum number of flowers per inflorescence, days to last green pod harvest, pod length pod width, vine length, 100 seed weight,. The genotypes collected from same geographical location fall in different clusters, revealed that geographical distance did not contribute to genetic divergence. Ample diversiy Dolichos bean with in India reported by Baswana *et al*. (1980) [1], Golani *et al.* (2007) [3], Upadhyay, (2011) [8], Patel, (2010) [6] and Kujur, (2016).

The selection and choice of parents mainly depends upon contribution of characters towards divergence (Table 5). Contribution of each character towards genetic divergence has been estimated from the number of times that each character appeared in the first rank. The present study showed that, days of first flowering (49.0%) contributed maximum to the total genetic diversity among the genotypes followed by inflorescence length (19%).days to 50% flowering (16%) and 100 seed weight (seed index) (9%).

Hence, days to first flowering, inflorescence length, days to 50% flowering and 100 seed weight (seed index) (9%) were considered to be important traits contributing towards genetic divergence.

Table 5: Percent contribution of different characters of the total diversity in cluster bean genotypes

S. No.	Source	Times Ranked First	Contribution%
1	Days of First Flowering	345.00	49.08
2	Days of 50% Flowering	112.00	15.93
3	Inflorescence Length (cm.	136.00	19.35
4	Flowers/ Inflorescence	6.00	0.85
5	Pod Formations/ Inflorescence	0.00	0.01
6	Days to First Pod harvest	5.00	0.71
7	Days of Last Green Pod ha	13.00	1.85
8	Number of Green Pod Picking	0.00	0.01
9	Pod Length (cm.)	5.00	0.71
10	Pod Width(cm)	7.00	1.00
11	Pod Weight (g)	0.00	0.01
12	Seeds/ Pod	0.00	0.01
13	Vine Length (m)	0.00	0.01
14	Seed Index (g)	64.00	9.10
15	Green Pod Yield Per Plant(kg)	0.00	0.01
16	Green Pod Yield Per Plot((kg)	10.00	1.42
17	Pod Yield (q/ha)	0.00	0.01

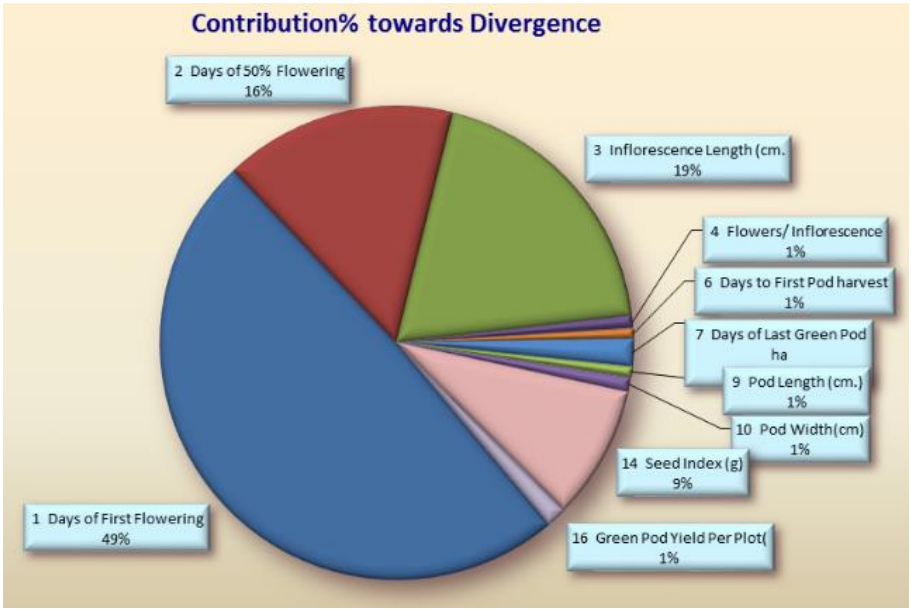

Fig 4.7: Contribution percent of different characters towords divergence

Acknowledgement
Authors are Sincerely Thankful to my friends Praveen Choyal and Ramesh N.D and Anita Kerketta Department of Horticulture Naini agricultural institute SHUATS Allahabad (U.P).

References

1. Baswana KS, Pandita ML, Partap PS, Dhankhar BS. Correlation and path coefficient analysis in Indian bean (*Dolichos lablab* var. *lignosus* L.). Haryana Agric. Uni. J Res. 1980; 10(4):485-489.
2. Bose TK, Som MG, Kabir J. Vegetable Crops, Naya Prakash Kolkata, India, 1993, 612.
3. Golani IJ, Mehta DR, Naliyandhara, Patel RK, Kanzariya MV. Genetic variability, correlation and path analysis for green pod yield and its characters in Hyacinth bean. Orissa J Hort. 2007; 35(1):71-75.
4. Kujur PK, Bahadur V, Pankaj P. Correlation and Path Analysis Study in Dolichos Bean (*Lablab purpureus* L.). International Journal of Current Microbiology and Applied Sciences. 2017; 6(9):2228-2235.
5. Mahalanobis PC. On the generalized distance in statistics. Proc. Nat. Inst. Sci., India. 1936; 21:49-55.
6. Patel KL. Genetic divergence analysis in dolichos bean *(Dolichos lablab* L.) M.Sc. (Ag.) Thesis Indira Gandhi Krishi Vishwavidyalaya, Raipur, 2010.
7. Rao CR. Advance Statistical Methods in Biometrics Research. Hofaer Pub. Darion, 1952, 371-378.
8. Upadhyay D, Mehta N, Singh J, Sahu M. Genetic divergence in dolichos bean (*Dolichos lablab* L.). Electronic Journal of Plant Breeding. 2011; 2(4):552-554.
9. Vavilov NI. Chromosome Atlas of cultivated plants. George Allen Unwin Ltd., London, 1939.
10. Venkatachalam M, Kshirsagar HH, Tiwari R, Sathe SK. Annual meeting and food expo Anaheim, California. Session 30c, food chemistry: proteins, 2002.