IJPS INTERNATIONAL JOURNAL OF PLANT SCIENCES
Volume **8** | Issue 1 | January, 2013 | 166-168

RESEARCH ARTICLE

Genetic divergence analysis in rice bean [*Vigna umbellate* (L.)]

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SUMMARY

A wide genetic variability among the genotypes was revealed by the D^2 analysis, where in 49 genotypes were grouped into ten clusters. Based on average inter-cluster distance, the clusters VII and VIII were found to be highly divergent from all the clusters, the intercluster D^2 value was 500.33, where lowest D^2 value was noticed between the clusters IV and VIII (23.35). The genotypes LRB-461, LRB-462, LRB-463, LRB-464, LRB-465, LRB-466, LRB-467, LL-476, LRB-491, LRB-498 and LRB-490 were found to be divergent.

Key Words : Rice bean, Genetic divergence, Seed yield

How to cite this article : Basavaprabhu, N.M., Murthy, Niranjana, Asif, M., Venkatesha, K.T. and Vijay Kumar, K.V. (2013). Genetic divergence analysis in recebean, *Vigna umbellate* (L.). *Internat. J. Plant Sci.*, **8** (1) : 166-168.

Article chronicle : Received : 22.07.2012; **Revised :** 20.11.2012; **Accepted :** 28.11.2012

Genetic diversity in the available germplasm has immense value in crop improvement for character of interest. From the point of selecting the parents for hybridization which are divergent enough for character of interest, estimation of genetic distance is most important. This genetic divergence can be estimated by using an effective statistical tool, Mahalanobis D^2 statistics, which gives clear idea about the diverse nature of the germplasm. Therefore, present investigation was undertaken to obtain the information on divergence in 49 rice bean genotypes.

MATERIALS AND METHODS

The experimental material consisted of 45 diversified germplasm lines and five check varieties of rice bean. The genotypes are maintained at All India Co-ordinated Research Network on Underutilized Crops, at Main Agricultural Research Station, Hebbal, Bangalore. The experiment was conducted at Main Agricultural Research Station, Hebbal, Bangalore during *Kharif* season 2009 under irrigated condition. The material was grown in 7×7 simple lattice design with two replications. For recording observations five plants were selected randomly from each plot in each replication and the observations were recorded on the characters plant height (cm), number of primary branches per plant, days to first flowering, days to 50 per cent flowering, pods per plant, number of pods per cluster, pod length (cm), seeds per pod, days to maturity, 100-seed weight (g) and seed yield per plant (g). Mahalanobis (1936) D^2 analysis was used for estimating genetic divergence among the genotypes. Method suggested by Rao (1952) was followed for computing D^2 values and for determining group constellations.

RESULTS AND DISCUSSION

Sufficient variation among various genotypes for all characters was observed which indicated that the present material of rice bean was appropriate for estimation of further analysis. Based on D^2 values the genotypes were grouped into ten clusters using Tocher's methods given by Rao (1952). Clustering of genotypes are presented in (Table1). Out of the

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ten clusters, cluster V and cluster X was biggest with 12 genotypes followed by cluster X with 11 genotypes, cluster VII with nine genotypes, cluster III with four genotypes, cluster I, II, IV, VI, VIII, and IX containing each two genotypes.

Inter and intra cluster distances values are given in the (Table 2). The genotypes included were found to be very diverse in nature as they have shown maximum inter cluster distance (D^2) of 500.33 between clusters VII and VIII, the minimum D^2 value was between the clusters IV and VIII (23.35). Intra cluster distance was highest in the cluster X (174.25) followed by cluster VII (166.59) and lower intra-cluster distance observed in cluster I (10.45), from the present investigation, it was clear that clusters-VIII and VII were the most divergent clusters.

Analysis of cluster means indicates diversity demonstrated by different cluster for a character. Cluster means

Table 1: Grouping of 49 rice bean genotypes based on D^2 analysis

Cluster	Number of genotypes	Genotypes included in the cluster
I	2	LRB-469, LRB-478
II	2	LL-449 , LRB-479
III	4	LRB-311,LRB-319,LRB-457,LRB-488
IV	2	LRB-459,LRB-468
V	12	LRB-322,LRB-324,LRB-325,LRB-446,LRB-445,LRB-448,LRB-452,LL-453,LRB-456,LBR-458,LRB-460,LRB-480,
VI	2	LRB-475,LRB-489,
VII	9	LRB-461, LRB -462,LRB-463,LRB-464,LRB-465,LRB-466,LRB-467,LL-476,LRB-491.
VIII	2	LRB-498, LRB-490.
IX	2	LRB-481, LRB-483.
X	12	LRB-472,LRB-473,LRB-464,LRB-477,LRB-482,LRB-484,LRB-487,KBR-1,RBL-6,RBL-35,RBL-50,RBL-1.

Table 2: Inter and intra-cluster D^2 values

Clusters	I	II	III	IV	V	VI	VII	VIII	IX	X
I	10.45	35.37	268.59	317.39	107	145.22	101.11	430.2	201.69	135.73
II		10.63	208.06	264.41	81.17	128.37	101.4	354.01	139.77	114.87
III			75.87	54.39	188.99	72.86	357.36	81.19	69.33	189.03
IV				12.65	214.24	59.95	411.77	23.35	43.51	214.01
V					123.01	110.96	174.38	282.6	126.68	145.53
VI						19.62	238.47	109.55	44.51	121.31
VII							166.59	500.33	273.75	210.39
VIII								20.57	75.35	282.17
IX									20.62	145.5
X										174.25

Table 3: Cluster means for growth characters in rice bean

clusters numbers	X_1	X_2	X_3	X_4	X_5	X_6	X_7	X_8	X_9	X_{10}	X_{11}
I	58.15	1.95	32.50	39.50	77.00	4.30	27.55	9.34	7.94	6.28	6.05
II	54.95	1.35	31.75	38.00	76.00	4.10	31.35	9.06	7.96	6.82	4.50
III	38.31	1.62	32.00	38.25	77.25	4.05	24.17	8.50	7.46	7.04	4.94
IV	32.90	1.80	32.00	39.25	76.75	3.65	15.60	8.74	7.47	6.07	4.15
V	50.00	1.47	32.16	37.70	76.50	3.72	21.38	8.54	7.02	6.19	3.94
VI	43.40	2.15	32.00	36.50	77.50	3.90	15.75	9.04	7.55	6.12	4.80
VII	58.41	1.47	34.89	39.33	79.22	3.74	23.05	8.85	7.60	6.44	3.89
VIII	29.80	1.60	34.00	38.75	78.00	3.15	12.76	8.23	7.03	6.11	3.05
IX	38.82	1.50	32.00	37.75	75.25	3.35	19.96	9.11	7.08	6.04	3.29
X	49.65	1.65	32.50	38.33	78.75	4.05	25.10	9.27	7.60	6.52	4.68

X_1=Plant height (cm), X_2=Number of primary branches, X_3=Days to first flowering, X_4=Days 50% flowering, X_5=Days to maturity, X_6=Number of pods per cluster, X_7=Pods per plant, X_8=Pod length (cm), X_9=Number of seeds per pod, X_{10}=100 seed weight (g), X_{11}=Seed yield per plant (g).

(Table 3) revealed that cluster I had high mean value for plant height, days to first flowering, days to 50 per cent flowering, number of pods per cluster, pod length and seed yield per plant. Where as pod per plant, number of seeds per pod and 100-seed weight were highest in cluster II, number of primary branches per plant was highest in cluster VI and days to maturity was highest in cluster VII.

In the present study, it was observed that considerable amount of genetic diversity was present among the entries with respect to yield and other characters. The entries in clusters VIII and VII were genetically diverse. The superior cluster with respect to seed yield was cluster-I. The cluster I also had the highest value for pods per plant and pods per cluster which showed high correlation with seed yield, therefore genotypes grouped in this cluster are selected and can be forwarded to further generation.

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