https://doi.org/10.29321/MAJ.10.A02275

Madras Agric. J. 73 (6): 317-320 June, 1986.

MULTIVARIATE ANALYSIS OF GENETIC DIVERGENCE IN BLACKGRAM

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Twentyfour geographically diverse blackgram (*Vigna mungo* (L.) Hepper) varieties were grouped into nine clusters on the basis of multivariate analysis for nine yield traits. Characters like yield, pods/plant, plant height, seed weight and days to maturity were found to contribute much to the genetic divergence in blackgram. The genetic clustering pattern revealed the absence of parellelism between geographic and genetic diversity. Inter-cluster distances and mean cluster character values indicated that hybridization of cluster III varieties (LBG 295, LBG-296, UG-135) with cluster-VIII variety (H-76-1) would exhibit high heterosis and also result in segregants with higher yield.

Varieties with wider eco-geographic origin were generally used in hybridization programme with the assumption that their presumed genetic diversity would result in selection of promising segregants. But Murty and Arunachalum (1966) have indicated that this criterian being only inferential, there exists virtually no close correspondence between eco-geographic and genetic diversity in a number of crop plants. Multivariate analysis by Mahalanobis D^2- statistics (1936) is a powerful tool in quantifying the degree of genetic divergence between the cultivars. The importance of such genetic diversity in successful hybridization programme has been emphasized by several workers. The present investigation aims at ascertaining the nature and magnitude of genetic diversity among a set of eco-geographically diverse blackgram varieties. Such a study will help in selection of genetically diverse genotypes which, upon hybridization, would give promising segregants.

MATERIALS AND METHODS

The materials of the study consisted of twentyfour blackgram varieties of diverse geographic origin (Table-1). The experiment was conducted during *Kharif* 1983 at Bhubaneswar in RBD with four replications. The Plot-size was 5 rows of 3m. length with a spacing of 30 cm x 10 cm. and N, P and K were applied at the rate of 25, 50 and 25 Kg/ha. Observations were recorded on days to flowering and maturity on plot basis and plant height, bunches/pl., pods/pl., pod length, seeds/pod, 100-seed wt. and yield/ pl. on ten random plants per plot. Genetic divergence (D^2) between varieties were calculated by pivotal condensation method and based on the D^2 - values the varieties were grouped into clusters in Trocher's method following Rao (1952).

RESULTS AND DISCUSSION

The analysis of variance for characters showed significant differences

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among the varieties for all the characters, indicating thereby, existance of tremendous genetic variability. The D² - values between all possible 276 pairs ranged from 9.87 between UG-117 and UG-152 to 683.3 between UG-135 and JU-1, indicating highly variable genetic distances among the varieties. Yield / plant contributed the highest towards divergence in maximum number of cases (23.25 %) followed by pods / plant (17.02 %), plant, height (13.04%), 100- seed wt. (11.59%), maturity (10.14%) and seeds/pod (8.33%). Malhotra and singh (1971), in a similar study in blackgram, observed that seed yielb contributed maximum to divergence followed by pod length, 100-seed wt. and pods/plant.

On the basis of D²- values the 24 varieties were grouped into 9 clusters (Table - 1). The clusters I to VI. which had more than one variety each, comprised varieties of diverse geographic origin. These indicated the absence of parallelism between geographic and genetic diversity in blackgram. Similar non-parallelism of genetic and geographic diversity in blackgram was reported by Malhotra and Singh (1971) and Shanmugam and Rangaswamy (1982). It was because genotypes possessing similar characteristics, though far separated geographically, have come together due to prolonged selection pressure of natural and artificial forces for local adaptability. Moreover varieties from Punjab and Haryana fell into 4 clusters each, while varieties from U. P. fell into 3 clusters and those from Orissa M P. fell into 2 clusters each. Murty and Arunachalum (1966) have observed that selection pressure or genetic drift would cause greater diversity among cultivars than the geographic distances. So populations from areas with complex environments having different ecological nitches are expected to accumulate enormous genetic divergence Thus it implies that selection of genotypes for hybridization programme on geographic diversity may be quite arbitrary, for geographic diversity is not an adequate index of genetic diversity.

A comparison of inter-cluster D-values revealed that distance between I and II was the lowest (9.28). Similarly the distance between III and IX was highest (25.19) indicating them to be most divergent clusters. A general study of all the inter-cluster distances indicated that clusters IV, V, VI and smaller average distance from rest of the clusters, thereby indicating that they would be placed in the central region of the divergence digramme. In the similar light clusters, III, VIII and IX had high average distance from rest of the clusters, so would be placed in periphery of the digramme and were genetically more diverse in multivariate traits.

A close examination of mean character values of the clusters indicated that cluster VII, IX and IV had low yields due to their low values for most of the yield traits. The cluster VI varieties, inspite of their longer pods and more seeds/pod, were low yielders due to low values for pods/pl. and 100-seed wt. The clusters I, II and V had moderate yield level owing

Table 1. Cluster composition and cluster means for nine characters in blackgram.

Cluster No.	Name and geographical origin of varieties *	Days to flowering	Days to maturity	Plant height	Bunches /plant	Pods/ plant	Length of pod	Seeds /pod	100-seed wt (g)	Yield/ plant (g)
I	UG 117 (P), UG152(P), UG 198(P), B12-4(O), T 9 (U), Pant U.26(U),	34.87	77.25	32.66	6.11	17.43	3.64	5.52	3.78	3.64
II	UG 301(P), Sarala(O), Pant U 19(P), Pant U.30(P)	31.63	76.81	41.78	8.05	19.81	3.82	5.36	3.41	3.58
III	UG 135(P), LBG 295(A), LBG 296(A)	33.75	81.83	50.43	8.58	22.96	3.69	5.02	3.52	4.06
IV	UG 157(P), UH 80-4(H), UG 30-7 (H).	33.67	73.08	30.53	7.09	16.73	3.61	4.72	3.16	2.49
V	JU 77-41(M), JU 78-4(M) COBG 10(T)	34.83	75:13	40.10	5 78	14.12	4.01	5.76	4.00	3,25
VI	PH 25(H), UH 28(H)	35,13	80.00	49.35	5.12	12.69	4.22	5 83	3.31	2.45
VII	K 78(U)	38.50	79.50	51.23	3.83	11.01	3.53	4.84	3.59	1 91
VIII	H 76-1(H)	35.75	83.50	54.05	5.17	14.75	4.79	6.16	4.31	3.92
X	JU 1(M)	38.75	71.25	31.40	5.38	8.48	3.55	4.66	3.48	1.38

* Geographical origin of the varieties in parenthesis : P = Punjab, O = Orissa, U = Uttar Pradesh, A = Andhra Pradesh, H = Haryana, M = Madhya Pradesh and T = Tamil Nadu.

Table : 2. Intra-cluster (underlined) and Inter- cluster genetic distances (D-values) among nine clusters in blackgram.

Clusters	I	II	III	IV	V	VI	VII	VIII	IX	Average distance
I	*5.89*	9.28	13.77	12.66	12.95	17.73	19.25	15.78	22.75	15.52
II		*5.96*	13 59	14.55	13.03	15.11	18.90	17.92	23.95	15.76
III			*6.21*	19.78	18.47	13.91	19.81	21.13	25.12	18.20
IV				*6.69*	11.25	10.28	15.14	16 30	13.97	14 24
V					*6.95*	13.80	14.21	13.29	19.41	14.55
VI						*6.98*	11.05	14.06	16.05	14 00
VII							----	21.05	12.18	16.45
VIII								----	24.34	18.01
IX									----	19.75

to their moderate values for most of the traits. The cluster-III, which had the highest yield, had high values for days to maturity, plant height, bunches/pl. and moderate tolow values for pod length, seeds/pod and seed wt. The cluster VIII, which had the second highest yield had high values for days to maturity, plant height, length of pod, seeds/pod and seed wt. and moderate values for bunches/pl. and pods/pl. Thus these two top yielding clusters showed a great difference between them with respect to bunches/pl., pods/pl., pod length, seeds/pod and seed wt.

Though crosses involving parents belonging to most divergent clusters would be expected to manifest maximum heterosis and also wide variability in genetic architecture, the chance of geting segregants with high yield level is quite limited when one of the cluster has very low yield level. Thus if greater diversity is observed between two higher yielding clusters, then their crosses would result in segregants with better yield. In the present study the maximum genetic distance (D= 25 12) was observed between cluster III and cluster IX, which had yield levels of 4.06 (highest) and 1.38 (lowest) g/pl respectively So even though their crosses may produce wide variability, possibility of geting segregant with higher yield is very less But it was interesting to note that the two top yielding clusters III and VIII showed a relatively high inter-cluster genetic distance (D-21.13). A close examination of the characters indicated that, though both clusters showed similarity in days to flowering, maturity, plant height and yield, they showed wide diversity in yield components like bunches/pl., pods/pl., pod length, seeds/pod and seed wt. Thus crosses of cluster III varieties (LBG-295, UG-135) with cluster VIII variety (H_{70-1}) would exibit high heterosis and also result in segregants with higher yield.

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