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MULTIVARIATE ANALYSIS IN NIGER (*GUIZOTIA ABYSSINICA* CASS.)

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ABSTRACT

Genetic divergence, assessed in 15 cultivars of niger using D^2 statistic for six developmental characters, showed grouping of cultivars into seven clusters. Cluster II was the largest with 4 cultivars, followed by cluster I with three and clusters III–V with two, and clusters VI and VII with a single cultivar each. Cluster II showed maximum genetic distance from cluster V, suggesting wide diversity between these groups. Four characters, viz. days to flowering, maturity, test weight and yield, were the highest contributors to D^2 values. Four clusters consisting of nine cultivars have been judged as important for varietal improvement programme on the basis of their intercluster distances and higher cluster mean values for the aforesaid four characters.

Key words: Genetic divergence, D^2 statistic, niger.

Multivariate analysis by Mahalanobis' D^2 statistic is a powerful tool in quantifying the degree of divergence among all possible pairs of populations at genotypic level before effecting actual crosses in modelling the varieties in a desired genetic architecture. Thus, the present investigation was taken up with 15 niger cultivars to ascertain the nature and magnitude of genetic diversity present in the material.

MATERIALS AND METHODS

Fifteen cultivars of niger were evaluated in randomized block design with two replications in plots of five 5-m-long rows at 30 x 10 cm spacing during kharif 1985. Ten plants were selected randomly from each plot for recording the data on six quantitative traits. The data were subjected to analysis of variance and then multivariate analysis of D^2 statistic according to [1]. The cultivars were grouped in different clusters following Tocher's method [2]. The relative contributions of different characters towards genetic divergence were also worked out.

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RESULTS AND DISCUSSION

The significant treatment mean squares indicated adequate variability among the cultivars. On the basis of D^2 values for all possible 105 pairs of populations, the 15 cultivars were grouped into seven clusters, showing wide diversity in the population for all the characters studied (Table 1). Cluster II was the largest with four cultivars, followed by cluster I with three, and clusters III–V with two each, and clusters VI and VII with a single cultivar each, suggesting that these two genotypes were distant from others.

Clusters V and I showed the maximum and minimum intracluster distances, respectively. Thus, the two local cultivars in cluster V were most heterogenous (Table 2). Statistical distances represent the index of genetic diversity amongst clusters. As regards intercluster distances, cluster II showed maximum genetic distance from cluster V, suggesting wide diversity between these groups [3]. Clusters VI and VII were also most distantly related with cluster V. The magnitude of heterosis largely depends on the degree of genetic diversity in the parental lines. So the genotypes belonging to the distant clusters could be used in hybridization programme for obtaining a wide spectrum of variation among the segregates [4].

Table 1. Composition of clusters based on D^2 statistic in niger

Cluster	No. of cultivars	Names of cultivars
I	3	GA-5, GA-II, Raichur-70
II	4	N-33, N-35, N-71, Phulbani-2
III	2	Alasi-1, GA-2
IV	2	IGP-76, Ootkamund
V	2	Koraput Local, Keonjhar Local
VI	1	Ghoti No.2
VII	1	IGP-72

Table 2. Intra- (in bold) and intercluster D^2 values for seven clusters in niger

Clusters	I	II	III	IV	V	VI	VII
I	**8.4** (2.9)	1961.9 (44.3)	698.1 (26.4)	988.8 (31.4)	216.1 (14.7)	1200.4 (34.6)	1558.9 (39.5)
II		**35.6** (6.0)	364.8 (19.1)	207.9 (14.4)	2012.4 (44.9)	193.9 (13.9)	87.8 (9.4)
III			**29.4** (5.4)	86.2 (9.3)	891.6 (29.9)	210.4 (14.5)	220.8 (14.9)
IV				**47.6** (6.9)	1085.9 (32.9)	64.3 (8.0)	106.5 (10.3)
V					**52.3** (7.2)	1108.6 (33.3)	1787.5 (42.3)
VI						—	176.6 (13.3)
VII							—

Note. D values given in parentheses.

The highest contributors towards divergence were days to flowering and maturity, test weight and achene yield and the least contributor was capsules/plant. Patel et al. [5] reported plant height, seed yield and test weight to contribute more towards diversity in safflower. On considering cluster means in respect of the above mentioned characters (high

Table 3. Cluster means for different characters in niger

Cluster	Days to 50% flowering	Days to maturity	Plant height (cm)	Capsules per plant	1000-achene weight (g)	Achene yield (q/ha)
I	89	144	185.9	15.6	4.1	4.4
II	75	126	191.1	16.1	3.8	3.7
III	83	133	185.4	14.3	4.0	4.9
IV	76	132	194.3	15.1	4.0	3.5
V	89	144	198.9	18.2	3.5	4.6
VI	74	131	199.9	18.9	3.8	3.0
VII	73	128	190.6	16.2	4.2	3.6

contribution to D^2 values), the importance of cluster II for days to flowering and maturity, cluster III for capsules per plant and yield, cluster V for yield, and cluster VII for test weight became obvious (Table 3). In terms of intercluster distance and characters with high contribution to D^2 values, there is scope for varietal improvement through hybridization programme between the two local cultivars of cluster V and cultivars from clusters II and VII.

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