Multivariate analysis in chilli (*Capsicum annum* L.)

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ABSTRACT

Thirty genotypes of chilli (*Capsicum annum*) were studied for genetic divergence for eight characters utilizing Mahalanobis D^2 statistics. The genotypes were grouped into seven clusters. The genotype GP-65(A) was quite different and formed cluster VII. Variability in this material was limited and was mainly due to a few extreme types. The genotype(s) in clusters II, V and VII had the highest dry yield per plant and higher values for fruits per plant, fruit length and days to flower and could be utilized in breeding programmes.

Key words : *Capsicum annum*, chilli, multivariate analysis.

Chilli (*Capsicum annum* L.) has a large varietal diversity in North Eastern India. Studies indicate sufficient genetic diversity for various yield contributing traits. Genetic diversity is one of the most important criteria which helps a breeder to choose parents for hybridization either to exploit heterosis or select desirable segregants. The importance of cluster analysis to determine the extent and nature of variability was reported earlier by Cuartero *et al.* (1983) and Deshpande, Anand & Ramchander (1988). The present investigation attempts to assess and analyse the extent and nature of genetic diversity in a set of thirty genotypes of chilli in respect of eight economic characters influencing yield using Mahalanobis D^2 statistics.

Thirty diverse genotypes of chilli collected from Meghalaya, Assam, Nagaland and Tripura were grown during *Kharif* 1989 in a Randomised Block Design with three replications. Twenty five day old seedlings were transplanted at a spacing of 45cm x 30cm and five randomly selected competitive plants were observed for eight characters. The mean values of these five plants were utilized for statistical analysis. Treating D^2 values as generalized distance (Mahalanobis 1936), the genotypes were grouped into clusters following the method described by Rao (1952).

The analysis of variance indicated highly significant differences among genotypes for the eight characters studied. The

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analysis of dispersion for the significance of differences in the mean values of eight correlated variables using Wilk's criteria (0.000008) revealed highly significant differences among the genotypes for the aggregate of eight characters (Chi square = 953.28 at 232 df). The 30 genotypes were grouped into 7 clusters. There were 14 genotypes in cluster I, 4 each in clusters II and III, 3 in cluster IV, 2 each in clusters V and VI and 1 in cluster VII (Table 1). The genotype GP-65 was unique and divergent and could not be grouped into any cluster and formed a separate cluster VII. This genotype was identified as having the highest mean values for dry yield per plant (69.50 g) and leaves (144.67) and was divergent from rest of the clusters and thus could be ideal choice to be used as donor in a hybridization programme. Cluster VI had the highest mean value for plant height (43.35 cm), fruits per plant (9.64) and fruit diameter (4.71 cm) with higher mean values for fruit length, plant height and branches per plant. The highest mean value for fruit length was observed in cluster V (5.00 cm) followed by cluster VI (4.96cm). In general, the genotypes in cluster VI had higher mean values for most of the characters studied except that they were poor yielders (34.40 g). The genotypes of these clusters may be utilized for breeding varieties for higher yield as these characters are known to influence yield in chilli (Shah,Lal & Pant 1986).

Table 1. Cluster means for 8 characters in 30 genotypes of chilli

Cluster	No. of genotypes	Genotypes included*	Days to flower	Plant height (cm)	No. of leaves/ plant	No. of branches/ plant	No. of fruits/ plant	Fruit length (cm)	Fruit diameter (cm)	Dry yield/ plant (g)
I	14	BD-77(M), NH/19(N), BD-127(M), BD-213(M), BD-10(M), BD-107(M), BD-180(M), BD-139(M), HP-67(A) H-784(T), H-957(T), BD-240(M) BD-135(M), BDS-847(T)	40.55	39.52	86.93	4.14	4.56	4.49	3.95	29.17
II	4	BD-183(M), BD-45(M), NH6/9(N), BD-188(M)	43.50	38.48	64.02	3.97	5.39	4.15	4.00	69.78
III	4	MNCH/64(A), BD-35(M) H-138(A), BD-220(M)	75.33	33.68	74.61	3.65	4.01	4.69	3.55	25.95
IV	3	BD-210(M), H-141(A), H-835(T)	47.22	28.66	55.34	3.77	5.12	4.49	3.44	13.10
V	2	BF-273(M), H-140(A)	59.50	38.93	62.98	3.42	6.04	5.00	3.85	55.10
VI	2	BD-273(M), GP-69(A)	47.50	43.35	108.57	3.97	9.64	4.96	4.71	34.40
VII	1	GP-65(A)	49.67	36.20	144.67	3.00	5.40	3.33	3.19	69.50

* M = Meghalaya, A = Assam, N = Nagaland, T = Tripura

The inter and intra cluster genetic divergence (D^2) values among the seven clusters is presented in Table 2. The genetic divergence values ranged from 8.22 between cluster II and VII to 21.28 between clusters IV and VII.The magnitude of genetic divergence was rather low and cluster I included 14 out of 30 genotypes studied. This suggested low variability and presence of a few extreme type(s) for the traits under study. Cluster VII was quite divergent from the remaining clusters except that it was relatively close to clusters II and V. Hence, the genotypes from this cluster, if utilized in a hybridization programme, might yield desired heterosis and release variability in subsequent generations. However, crossing very diverse genotypes may not yield proportionate heterotic response because a cross between extremely divergent parents might create a situation wherein the harmonious functioning of alleles is somewhat disturbed and consequently the physiological function may not be so efficient as in a situation where the alleles were exposed to similar selection pressure. This suggests that the selection of parents preferably should also be based upon their per se performance,stability and combining ability (Arunachalam *et al.* 1980; Prasad & Singh 1986; Dobhal, Murty & Rao 1989).

The 30 genotypes, collected from different states of North Eastern India, did not show any specific trend in clustering pattern. The genotypes, in general, belonging to the same geographical area, fell in different clusters and showed different genetic identity. This indicated that there was no relationship between geographic and genetic diversity. This may be attributed to differential selection pressure applied by the farming community for developing varieties suiting to their preference and needs.

Table 2. Intra- and inter-cluster divergence values among seven clusters in chilli

Cluster	I	II	III	IV	V	VI	VII
I	*4.99*	15.21	11.78	8.72	11.50	8.55	15.98
II		*5.89*	18.69	20.58	9.49	13.72	8.22
III			*6.18*	11.08	11.93	11.26	17.79
IV				*3.81*	16.32	10.50	21.28
V					*3.75*	9.85	8.36
VI						*7.81*	14.07
VII							*0.00*

Figures in italics denote intra-cluster divergence values

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