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RELATIONSHIP BETWEEN GENETIC DIVERGENCE AND PHENOTYPIC STABILITY IN CHICKPEA

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ABSTRACT

In this investigation, by and large, genotypes included in the same cluster had identica means but the linear responses were not the same. However, genotypes included in the same cluster had almost identical non-linear responses. Therefore, grouping of material into different clusters based on regression analysis was found to be reliable as that of Mahalanobis' D^2 Statistic.

For the improvement of any crop species the genetic diversity for characters of economic importance is almost a prerequisite for a plant breeder to start with. Similarly, the stability of productivity of the varieties developed by him is equally important. Therefore, the role of genetic diversity in breeding for wide adaptation is of paramount importance for an efficient breeding programme. There are a few published reports in other crops in literature but such an information on chickpea is lacking. The present investigation was carried out to understand the relationship between genetic divergence and phenotypic stability for seed yield in chickpea.

MATERIALS AND METHODS

The material used in this study included 32 chickpea genotypes of diverse origin. This material was evaluated in six environments in a randomized complete block design (RBD) with three replications each at *Pantnagar*, *Nagina* and *Bulandshahar* during 1976-77 and 77-78 crop seasons. Therow to row and within row distance was kept at 30 cm and 10 cm, respectively. Each plot consisted of four rows five meter long. Five competitive plants from each experimental plot were randomly taken for recording the observations. Plot means were used for the statistical analyses. The data were collected on ten quantitative characters but data on yield/plant are reported in this paper. Genetic divergence (D^2) was calculated as described by Rao (1952) and stability parameters were estimated following Eberhart and Russell (1966).

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RESULTS AND DISCUSSION

The mean performance, linear and non-linear responses for seed yield of genotypes falling in different clusters in the pooled data are given in Table 1.

TABLE 1

Mean and stability of 32 chickpea genotypes for seed yield/plant comprising different clusters

Cluster No.	Genotypes	Origin	X_i	b_i	S^2_{di}
1.	P—3552	Iran	M (9.68)	1 (0.85)	7.33**
	K—468	Uttar Pradesh	M (8.74)	1 (0.82)	3.94
	G—130	Punjab	M (8.06)	1 (0.53)	0.83
	NEC—240	U.S.S.R.	M (8.21)	<1 (0.49)*	3.86
	H—208	Haryana	M (7.96)	<1 (0.43)*	9.65**
	B—110	West Bengal	M (10.88)	1 (1.35)	6.23*
	NEC—1639	Pakistan	M (9.52)	1 (0.59)	4.42*
	Pant G—110	Uttar Pradesh	M (10.41)	1 (0.66)	2.66
	Hima	Haryana	M (8.47)	1 (0.79)	7.15*
2.	850-3/27	Utter Pradesh	H (14.12)	1 (1.09)	16.02**
	Kaka	Iran	L (6.48)	<1 (0.37)*	0.77
	P—3896	Iran	M (8.59)	1 (0.85)	—1.22
3.	P—840	Moracco	M (11.75)	>1 (1.47)*	24.30**
	Annigeri—1	Karnataka	H (13.49)	>1 (2.10)**	9.56**
	P 1081—1	Nigeria	H (12.49)	1 (1.45)	13.67**
	V—4	Mexico	M (12.05)	>1 (1.71)**	7.30**
4.	P—896	Afganistan	L (7.32)	1 (0.51)	6.71*
	JG—62	Madhya Pradesh	L (7.15)	1 (1.10)	0.47
	Giza	Egypt	M (7.83)	1 (0.67)	8.42*
	Pink—2	Madhya Pradesh	M (7.83)	<1 (0.53)	3.59
5.	USA—613	U.S.A.	H (12.40)	1 (1.14)	10.67**
	P—2974	Iran	H (12.68)	>1 (1.68)**	4.90*
	Radhey	Uttar Pradesh	H (13.41)	1 (0.97)	19.37**
	L—532	Punjab	H (12.98)	>1 (1.51)**	12.48**
6.	NEC—1604	Egypt	M (9.09)	1 (0.57)	8.05*
	Hyb. 16—3	Utter Pradesh	M (7.57)	1 (0.75)	4.67*
	L—550	Punjab	M (9.69)	1 (1.00)	5.72*
	K—4	Uttar Pradesh	M (12.01)	>1 (2.01)**	1.89
7.	GL—651	Punjab	M (8.22)	1 (0.94)	1.79
8.	NEC—1607	Lebanon	H (12.36)	1 (0.79)	24.51**
	Jam	Iran	M (9.65)	1 (0.82)	7.30*
	NEC—10	Jordan	M (9.42)	1 (1.35)	2.60

H=High yield (12.2g and above/plant); M=Medium yield (7.82 to 12.1 g/plant); L=Low yield (Below 7.8 g/plant).

b<1, 1 and >1=Regression coefficient significantly lower, equal and greater than 1, respectively.

*=Significant at 5 per cent level

**=Significant at 1 per cent level

A close persual of the table revealed that, by and large, genotypes grouped in a single cluster had almost identical means. Linear responses of genotypes in a cluster were not identical. However, some similarity in non-linear responses of genotypes included in a cluster was observed. This suggested that genetically diverse material can be effectively selected using non-linear function as one of the criteria of classification and *vice versa.*

Nine genotypes were included in cluster 1. Of these, 6 genotypes were of Indian origin and three genotypes (P-3552, NEC-240 and NEC-1639) came from Iran, USSR and Pakistan, respectively. These genotypes possessed average yield with $S^2_{di}>0$. On the contrary, cluster 2 comprised three genotypes which had low to high yield, and b_i values ranged from 0.37 to 1.47. Only one genotype (850-3/27) had non-linear response significantly greater than zero. Cluster 3 consisted of four genotypes. Of these, Annigeri-1 and P-1081-1 possessed high yield with $S^2_{di}>0$. Four genotypes, viz. P 896, JG-62, Giza and Pink-2, occupied cluster 4. Two genotypes, namely, P 896 and JG-62, were low yielders and Giza recorded $S^2_{di}>0$. Cluster 5 included four genotypes (USA-613, P 2974, Radhey and L-532). All of them had high yield and non-linear sensitivity coefficients were significantly greater than zero. Similarly, cluster 6 had four genotypes. All of them recorded average yield and possessed $S^2_{di}>0$ except K-4. Only one genotype (GL-651) constituted cluster 7. This genotype had average yield and $S^2_{di}=0$. Three genotypes were included in cluster 8. Of these NEC-1607 recorded high yield. Jam and NEC-10 belonged to average yielding group. NEC-1607 and Jam showed $S^2_{di}>0$ and NEC-10 had $S^2_{di}=0$.

Several studies have been conducted on these two aspects in different crops. However, only a few workers have tried to understand the relationship between these two analytical procedures (Rana and Murty, 1971; Verma *et al.*, 1973; Peter, 1975; Jag Shoran, 1982). In the present investigation it was observed that, by and large genotypes included in the same cluster had identical means but linear responses were not similar. However, genotypes included in the same cluster had almost identical non-linear responses. From this relationship it can be concluded that either of the analyses may be effectively used to select diverse parents for any crossing programme. These results further support the views of Verma *et al.* (1973), Peter (1975), and Jag Shoran (1982) that the grouping on the basis of regression analysis for seed yield to select genetically diverse parents was almost similar to that of multivarite analysis (D^2 statistic).

REEFRANCES

Eberhart, S.A. and W.A Russell (1966). Stability parameters for comparing varieties. *Corp Sci.*, **6** : 36-40.

Jag Shoran (1982). Note on the relationship between genetic divergence and phenotypic stability in pigeonpea. *Indian J. agric. Sci.*, **52** : 862-63.

Peter, K.V. (1975). Genetic analysis of certain quantitative charaters in tomato. (*Lycopersicon esculantum* Mill.) Ph.D. thesis, G.B.P.U. A & T, Pantnagar (Unpublished).

B.S. Rana, and B.R. Murty (1971). Genetic divergence and phenotypic stability for some characters in the genus sorghum. *Indian J. Genet.*, **31** : 345-356.

C.R. Rao (1952). Advanced statistical methods in Biometric Research. John Wiley & Sons, New York.

Verma, M.M., B.R. Murty and H.B. Singh (1973). Adaptation and genetic diversity in soybean II. Genetic diversity and relationship with adaptation. *Indian J. Genet.*, **33** : 326-333.