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INVESTIGATION OF GENOTYPE X ENVIRONMENT INTERACTION FOR SEED YIELD IN CHICKPEA (*CICER ARIETINUM* L.)

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Abstract

The stability analysis in 14 genotypes for seed yield of chickpea was performed and response of G x E interaction was evaluated. The linear component of interaction was more important than non linear component. CM 72 and C 44, being high yielding and less susceptible to the changes in the environment, were found to be most suitable and adaptable genotypes.

Introduction

Chickpea (*Cicer arietinum* L.), third largest food grain legume of the world (Anon., 1980), is considered to be very sensitive to environmental changes since the yield shows high fluctuations under different environments. A knowledge of the genotype x environment interaction is therefore important in understanding the stability in yield of a particular variety when it is used in breeding programmes. The present study was designed to determine the grain yielding ability, magnitude and nature of G x E interaction and stability characters of 14 elite genotypes of chickpea tested under different environmental conditions.

Materials and Methods

Fourteen genotypes of chickpea were grown at 6 locations viz., Islamabad, Faisalabad, Dokri, Karak, Kalur Kot and Serai Naurang in Bannu during 1985-86. The experiment was laid in randomized complete block design with 4 replications. Row to row distance was 30 cm with plant to plant spacing of 10 cm. Data on yield per plot (g) was converted to Kg/ha and analysed for stability parameters according to the method suggested by Eberhart & Russel (1966) on VAX 11/780 computer of International Crop Research Institute for the Semi Arid Tropics (ICRISAT). Heritability and genetic advance were calculated using the formula given by Allard (1960).

Results and Conclusions

Analysis of variance showed highly significant differences among the genotypes and environments for seed yield (Table 1), which indicates the presence of genetic variability in the genetic material as well as environments under study. The genotype x environment

Table 1. Pooled analysis of variance for seed yield in chickpea.

Source of Variation	D.F.	M.S.
Genotypes (G)	11	90657 **
Env. + (G x E)	60	1036335 **
Environment (Linear)	1	52280136 **
G x E (Linear)	1	188331 **
Pooled deviation	48	19340
Pooled error	198	1635
Heritability	= 0.49	
Genetic Advance	= 74.8	
Genetic Advance expressed as % age of mean	= 5.6%	

** = P < 0.01

interaction was also highly significant. Partitioning of genotype x environment interaction into linear [G x E (Linear)] and non linear (Pooled deviation) components revealed that both were highly significant and thus important in determining G x E interaction. Relatively higher value of the linear component as compared to non linear one, suggested the possibility of prediction of performance for seed yield over the environments. Higher values of the linear component as compared to non linear one has been reported (Khan *et al.*, 1987; Jindal *et al.*, 1985; Jain *et al.*, 1984; Yadav & Tomar, 1985). In the present studies, genetic advance expressed as percentage of mean was very low, which is a result of low mean yield.

Finlay & Wilkinson (1963) suggested linear regression slope as a measure of stability. Eberhart & Russel (1966) and Paroda & Hayes (1971) emphasized that both regression and deviation are important for the estimation of phenotypic stability. The linear component (bi) was significantly different for most of the genotypes, whereas the non linear component (Sd) was significant for a few genotypes (Table 2), indicating that most of the G x E interaction was linear in nature.

The highest yield was recorded for CM 68 (1774 Kg/ha), followed by CM 72 (1772 Kg/ha). CM 68 performed well only under favourable environments as reflected by the above unity regression (bi = 2.41) and highly significant deviation from linearity (Sd = 92.1). The other high yielding genotypes viz., PK 51821, CM 1, RC 32 and NEC 138-2 were also sensitive to environmental changes. However, RC 32 had non significant deviation from regression and was adapted to favourable environments with little deviation from a linear response to environmental changes. Only two genotypes, CM 72 and C 44 had above average yield, unity regression and non significant deviation values. Two

Table 2. Estimates of stability parameters for seed yield in chickpea.

S.No.	Genotype	X	bi	Sd
1.	CM 72	1772	1.01	2.0
2.	CM 68	1774	2.41*	92.1**
3.	NEC 138-2	1388	3.15**	33.2**
4.	C 44	1218	1.02	1.9
5.	CM 88	1327	-0.22*	45.0**
6.	CM 1	1499	4.19**	29.2**
7.	ICC 11514	1198	1.59*	6.1
8.	PK 51821	1461	3.66**	68.1**
9.	RC 32	1402	1.34*	5.4
10.	GL 769	1219	1.72*	4.1
11.	ILC 202	819	1.04	3.4
12.	ILC 3279	906	1.03	4.6

* and ** Significant when tested against pooled deviation mean square at $P < 0.05$ and 0.01, respectively.

kabuli lines ILC 202 and ILC 3279 had low yields but these were stable having unity regression and non significant deviation from linearity.

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