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Multilocation Performance of Greengram (*Vigna radiata* (L). Wilczek) Cultivars in Tamil Nadu

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The interaction of genotypes with environment for grain yield was studied by growing four genotypes of greengram in three locations ever two years under rainfed conditions, and the genotype-environment interactions were found to exist. Mutant-2 was found to show high phenotypic stability, and also high yielding in all the environments. Development of high yielding line coupled with stability over the environments through mutation breeding is indicated.

Stability of a variety over a wide range of environments has considerable significance in crop improvement. Methods have been developed to estimate the magnitude of genotype x environment interactions (Finlay and Wilkinson, 1963;Eberhart and Russell, 1966;Perkins and Jinks, 1968). In this investigation attempts have been made to study the genotype x environment interactions for yield of greengram so that selection of more stable and superior genotypes could be possible.

MATERIAL AND METHODS

The experimental materials consisted of four promising greengram varieties namely Co. 1, Co. 2, Co. 3 and Mutant - 2 selected on the basis of their grain yield. The experiments were conducted during monsoon season of 1973 and 1974 at Coimbatore, Bhavanisagar and Aliyarnagar under rainfed conditions. The materials were sown in a randomised blocks design comprising four replications. Data on the yield of grain were obtained from each plot of 5 m x 2.4 m. The pooled data were first subjected to the analysis of variance to test the significance of genotype x environment interactions. Various stability parameters were estimated using models proposed by Eberhart and Russell (1966) and Perkins and Jinks (1968). Ecovalence was calculated as suggested by Wricke (1962).

RESULTS AND DISCUSSION

Mean grain yield in kg/ha for the four genotypes of greengram studied in six environment are presented in Table 1. On the basis of environment mean values, clear differences in yield were found to exist in different environments. The highest yield was recorded during monsoon 1973 at Coimbatore, whereas comparatively poor yields were obtained in the same year in the other two locations. Similar trend was observed in 1974 also but the difference in magnitude was not so high. Among the genotypes, Mutant-2 recorded the highest mean yield followed by Co.3.

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The pooled analysis of variance revealed that the different components viz., genotype, environment, genotype x environment interaction, environment plus genotype x environment intraction, environment linear, genotype x environment linear as well as pooled deviation were significant at one percent level when tested against the pooled error. The mean differences between the genotypes and the environments were highly significant when tested against GxE interaction. The G x E (linear) was high in proportion than the non-linear. The pooled analysis, thus indicated the differential yielding potential of the genotypes in different envrionments and the feasibilitly of production of genotypes across the environments.

Finlay and Wilkinson (1963) considered linear regression slopes as a measure of stability. Eberhart and Russell (1966) emphasized the need of considering both the linear and non-linear components of genotype x environment interactions in judging the phenotypic stability of a genotype. Samuel *et al.* (1970) and Paroda and Hayes (1971) emphasised that the linear regression should simply be regarded as a measure of the response of a particular genotype and the deviation from the regression line should be considered as a measure of stability; genotypes with the lowest deviation being the most stable and *vice versa*. Luthra and Singh (1974) suggested ecovalence for predicting stability of genotypes.

The regression coefficient(b_E) was around unity for CO. 2, CO. 3, and Mutant-2 and it was less than unity in the case of CO 1 (Table 2). The order of ranking of various genotypes, both with respect to response and stability was the same under Eberhart and Russell (1966) as with Perkins and Jinks (1968) models. This was expected because the latter model, being b_E-1 is in no was different from the former. The varieties CO 3 and Mutant-2 which had low ecovalence and S_b values, can be considered as more stable genotypes. Among these two, Mutant-2 was high yielder than CO 3. Interestingly Mutant-2 was evolved from CO. 1 through irradiation of the seeds with gamma rays (80 krad) and by further selection in M_3 to M_6 generations for polygenic variability. The evolved genotype, Mutant-2 not only differed in yield but also in stability over years and locations from the parental type CO. 1. Hence CO. 3 and Mutant-2, besides their utility as commerical strains, could further be exploited in breeding superior stable types of greengram suitable for rainfed culture.

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Table 1 Sced yield (kg/ha) of four genotypes of greengram at three locations under rainfed conditions

Variety	Environments						Mean of the variety
	1973			1974			
	Coimbatore	Bhavanisagar	Aliyarnagar	Coimbatore	Bhavanisagar	Aliyarnagar	
CO. 1	1205	361	417	833	1103	1056	829.2
CO. 2	1461	292	229	750	256	550	589.7
CO. 3	1569	433	379	1143	679	350	842.2
Mutant-2	1624	411	607	1190	1422	1016	1045.0
Environmental mean	1465	374	408	976	865	868	826.5
Euvironmental index	638.5	—425.5	—418 5	152.5	38.5	41.5	—

Table 2. Estimates of different stability parameters

Variety	Regression coefficient		Ecovalence		Mean yield (kg/ha)
	b^E	B_i	S_b		
CO. 1	0.7921*	—0.2079*	0.1892	1,81,111.3	829.2
CO. 2	1.0465	0.0465*	0.2349	2,26,686.8	589.7
CO. 3	1.0846	0.0846**	0.1307	75,481.3	842.2
Mutant-2	1.0752	0.1752**	0 y331	1,56,471.5	1,045.0

* Significant deviating from unity at per cent level

b^E —Eberhart and Russel (1966) model

B_i —Perkins and Jiuks (1969) model $(b^E - 1)$