Indian J. Genet., **43**: 478–480 (1983)

PHENOTYPIC STABILITY OF LATE MATURING ARHAR GENOTYPES

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ABSTRACT

Fifteen genotypes of arhar (*Cajanus cajan* L.) were evaluated for stability of grain yield for four years at Sabour. The genotype × environment interactions were found significant and its major portion was due to non-linear component. Considering the mean square deviation as the measure of stability, it was found that high yielding lines like 'SB 58', 'K 28' and 'Bahar' were unstable. The varieties 'SB 3' and 'Basant' showing medium yield performance were found stable and most desirable.

BREEDERS are confronted with the problem of evolving crop varieties which can be grown over a range of environments. This is even more important in case of pulses which are traditionally grown in more diverse soil and climatic conditions. One of the major factors responsible for low yield of pulses is the lack of stability in yield as compared to cereal crops. Information about the genotype × environment interaction and stability of genotypes is scanty in case of *arhar* which is an important pulse crop. In the present investigation the phenotypic stability of a few late maturing lines of *arhar* have been compared in order to ascertain whether the strains differ in their response to environment and stability.

MATERIALS AND METHODS

Fifteen diverse, and late maturing genotypes of *arhar* were grown from 1978 to 1982 at the Sabour Farm of Rajendra Agricultural University, Bihar, during *kharif*. The varieties were sown in a randomised block design with four replications. A plot consisted of 8 rows 4·8 m long spaced at a distance of 75 cm apart. Plant to plant distance was 25 cm. All cultural practices of commercial crop were followed during the entire growing season. Yield data were recorded on plot basis. Stability parameters were computed using the model proposed by Eberhart and Russell (1966).

RESULTS AND DISCUSSIONS

Mean yield and stability parameters are given for fifteen genotypes in Table 1. 'SB 58' followed by 'K 28' and 'Bahar' recorded the highest yield whereas 'T 7' recorded lowest yield. Environmental mean values indicated that the performance of genotypes were best in E 2(1979–80) and poorest in E 1(1978–79). The environmental means varied from 6·58 Q/ha to 14·82 Q/ha.

Pooled analysis of variance showed that varieties were significantly distinct in respect of grain yield. Highly significant mean square due to genotype × environment interaction revealed that the genotypes interacted considerably

with environmental conditions that varied from year to year. Partitioning of mean square due to genotype × environment interactions into linear and non-linear components revealed that major proportion of interaction could be attributed to the non-linear component. Linear component was significant when tested against pooled error only. This indicated that the prediction of performance of genotypes in different environments would be difficult.

TABLE 1

Stability parameters of fifteen arhar genotype tested in four environments

Genotype	Yield Kg/ha					bi	S^2d
	E_1	E_2	E_3	E_4	Mean		
SB 58	752	1609	984	1538	1221	0.179	0. 580**
PS 41	336	1134	810	583	715	0.772	0.1693**
T 7	394	1285	483	375	634	1.137	0.0026
K 23	555	1273	694	676	799	0.803	0 0053
K 16	347	1273	671	722	753	0.959	0.0669
K 28	914	1678	1447	803	1215	0.814	0.5266**
NP (WR) 15	637	1238	949	635	865	0.658	0.1148**
T 17	613	1157	1019	612	850	0.545	0.2146**
SB 16	845	1737	266	873	930	1.382	0.5966**
7 S	833	1737	625	728	980	1.290	0.1046**
Bahar	787	1678	579	1122	1042	1.139	0.2606**
SB 3	775	1551	926	664	979	0.982	0.0852
Basant	671	1643	550	832	924	1.263	0.0499
K 3	520	1620	787	641	892	1.286	0.0192
35/16	891	1620	266	931	927	1.186	0 6817**
Mean	658	1482	742	782	915	—	—

**Significant at 1% level; Significant at 5% level.

Eberhart and Russell (1966) have suggested two stability parameters i.e. (i) linear regression and (ii) deviation from such regression. Jatsara and Paroda (1980) have emphasized the use of deviation from regression alone as a measure of stability whereas the linear regression could be treated as a measure of varietal response. A stable variety will, thus have, lowest deviation around the regression line and *vice versa*. Accordingly, the mean and deviation from regression of each genotype were considered for stability and linear regressions were used for testing the varietal response. Out of fifteen genotypes investigated six had non-significant S^2d for grain yield. 'SB 58' possessed the highest mean yield followed by 'K 28' and these genotypes were characterized as non-responsive and unstable as evidenced from low value of regression (b) and the significant values

of S^2_d Varieties 'Bahar' and '7 S' which ranked 3rd and 4th in mean yield performance were responsive to environmental changes and unstable as they were associated with significantly high value of S^2_d. The mean yield of 'SB 3' was higher than grandmean and it showed average response ($b=0\cdot982$) and stability of yield performance. 'Basant' appeared stable and highly responsive to better environments. Thus varieties 'SB 3' and 'Basant' could be grown in relatively wider range of environments with an average expected yield. 'T 7' and 'K 23' showed below average performance and were stable as measured by non-significant S^2_d The results thus revealed that most high yielding lines under test were unstable. However, some varieties which gave above average response were stable. This indicates the possibility of identifying strains of late maturing *arhar* with medium to high yield when a large number of lines are tested across several environments.

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