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GENOTYPE x ENVIRONMENT INTERACTIONS FOR SEED YIELD IN CASTORBEAN

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Twelve promising genotypes of castorbean (*Ricinus communis* L.) were evaluated for seed yield during monsoon season of 1978, 1980, 1981 and 1982. Genotype x environment interactions were significant indicating the differential response of genotypes. A major portion of the interaction was accounted for by the presence of linear component although non-linear component was also significant. The genotypes (Aruna) and (279) appeared best suited for favourable growing seasons, whereas genotypes 157B and R 63 gave stable performance under fluctuating environmental conditions.

Genotype x environment interactions have an important bearing on the selection of varieties over wide range of environments. The larger the interaction the lesser are the chances of progress under selection in a breeding programme. Therefore, need for identification of stable varieties is obvious. Till now no information on these aspects is available in case of castorbean (*Ricinus communis L.*). In the present investigation, attempts have been made to study the genotype environment interactions for seed yield (q ha) so that selection of more stable and superior genotypes would be possible in castorbean.

MATERIALS AND METHODS

The performance of 12 genotypes of castorbean, collected from castor growing areas of the country, was tested during monsoon seasons of 1978, 1980, 1981 and 1982. The experiment was laid out in a randomized block design with three replications. The plot size was kept 21.6 m^2 during all the seasons with row spacing maintained at 60 cm. The crop received a basal dressing of @ 20 kg N/ha and 40 kg P/ha and top dressing of 20 kg N/ha after one month of sowing in all seasons.

The stability parameters of genotypes were computed on the basis of mean performance over years, using statistical model suggested by Eberhart and Russell (1966).

RESULTS AND DISCUSSION

Mean grain yield (q/ha), regression co-efficient (b) and deviations from regression ($\bar{S}^2d$) for the 12 genotypes are given in Table 1. In general, genotypes performed well in monsoon season of 1978 and 1980 because of good rainfall distribution seasons but yield levels were low in 1981 and 1982 due to acute drought conditions. The environmental conditions prevailed, differed considerably during all monsoon seasons.

The test for homogeneity of variances indicated that error variances were homogeneous. Analysis of variance for grain yield revealed significant

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differences among the genotypes and the environments. The significant genotype-environment interactions revealed that the genotypes showed different years. A major portion of these interactions was accounted for by the presence of linear component although non-linear component (deviation) was also significant (Table 2). The significance of the latter appeared to be due to the presence of genetic variability among the material tested (Perkins and Jinks, 1968; Paroda and Hayes, 1971; Paroda *et al*, 1973). An ideally adaptable variety would be the one having high mean value, unit regression coefficient (b=1.0) and a deviation from regression as small as possible($\bar{S}^2d$ = 0) (Eberhart and Russell, 1966). Accordingly, the response as well as deviation from regression of each genotypes were considered separately.

The perusal of data in Table 1 revealed that genotypes 157B and R 63 were the most stable with regression value approaching to unity and less deviation from regression. However, these genotypes were not the highest yielders although the mean yield over all environments was in the range of 5.28-5. 43 q/ha. The genotypes Aruna and 279 had high mean yield and were more responsive to favourable environments as reflected by high 'b' values. These genotypes were also found stable as these had low deviation values from regression. The genotypes GAUGH 1 and GAUC 1 have high mean yield, however, deviation from regression was significant and hence, were not stable. Excepting PLG 104 rest of the genotypes had low mean yield and were responsive to less favourable growing seasons as reflected by low 'b' values (b<1) and

Table 1. Mean yield (q/ha) and 2 parameters of stability of 12 genotype of castorbean.

Genotype	1978 (297.7mm)	1980 (239.0mm)	1981 (238.0mm)	1982 (195.0mm)	Mean	b	$\bar{s}^2d$
Aruna	15.9	8.3	4.0	4.4	8.15	1.48**	−0.265
33-1-21	7.3	5.7	1.7	2.3	4.25	0.70	0.170
1-31	6.5	5.9	2.2	1.9	4.13	0.59*	0.919
Mauthner's dwarf	5.5	4.4	2.4	2.0	3.58	0.43**	−0.259
15 B	9.9	6.0	2.4	2.8	5.28	0.93	−0.440
R 63	9.9	5.9	3.0	2.9	5.43	0.88	−0.444
279	17.7	6.9	1.7	2.9	7.30	1.93**	1.434
GAUC 1	15.3	6.0	3.0	3.1	6.85	1.52**	1.800*
GAUCH 1	18.2	7.8	3.9	3.9	8.45	1.78**	1.821*
13 A	6.5	5.6	2.2	2.8	4.28	0.53**	0.203
PLG 104	6.2	6.7	1.9	2.9	4.43	0.53**	2.178*
1-4	7.7	4.6	2.6	2.0	4.23	0.69	−0.459
Mean	10.6	6.2	2.6	2.8	5.53	1.00	
SEm ±	1.36	0.43	0.29	0.17	0.60	0.16	
CD 5%	3.97	1.26	0.85	0.51			

* P = 0.05; ** P = 0.01

Note : Figures in parentheses indicate amount of rainfall received during cropping seasons.

small deviation from regression. The genotype PLG 104 had high deviation value from regression and hence was unstable.

Prediction of phenotypic mean performance across genotypes as well as across environments had established the practical utility of studies on parameters of stability (samuel *et al*, 1970; Paroda *et al*, 1973 and Karwasra *et al.*, 1975). The studies of this kind help a breeder in selecting the most satble genotypes along with a desired response which would largely depend on the environmental conditions with which he is confronted. In the present material genotypes Aruna and 279 appeared to be best for favourable environmental conditions, while genotypes 157B and R 63 were the most stable genotypes under fluctuating environmental conditions and hence it could judiciously be made use of in breeding programme.

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Table 2. Analysis of variance for genotype x environment for grain yield of castorbean.

Source	d. F.	Mean square
Genotype	11	11.737**++
Env. + (var. x env)	36	18.182**++
Env. (linear)	1	499.016**++
Genotype x env. (linear)	11	11.76 **++
Pooled deviation	24	1.090*
Pooled error	96	0.536

** P = 0.01 against pooled error

* P = 0.05 against pooled error

++ P = 0·01 against pooled deviation

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