both S^2d and r^2 were taken into consideration.

Considering the average yield of the genotypes, UG 301 gave the maximum yield of 6.62 q/ha and was at par with OBG 2, UH 28, OBG 1, UG 191 and T 9, which yielded more than 6.1 q/ha. The genotypes UG 301, UH 28, UG 298, JU 77-41, Sarala and OBG 7 showed bi-values of 1.4 to 1.7 indicating their better adaptation to rich environments. Stability of yield of the genotypes were high for UH 28, UG 298, and Sarala, moderate for UG 301 and low for JU 77-41 and OBG 7. The genotypes OBG 2, OBG 1, UG 191, Pant U 30 and OBG 10 showed b values of around 1.0 (0.9-1.2) indicating that these are well adapted to all types of environments. Stability of genotypes was high for OBG 2, OBG 1, UG 191 and moderate for Pant U 30 and OBG 10. The low bi-values (less than 0.6) of T 9 and OBG 3 indicated their better adaptation to poorer environments. Stability of yield was moderate for T 9 and low for OBG 3. Rest of the genotypes had lower average yield (less than 5.6 q/ha) and showed moderate to low yield stability.

Thus considering average yield, adaptation and stability, the genotypes UG 301, OBG 2, UH 28, OBG 1, UG 191 and T 9 had high average yield (6.1 to 6.62 q/ha) and moderate to high stability of yield performance under varied environmental conditions. Of these genotypes UG 301 and UH 28 were better adapted to rich environments. while T 9 was better suited for poorer environments and OBG 2, OBG 1 and UG 191 were well adapted to all environmental conditions.

REFERENCES

BILBRO, S.D. and RAY, L.L. 1976. Environmental stability and adaptation of several cotton cultivars. **Crop Sci., 16:** 821-824

EBERHART, S.A. and RUSSELL, W.A. 1966. Stability parameters for comparing varieties. **Crop Sci., 6:** 36-40.

FINLAY, K.W. and WILKINSON, G.N. 1983. The analysis of adaptation in plant breeding programme. **Aust. J. Agril. Res., 14:** 742-754.

MISRA, R.C. 1983. Variability, correlation and path-coefficient analysis in blackgram. **Andhra agric. J., 30:** 239-43.

SINGH, U.P., SINGH, U. and SINGH, P. 1975. Estimates of variability, heritability and correlation for yield and its components in Urd. **Madras Agric. J., 63:** 141-147.

Madras Agric. J. 77, (9-12): 533-536 (1990)

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PHENOTYPIC STABILITY FOR SEED YIELD IN INDIAN MUSTARD

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ABSTRACT

Twenty nine promising genotypes of Indian mustard (**Brassica juncea** (L.) Czern & Coss) tested for their seed yield and phenotypic stability revealed that the genotypes interacted considerably with environmental conditions that prevailed in different situations. Both linear and non linear components were significant. S^2d value was significant for 19 genotypes. Genotypes DIR 153 and RH 827, though having high s^2d values, had almost unit responses to changes in environmental conditions and were high yielders. Genotypes RK 8302 and RK 8301 had high mean seed yield and indicated stable performance in high yielding environments. However, it was T 59 with high deviation value, which gave higher productivity in such situations. Genotypes RIK 81-1, RK 8304 and RS 83 performed promosingly in low yielding environments with latter two genotypes giving stable performance.

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KEY WORDS : Mustard, Stability

Indian mustard (*Brassica juncea* (L.) Czern & Coss) is an important drought hardy crop amongst rapeseed-mustard group. In India, Rajasthan state accounts for 14.45 and 17.90 per cent of cultivation and production, respectively. In western Rajasthan, comprising of 60 per cent of Indian arid zone (Thar desert), the inadequacy of irrigation resources and absence of winter rainfall are the main factors limiting crop production in winter season. However, the introduction of Indian mustard, under limited moisture supply conditions in this regions proved very successful and now it accounts for substantial area under its cultivation. The main aim of this study was to evaluate the promising genotypes and to identify the promising ones which may give maximum mean economic yield over environments and show consistent performance. Therefore, promising strains were evaluated in multienvironmental tests so as to identify the most stable and widely adapted genotype for further exploitatin and use in future breeding programmes. Particularly information on this aspect is scanty in case of Indian mustard (Labana *et al.*, 1975, 1980, Henry and Daulay, 1985).

MATERIALS AND METHODS

The performance of 29 diverse promising genotypes of Indian mustard, collected from its major growing areas of the country, were evaluated for seed yield in randomized block design with 3 replications during winter seasons of 1983-84 and 1984-85 consisting of 3 environments. During 1983-84, the crop was sown in first fortnight of October with 3 and 2 irrigations. In 1984-85 the crop was sown in first fortnight of December with 3 irrigations given at critical stages of crop growth *viz.*, 4-6 leaf stage, at branching stage and at flowering stage, respectively. The levels of irrigations applied was 5 cm each by measuring water volume by a water meter. Basal dressing of 20 kg N and 40 kg P/ha was applied uniformly. Top dressing of 20 kg N/ha was done at the time of first irrigation. The plot size was 9.6 m^2 with inter and intra-row spacings maintained at 40 cm and 10 cm, respectively. The seed yield was assessed.

The stability parameters of different genotypes were computed on the basis of mean performance (q/ha) over environments, using statistical model suggested by Eberhart and Russell (1966)

RESULTS AND DISCUSSION

The yield performance of different genotypes was markedly influenced by different environments (Table 1). The maximum yield variation was obtained, when crop was sown in first fortnight of October with two irrigations followed by same date of sowing with three irrigations. The mean yield performance of all the genotypes ranged from 6.94 q/ha to 14.40 q/ha. The studies indicated that sowing time together with levels of irrigation had the important influence on the yield performance of Indian mustard. The general mean performance of the crop sown in first fortnight of October with three irrigations was markedly higher than the crop which was sown in first fortnight of December with three irrigations under same management practices. The purpose of supplying three irrigations in the latter case was to assess the yield potential under optimum conditions in late sown conditions. Genotype DIR 153 gave the highest mean seed yield (14.40 q/ha) closely followed by T 59 (14.2 q/ha) and RH 827 (14.10 q/ha).

Pooled analysis of variance indicated that mean difference between the genotypes and the environments was highly significant (Table 2). This revealed that there was enough variability amongst the genotypes as well as environment under the study. Highly significant mean squares due

Table 1. Mean seed yield (q/ha) and two parameters of stability of 29 genotypes of Indian mustard.

Genotypes	Source	1983 -84 First fortnight of Oct. (3 irrigations)	1983-84 First fortnight of Oct. (2 irrigations)	1984-85 First fortnight of Dec. (3 irrigations)	Mean	b	$s^{-2}d$
RW 4-C-6(I-II)	Berhampore (WB)	14.50	12.72	8.10	11.77	0.87	0.91*
RW 4-C-6(J-II)	"	10.70	5.93	4.20	6.94	0.87	1.74**
RW 2367	"	13.60	9.42	5.33	9.45	1.12	-0.24
RW 1765	"	13.70	9.71	7.75	10.39	0.80	0.71*
RAURD 82-1	Rajendra Agril Univ. Bihar	13.20	8.05	6.70	9.32	0.87	2.64**
RAURD 1002	"	12.50	9.68	6.50	9.56	0.81	-0.14
RAVSR-1	"	12.70	7.41	4.61	8.24	1.09	1.12**
RAVSR-2	"	15.70	10.37	5.55	10.54	1.37	-0.04
RK 8301	Kanpur, U.P	16.70	11.48	7.92	12.03	1.18	0.61*
RK 8302	"	16.60	11.76	8.08	12.15	1.15	0.17
RK 8303	"	12.40	8.22	8.67	9.76	0.49	3.75**
RK 8304	"	14.70	11.74	9.54	11.99	0.70	-0.08
RH 815	Hissar (Haryana)	17.80	15.14	7.12	13.35	1.45	3.87**
RH 827	"	16.70	15.94	9.67	14.10	0.96	4.31**
RH 8114	"	13.70	8.04	6.92	9.55	0.91	3.67**
RH 8115	"	11.50	8.43	6.83	8.92	0.63	0.28
RH 8122	"	15.70	14.33	6.29	12.11	1.29	6.08**
RH 8130	"	13.00	7.16	3.71	7.96	1.25	1.14**
RIK 81 - 1	Kanpur, U.P.	15.40	13.76	8.92	12.69	0.88	1.26**
RS 65	Durgapura (Rajasthan)	12.50	8.72	7.25	9.49	0.70	1.01*
RS 83	"	14.50	12.10	8.10	11.57	0.87	0.07
RS 85	"	14.70	10.05	7.10	10.62	1.02	0.61*
RLC 1102	Ludhiana (Punjab)	13.70	11.16	6.92	10.59	0.92	0.13
RLC 1101	"	12.60	10.57	6.62	9.93	0.81	0.32
DIR 152	Delhi	13.50	6.25	5.50	8.42	1.07	7.62**
DIR 153	Delhi	16.70	17.18	9.33	14.40	1.01	10.51**
PR 51	Pantnagar	14.00	9.29	4.67	9.32	1.26	-0.14
T 59	Kanpur, UP	17.50	16.12	8.99	14.20	1.16	4.62**
KRANTI	Pantnagar, U .P.	15.40	13.05	4.29	10.91	1.51	5.72**
Mean		14.34	10.82	6.94	10.70	1.00	
SEm ±		0.50	0.41	0.21			
CD 5%		1.39	1.13	0.59			

* P = 0.05, ** p = 0.01.

Table 2. Analysis of variance for genotype X environment interactions for seed yield in Indian mustard.

Source	d.f.	M S
Genotypes	29	11.27**++
Env. + (genotype X env.)	58	15.68**++
Env. (linear)	1	795.54**++
Genotype X Environment (linear)	28	1.69**
Pooled deviation	29	2.30**
Pooled errorr	168	0.15

** p = 0.01 against error

++ P = 0.01 against pooled deviation

to environment plus genotype x environment interactions revealed that the genotypes interacted considerably with growing environmental conditions that prevailed in different situations. Both linear and non linear components were significant. Similar results were reported by Labana *et al.* (1975, 1980) and Henry and Daulay (1985) in case of Indian mustard.

Out of 29 genotypes investigated, 19 genotypes had significant deviation from regression for seed yield (Table 1). The genotype DIR 153 gave the highest seed yield followed by T 59 and RH 827. Out of these, DIR 153 and RH 827 had almost unit responses to changes in environmental conditions. T 59 was found more responsive to favourable environment as reflected by 'b' values ($b > 1$). The similar response of T 59 to favourable growing conditions is also reported by Henry and Daulay (1985). These genotypes also performed relatively better under late sown conditions in 1984-85. However, these genotypes were less stable as these had high $s^{-2}d$ values. Genotypes RK 8304, RS 83, RH 8115, RAURD 82-1 and RLC 1101 were found to be responsive to unfavourable growing seasons and were stable. Out of these. RK 8304 and RS 83 had high mean yield over population mean yield. Other genotypes RIK 81-2, RK 8303, RW 4-C-6 (I-II), RS 65 RW 1765 also were high yielding under adverse growing conditions. However. these had high $s^{-2}d$ values. Genotypes RK 8302, RK 8301, RH 815, RH 8122 and Kranti had high mean seed yield over population mean yield and were responsive to favourable growing conditions only. Out of these, RK 8302 had low deviation and was stable under such situations. Genotype RK 8301 also had average stability as $s^{-2}d$ value was significant only at lower level of significance ($p = 0.05$), whereas the latter three genotypes had high $s^{-2}d$ values.

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REFERENCES

EBERHART, S.A. and RUSSELL, W.A. 1966. Stability parameters for comparing varieties. **Crop Sci., 6:** 36-40.

HENRY, A. and DAULAY, H.S. 1985. Genotype x environment interactions for seed yield in Indian mustard. **Madras Agric. J., 72:** 347-349.

LABANA, K.S., GUPTA, M.L. and SINGH, M. 1975. Stability of grain yield in **Brassica juncea. Oilseeds J., 5:** 25-26.

LABANA, K.S., BADWAL, S.S. and CHAURASIA, B.D. 1980. Varietal performance and genotype x environment interaction in mustard. **Indian J. Genet., 40:** 57-63.