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PHENOTYPIC STABILITY FOR SEED YIELD IN INDIAN MUSTARD (*Brassica juncea* CZERN AND COSS)

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ABSTRACT

Twenty nine promising genotypes of Indian mustard (*Brassica juncea* Czern & Coss) tested for their seed yield and phenotypic stability revealed that the genotypes increased considerably with environmental conditions that prevailing in different situations. Both linear and non linear components were significant.s2d values were significant for 19 genotypes. Genotype Laxmi and RRN 505, though having high s2d values, had almost unit response to change in environmental conditions and were high yielders. Genotype NRCDR 2, Varuna Rohini and RRN 573 had high mean seed yield and indicated stable performance in high yielding environments. However, it was Laxmi, with high deviation value, which gave higher productivity in such situations Genotypes RH 30, Navgold and Kranti performed promisingly in low yielding environments with latter two genotypes giving stable performance.

Key Words : *Mustard, phenotypic stability, seed yield, genotypes.*

Indian mustard (*Brassica juncea* L. Czern and Coss) is an important drought hardy important crop amongst rapeseed-mustard group in India. Rajasthan state accounts for 14.45 and 17.90 percent of cultivation and production in 90's, respectively and in 2010's 33 and 35 per cent of cultivation and productivity. The introduction of improved Indian mustard and management practices under limited moisture supply conditions in this region proved very successful and now it is accounts for substantial area under its cultivation. However, the inadequacy of irrigation resources and uncertain of winter rainfall are the main factors limiting crop production in rabi season. It is essential to breed high yielding varieties which may perform consistently better under different environmental conditions. Finley and Wilinson 1963 considered linear regression as a measure of stability, whereas Eberhart abd Russell 1966 emphsised that both linear (bi) and non linear (S2di) components of genotype x environment interaction be considered while judging the phenotypic stability of a genotype. 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 multi-environmental test so as to identify the most stable and widely adapted genotype for further exploitation and use in future breeding programmes. Particularly information on this aspect is scanty in case of Indian mustard (1, 2).

MATERIALS AND METHODS

The performance of 29 diverse promising genotypes of Indian mustard from its major growing area of country, were evaluated for seed yield in randomized block design with three replications during rabi seasons of 2007-08, 2008-09 and 2009-10 consisting of three environments . During 2007-08 the crop was sown in first fortnight of October with 3, 2008-09 with 2 irrigations. In 2009-10 the crops was sown in the Second fortnight of November with 3 irrigations given at critical stages of crop growth viz., 4-6 leaf stage, at branching stage and at flowering stage, respectively. The basal dose of 40 kg N and 40 kg P/ha was applied uniformly. Top dressing of 40 kg N/ha was done at the time of first irrigation. The plot size was 9.0 m2 with inter and intra row spacing maintained at 30 cm and 10 cm, respectively.

The stability parameters of different genotypes were computed on the basis of mean performance (q/ha over environments, using statistical model suggested by (3).

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

Genotypes	2007-08 first fortnight of October (3 irrigations)	2008-09 first fortnight of October (2 irrigations)	2009-10 second fortnight of November (3 irrigations)	Mean	b	s^2d
Aashirvad	16.1	14.32	9.7	13.37	0.87	0.91*
Vasundhara	12.3	7.53	5.8	8.54	0.87	1.74**
NRCDR 601	15.2	11.02	6.93	11.05	1.12	-0.24
RL 1359	15.3	11.31	9.35	11.99	0.8	0.71*
RH 30	14.8	9.65	8.3	10.92	0.87	2.64**
Vardan	14.1	11.28	8.1	11.16	0.81	-0.14
RRN570	14.3	9.01	6.21	9.84	1.09	1.12**
RRN 626	17.3	11.97	7.15	12.14	1.37	-0.04
Varuna	17.3	13.08	9.52	13.30	1.18	0.51*
NRCDR 2	18.1	13.36	9.68	13.71	1.15	0.17*
BIO 902	14	9.82	10.27	11.36	0.49	3.75**
Navgold	16.3	13.34	11.14	13.59	0.7	-0.08
Rohini	19.4	16.74	8.72	14.95	1.45	3.87**
RRN 505	18.3	17.54	11.27	15.70	0.95	4.31**
RRN 624	15.3	9.64	8.52	11.15	0.91	3.67**
RRN 625	13.1	10.03	8.43	10.52	0.63	0.28
RRN 573	17.3	15.93	7.89	13.71	1.29	6.08**
RRN 652	14.6	8.76	5.31	9.56	1.25	1.14**
RRN 605	17	15.36	10.52	14.29	0.88	1.26**
RRN 613	14.1	10.32	8.85	11.09	0.7	1.01*
Kranti	16.1	13.7	9.7	13.17	0.87	0.07
RRN 614	16.3	11.65	8.7	12.22	1.02	0.61*
RRN 615	15.3	12.76	8.52	12.19	0.92	0.13
RRN 623	14.2	12.17	8.22	11.53	0.81	0.32
RRN 631	15.1	7.85	7.1	10.02	1.07	7.52**
Laxmi	18.3	18.78	10.93	16.00	1.01	10.51**
RRN616	15.6	10.89	6.27	10.92	1.2	-0.14
Aravali	19.1	17.72	10.59	15.80	1.16	4.62**
RH 819	17	14.65	5.89	12.51	1.51	5.72**
Mean	15.90	12.42	8.54	12.29	1	
SEm+	0.5	0.41	0.21			
CD 5%	1.39	1.13	0.59			

*, **, Significant at 5 and 1% levels, respectively.

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 fallowed by same date of sowing with three irrigations. The mean yield performance of all the genotypes ranged from 8.54 q/ha to 15.90 q/ha. The studies indicated that sowing time together with levels of irrigations had the important influence on the yield performance of Indian mustard. The general mean performance of the crop sown in the first fortnight of October with three irrigations was markedly higher than the crop which was sown in the second fortnight of November with three irrigations under the same management practices. The purpose of applying three irrigations in the later case was to assess the yield potential under optimum conditions in late sown conditions. The genotype Laxmi gave the highest

Table-2: Analysis of variance for genotype x environment interactions for seed yield in Indian mustard.

Source	DF	MS
Genotypes	28	11.276**++
Environ.+ (genotype x environment)	58	15.683**++
Environ (linear)	1	795.547**++
Genotype x Environment (linear)	28	1.692**
Pooled deviation	29	2.304**
Pooled error	174	0.152

**, Significant against pooled error ++ Significant against pooled deviation

mean seed yield (16.00 q/ha) closely followed by Aravali(15.80 q/ha) and RRN 505 (15.70 q/ha).

Pooled analysis of variance indicated that the 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 to environment plus genotype x environment interaction 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 (4, 5).

Out of 29 genotypes investigated 19 genotypes had significant deviation from regression for seed yield (Table-1). The genotype Laxmi gave the highest seed yield followed by Aravali and RRN 505. Out of these Laxmi and RRN 505 had almost unit responses to changes in the environmental conditions. Laxmi was found more responsive to favourable growing conditions is also reported by (6). These genotypes also performed relatively better under late sown conditions in 2009-10. However, these genotypes were less stable as these had high s^2d values. Genotypes Navgold, Kranti, RRN 625, RH 30 and RRN 623 were found to be responsive to unfavourable growing seasons and were stable. Out of these Navgold and Kranti had high mean yield over population mean yield. Other genotypes RRN 605, BIO 902, Aashirwad, RRN 613, RL 1359 also were high yielding under adverse growing conditions. However, these had high s^2d values. Genotypes NRCDR 2, Varuna, Rohini, RRN 573 and RH 819 had high mean seed yield over population mean yield and were responsive to favourable growing conditions only. Out of these NRCDR 2 had low deviation and was stable under such situations. Genotype Varuna also had average stability as s^2d value was significant only at lower levels of significance (p=0.05) whereas the latter three genotypes had high s^2d values.

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