

Variability Studies in Indian Mustard on Normal and Saline Soils

D Kumar

Central Arid Zone Research Institute, Jodhpur–342 003 India

Abstract Study on variability in 30 genotypes of Indian mustard [*Brassica juncea* L. Czern & Coss] indicated higher estimates of GCV, PCV, heritability and genetic advance for number of primary branches and siliquae plant⁻¹ on normal soil; and for seedling emergence, number of siliquae on main shoot, number of secondary branches plant⁻¹ and seed yield on saline soil. Number of siliquae plant⁻¹ on normal soil; and seedling emergence and plant height on saline soil had significant positive association with seed yield. Seedling emergence and plant height exhibited maximum direct positive effects on seed yield on saline soil.

Key words Salinity, Association, Direct effect, Heritability, Genetic advance

Progress in breeding programme under any agroclimatic or soil condition depends on the extent and nature of variability existing in the base population. Variability and association analysis are useful in getting information on the traits that are expected to respond towards simple selection. Such information on Indian mustard under saline environments of hot desert is completely lacking, some reports are however available for semi-arid saline environment (Kumar *et al.* 1983, Sinha 1991) and to a greater extent for normal conditions (Katiyar *et al.* 1974, Hari Singh 1986). Present in-

vestigation, was therefore undertaken to study the variability, correlation and path estimates on 30 genotypes of Indian mustard grown on normal and saline soils of arid environment.

Materials and Methods

Thirty genetically diverse genotypes of Indian mustard (*B. juncea* L. Czern and Coss) were raised on normal (ECe 2.0 dSm⁻¹, pH 8.0 and ESP 12.0) and saline (ECe 10.5 dSm⁻¹, pH 8.0 and ESP 12.5), light textured soils at Central Arid Zone Research

Table 1 Estimates of parameters of variance in Indian mustard on normal and saline soil.

Parameters	Seedling emergence (%)	Plant height (cm)	No. of siliquae on main shoot	No. of primary branches plant ⁻¹	No. of secondary branches plant ⁻¹	No. of siliquae plant ⁻¹	Seed yield plot ⁻¹ (g)
Range	61.3–90.0 5.6–26.2	110.8–176.1 85.4–128.9	24.8–35.9 14.9–38.1	3.9–7.3 3.7–6.1	3.9–14.2 2.7–11.8	84.4–262.6 37.3–207.5	36.6–106.6 7.3–17.3
Mean	76.23 11.83	139.54 108.27	31.13 22.78	5.64 5.03	7.63 6.40	120.28 100.92	73.61 44.67
GCV(%)	11.03 36.49	8.73 10.08	5.84 21.75	12.36 3.26	26.48 36.67	17.78 8.30	20.67 35.58
PCV(%)	12.79 40.90	12.63 13.93	12.07 28.31	17.58 20.14	32.71 42.95	24.26 80.37	26.83 48.13
Heritability (%)	74.35 79.57	48.22 52.38	23.41 59.05	49.43 2.63	65.72 72.90	53.72 1.07	59.37 54.67
Genetic advance	12.83 7.11	12.15 11.78	0.87 6.03	0.71 0.008	2.72 3.52	23.67 0.18	18.61 17.90
Genetic advance as (%) of mean	16.89 59.84	8.70 10.88	2.79 26.57	12.58 0.001	35.64 35.00	19.67 0.001	25.28 40.07

Table 2 Phenotypic correlation co-efficients among 8 traits of Indian mustard on normal and saline soil.

	Plant height	No. of siliquae on main shoot	No. of primary branches plant ⁻¹	No. of secondary branches plant ⁻¹	No. of siliquae plant ⁻¹	Seed yield plot ⁻¹
Seedling emergence	0.013 0.091	-0.002 0.154	-0.307 -0.744**	-0.166 -0.042	-0.108 -0.045	-0.102 0.475**
Plant height	-	0.173 0.456**	0.380 0.287	0.243 0.384	0.517** 0.135	0.107 0.481**
No. of siliquae on main shoot	-	-	0.102 0.322	-0.033 0.184	0.472** 0.242	0.128 0.189
No. of primary branches plant ⁻¹	-	-	-	0.575** 0.303	0.332 0.121	0.193 0.190
No. of secondary branches plant ⁻¹	-	-	-	-	0.399 0.240	0.141 0.191
No. of siliquae plant ⁻¹	-	-	-	-	-	0.489** 0.139

* P = 0.05, ** P = 0.01

Table 3 Direct and indirect effects of different traits of Indian mustard on normal and saline soils

Correlated traits	Direct and indirect effects						Genotypic correlation with seed yield
	Seedling emergence	Plant height	No. of siliquae on main shoot	No. of primary branches/plant ⁻¹	No. of secondary branches/plant ⁻¹	No. of siliquae/plant ⁻¹	
Seedling emergence	-0.300 0.678	0.145 0.014	0.051 -0.014	0.137 -0.156	0.162 0.058	0.314 0.052	-0.109 0.420*
Plant height	0.037 0.033	1.163 0.295	0.308 -0.371	-0.146 0.699	0.331 -0.362	-1.315 0.388	0.153 0.590**
No. of siliquae on main shoot	-0.018 0.136	0.435 0.154	0.824 -0.712	-0.049 0.602	0.186 -0.199	-1.584 0.538	0.201 0.356
No. of primary branches plant ⁻¹	0.180 -0.352	0.747 0.686	0.180 -1.426	-0.227 0.300	0.401 -0.786	-1.034 1.664	0.120 0.127
No. of secondary branches plant ⁻¹	0.067 -0.051	0.538 0.138	0.213 -0.184	-0.126 0.307	0.721 -0.770	-1.027 0.691	0.067 0.147
No. of siliquae plant ⁻¹	0.052 0.099	0.855 0.318	0.730 -0.106	-0.131 1.391	0.512 -1.484	-1.789 0.359	0.400* 0.201

* P = 0.05, ** P = 0.01

Residual effects for normal soil, 0.920 and 1.121 for saline soil.

Institute, Jodhpur during *rabi* (October-February 1987-88). A randomized block design with 3

replications was used. Each genotype was represented by 4 m long single row with 30 x 10 cm

spacing. The crop was fertilized with 60 kg N ha^{-1} and received 4 irrigations including pre sowing of 6 cm each. Fifty seeds were sown for each genotype and the seedlings emerged at 20th day of sowing were counted and expressed as a percentage. Observations on 5 random plants from each treatment were recorded for yield components and yield plot⁻¹. Genotypic and phenotypic coefficient of variability (GCV and PCV), broad sense heritability (Hanson *et al.* 1956) and the path coefficient analysis were estimated (Dewey & Lu 1959).

Results and Discussion

Variability : Significant differences were observed amongst the genotypes for all the characters on both normal and saline soils (Table 1). Range of variation was maximum for number of siliquae plant⁻¹, followed by seed yield and plant height on both soils. Range was comparatively restricted for all the traits on saline than on normal soils.

The estimates of GCV were larger than the corresponding PCV estimates. These estimates were almost of equal magnitude for plant height on both soils, reflecting, therefore, lesser environmental influence on plant height. Higher estimates of GCV in respect of seedling emergence, number of siliquae on main shoot and secondary branches plant⁻¹ and seed yield on saline soil indicated the scope for their genetic improvement on problem soil.

Despite high GCV for seed yield, heritability was moderate on both the soils. On normal soil, heritability was much higher in respect of siliquae plant⁻¹, primary branches plant⁻¹, whereas the same was much higher for number of siliquae on main shoot on saline soil. These estimates were, however, consistent for rest of the traits over the soil conditions.

Genetic advance as % of mean was highest (35.64 and 35.00) for secondary branches plant⁻¹ on normal and saline soils, respectively, and lowest (0.001%) for primary branches and siliquae plant⁻¹ on the latter soil. Number of secondary branches plant⁻¹ and seed yield due to higher estimates of heritability and genetic advance, indicated the presence of additive genes for the expression of

these traits on both soils. Similar was the case in respect of seedling emergence on problem soil.

Correlation coefficients : There was a significant positive association of seed yield with number of siliquae plant⁻¹ on normal soil whereas, on saline soil, yield had significant positive association with per cent seedling emergence and plant height (Table 2). Association of yield with its components greatly varied under two types of soils, hence for drawing a valid conclusion for character associations the plant material may be tested over a range of environments. Amongst the components, main shoot length and number of siliquae plant⁻¹ had significant positive association on both soils indicating the possibility of their simultaneous improvement. Plant height also had significant positive association on both soils indicating the possibility of their simultaneous improvement. Plant height also had significant positive association with main shoot length and number of siliquae plant⁻¹ on normal soil. No reliable conclusion could however, be drawn for rest of the traits, particularly on problem soil.

Path analysis : Significant positive association of number of siliquae plant⁻¹ with seed yield on normal soil was largely due to indirect effect via number of siliquae plant⁻¹ and plant height (Table 3). However, on saline soil, significant positive association of seedling emergence and plant height with seed yield was mainly due to their direct effects. High direct positive effects of siliquae plant⁻¹ and primary branches plant⁻¹ on saline soil showed cancellation due to the indirect effects of secondary branches plant⁻¹, number of siliquae on main shoot and main shoot length, resulting in poor association of siliquae plant⁻¹ and primary branches plant⁻¹ with seed yield.

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(Received August 1992 Accepted January 1993)