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Assessing genetic variability in Indian mustard (*Brassica juncea* L. Czern and Coss.) for seed yield and it's contributing attributes under normal and saline/alkaline condition

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Abstract
Twenty diverse genotypes of Indian mustard (*Brassica juncea* L. Czern and Coss.) with four checks were evaluated for thirteen quantitative traits under normal condition (NS) and saline/alkaline condition (SS). The variability studies indicated that high PCV (phenotypic coefficient of variability) and GCV (genotypic coefficient of variability) was observed in case of secondary branches/plant, biological yield/plant and seed yield/plant in both the conditions (NS and SS) while moderate PCV and GCV was observed in case of number of primary branches/plant, length of main raceme, seeds/ siliquae and harvest index in both the conditions (NS and SS). Days to 50% flowering, days to maturity in NS and in SS, days to 50% flowering, days to maturity and plant height showed lower PCV and GCV. High heritability in broad sense was noted for all the characters in both the conditions (NS and SS) except for days to 50% flowering and primary branches/plant in NS and days to maturity in SS which showed moderate heritability while high genetic advance as % of mean was noted for all the characters except for days to 50% flowering, days to maturity, plant height, primary branches/plant and oil content in both the conditions (NS and SS). High heritability coupled with high genetic advance as percent mean was observed for secondary branches per plant followed by plant height, length of main raceme, siliquae on main raceme, 1000-seed weight, biological yield per plant, seed yield per plant and harvest index in NS and in SS, it was for secondary branches per plant followed by primary branches per plant, length of main raceme, siliquae on main raceme, seeds per siliqua, 1000-seed weight, biological yield per plant, seed yield per plant and harvest index, indicating the involvement of additive gene action. Hence, emphasis should be given to select these quantitative traits to enhance the yield potential of Indian mustard in normal as well as saline/alkaline condition.

Keywords: *Brassica juncea* L. genetic variability, heritability, genetic advance

Introduction
Indian mustard [*Brassica juncea* (L.) Czern & Coss], which is cultivated under the genus *Brassica* is cultivated all over India and it is throughout the world belongs to family Cruciferae (Brassicaceae). It has 38 to 42% oil and 24% protein. Among rapeseed and mustard, rai (*B. juncea*) is very popular among the farmers due to higher yield and greater tolerance against lodging, shattering, drought condition, heat and relative diseases as well as the saline sodic conditions. *Brassica* also performs well on neglected sites where problems like soil acidity, low available nutrient content, poor drainage, drought, and soils with topographical limitations exist germplasm, which is prerequisite for any breeding programme, serves as a valuable source material as it provides scope for building for genetic variability. Study of variability, heritability and genetic advance in the germplasm will help to ascertain the real potential value of the genotype. Hence, this present study was planned to assess the variability, heritability and genetic advance for yield and other characters in a set of genotypes.

Materials and methods
The materials for present study comprised 20 genotypes along with four checks viz., CS-52, CS-54, Narendra rai (NDR-8501) and Maya in Indian mustard (*Brassica juncea* L. Czern & Coss.) under normal condition (NS) and saline/alkaline condition (SS), The experiment was conducted at the Research Farm of Department of Genetics and Plant Breeding, Narendra Deva University of Agriculture & Technology, Narendra Nagar (Kumarganj), Faizabad, during *Rabi* season of 2013-14 in two conditions (Normal and saline/alkaline condition). The material was sown in Randomized Block Design with three replications. Each block consisted of single row of five meter length, following spacing (row to row and plant to plant) of 45 cm and 15 cm, respectively.

In each entry, five plants were randomly tagged and utilized to collect data on yield and its component characters *viz*., days to 50% flowering, days to maturity, plant height (cm), primary branches per plant, secondary branches per plant, length of main raceme, siliquae on main raceme, seeds per siliqua, 1000-seed weight (g), biological yield per plant (g), seed yield per plant (g), harvest index (%) and oil content (%). The data were subjected to statistical analysis using genotypic and phenotypic coefficient of variation (Burton and de Vane, 1953) [3]; heritability in broad sense (Hanson *et al*., 1956) [4]; genetic advance in percent of mean (Johnson *et al*., 1955) [5] was applied to carry out selection based on characters which would be more effective to meet higher seed yield.

Results and discussion

The analysis of variance revealed significant differences among treatments for all the characters under normal condition (NS) and saline/alkaline condition (SS) are presented in (Table 1). The genotypic and phenotypic coefficient of variability, heritability (% in broad sense and genetic advance in percent of mean are presented in (Table 2). Estimates of genetic variability revealed that the GCV and PCV were comparatively higher for secondary branches/plant, biological yield/plant and seed yield/plant in both the conditions (NS and SS) similar findings were also reported by Rai *et al*., (2005) [8], Amit *et al*., (2013) [2] while moderate PCV and GCV was observed in case of number of primary branches/plant, length of main raceme, seeds/siliqua and harvest index in both the conditions (NS and SS). Days to 50% flowering, days to maturity in NS and in SS, days to 50% flowering, days to maturity and plant height showed lower PCV and GCV indicated that these characters were highly influenced by environmental factors. The phenotypic coefficient of variation which measures total variation was found to be greater than genotypic coefficient of variation for all the characters indicating some degree of environmental influence on the traits. High heritability value was noted for all the characters in both the conditions (NS and SS) except for days to 50% flowering and branches/plant in NS and days to maturity in SS which showed moderate heritability indicated that selection was effective in these characters. These findings are in accordance with previous reports of Kuble *et al*., (2000) [6], Upadhyay and Kumar (2009) [9], Yadav *et al*. (2012) [10]. High heritability coupled with high genetic advance as percent mean was observed for secondary branches per plant followed by plant height, length of main raceme, siliquae on main raceme, 1000-seed weight, biological yield per plant, seed yield per plant and harvest index in NS and in SS it was for secondary branches per plant followed by primary branches per plant, length of main raceme, siliquae on main raceme, seeds per siliqua, 1000-seed weight, biological yield per plant, seed yield per plant and harvest index, revealed the involvement of additive gene action for these traits. Hence, the improvement of these traits can be made through direct phenotypic selection. Heritability estimates along with genetic advance would be more useful in predicting yield under phenotypic selection than heritability estimates alone as suggested by Johnson *et al*. (1955) [5]. The traits such as days to maturity, primary branches/plant and oil content in normal condition (NS) while days to 50% flowering and oil content in saline/alkaline condition (SS) in which high heritability accompanied by low genetic advance was recorded indicates the effect of non additive gene action and hence heterosis breeding were rewarding for these traits. These findings are accordance with previous report of Pant and Singh (2001) [7]. To break yield barrier and to attend yield plateau, the proper investigation on variability, heritability and genetic advance suggested those characters which would be taken into consideration for formulating selection breeding programme in order to bring out improvement in the studied population of Indian mustard (*Brassica juncea* L. Czern and Coss.) under both the conditions normal and saline/alkaline condition.

Table 1: Analysis of variance for 13 characters in Indian mustard under normal (E1) and saline/alkaline (E2) condition

S. No.	Character	Replications		Treatments		Error	
		E1	E2	E1	E2	E1	E2
	d.f.	2	2	19	19	38	38
1	Days to 50% flowering	5.07	0.20	16.938**	18.49**	5.51	0.73
2	Days to maturity	1.52	1.62	33.69**	14.87**	2.10	0.95
3	Plant height (cm)	3.90*	2.85	1020.14**	172.83**	1.07	5.92
4	Primary branches/plant	0.08	0.11	1.24**	1.96**	0.24	0.12
5	Secondary branches/plant	0.20	0.05	21.12**	19.11**	0.13	0.04
6	Length of main raceme (cm)	1.91*	0.62	190.55**	242.50**	0.56	0.42
7	Siliquae on main raceme	0.42	0.80	183.26**	176.73**	0.39	0.34
8	Seeds/siliqua	0.21	0.01	5.49**	6.32**	0.25	0.25
9	1000 seed weight (g)	0.0005	0.02	2.01**	2.01**	0.007	0.01
10	Biological yield/plant (g)	0.24	23.84*	198.39**	95.86**	10.05	6.39
11	Seed yield/plant (g)	0.07	0.86*	16.74**	4.55**	0.49	0.24
12	Harvest index (%)	1.05	0.22*	28.69**	33.24**	0.36	0.06
13	Oil content (%)	0.05	0.02	1.35**	1.48**	0.04	0.03

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

E1= Normal condition (NS)

E2= Saline/alkaline condition (SS**)**

Table 2 : Mean, range, genotypic and phenotypic coefficient of variability, heritability (% in broad sense) and genetic advance in % of mean for different characters in Indian mustard under normal (E1) and saline/alkaline condition (E2).

	Range				Mean		GCV (genotypic Coefficient of variability)		PCV (phenotypic coefficient of variability)		h^2 (broad sense) heritability (%)		Gen. Adv as % of mean	
	E1 (Min)	E1 (Max)	E2 (Min)	E2 (Max)	E1	E2	E1	E2	E1	E2	E1	E2	E1	E2
Days to 50% Flowering	57.00	66.00	5.00	61.67	61.13	56.10	3.19	4.34	4.99	4.60	40.88	89.08	4.20	8.43
Days to Maturity	118.00	130.00	114.34	122.34	122.77	117.97	2.64	1.76	2.89	2.12	83.40	68.84	4.97	3.01
Plant height (cm)	113.00	186.00	107.30	143.80	147.24	128.56	12.52	5.80	12.54	6.10	99.68	90.39	25.75	11.36
Primary branches/plant	3.73	6.37	3.34	6.07	4.95	4.52	11.71	17.32	12.27	18.89	58.86	84.01	18.51	32.70
Secondary branches/plant	4.05	12.19	4.03	11.98	7.49	7.18	35.29	35.12	35.62	35.22	98.20	99.43	72.05	72.14
Length of main Raceme	38.36	66.22	35.35	65.13	53.24	50.53	14.95	17.78	15.01	17.82	99.12	99.48	30.66	36.52
Siliquae on main raceme	27.69	53.98	26.91	52.92	37.78	36.81	20.67	20.83	20.73	20.89	99.37	99.43	42.44	42.79
Seeds/siliqua	10.73	16.13	10.69	16.57	12.90	12.34	10.24	11.54	10.96	12.22	87.28	89.19	19.70	22.45
1000 seed weight (g)	3.02	6.19	2.64	5.92	4.03	3.71	20.30	22.02	20.41	22.26	98.93	97.83	41.59	44.86
Biological yield /plant (g)	16.58	42.80	16.43	36.19	26.97	24.69	29.38	22.12	31.64	24.37	86.20	82.36	56.19	41.35
Seed yield/plant (g)	4.38	9.25	4.15	8.35	6.37	5.67	22.66	21.13	25.17	22.81	81.11	85.79	42.05	40.32
Harvest index (%)	18.28	28.61	17.84	28.46	24.18	23.44	12.71	14.19	12.95	14.23	96.34	99.43	25.69	29.14
Oil content (%)	39.93	42.92	38.87	41.79	41.23	40.12	1.60	1.73	1.67	1.79	92.16	94.02	3.17	3.46

E1= Normal condition (NS)

E2= Saline/alkaline condition (SS)

References

1. Al Jibouri HA, Miller PA, Robinson HF. Genotypic and environmental variance and covariance in an upland cotton cross of inter-specific origin. Agron J. 1958; 50:633-637.
2. Amit Singh, Ram Avtar, Dhiraj Singh, Sangwan O, Balyan P. Genetic variability, character association and path analysis for seed yield and component traits under two environments in Indian mustard. Journal of Oilseeds Brassica. 2013; 4(1):43-48.
3. Burton GW, de vane EH. Estimating heritability in tall fescue (*Festuca arundinacea*) from replicated clonal material. Agron J. 1953; 45:478-481.
4. Hanson CH, Robinson HF, Comstock RE. Biometrical studies of yield in segregating population of Korean lespedza. Agron. J. 1956; 48:268-272.
5. Johnson HW, Robinson HF, Comstock RE. Estimates of Genetic and environmental variability in soybean. Agron. J. 1955; 47:314-318.
6. Khulbe RK, Pant DP, Naveen Saxena. Variability, heritability and genetic advance in Indian mustard [*Brassica juncea* (L.) Czern & Coss]. Crop Research (Hisar). 2000; 20(3):551-552.
7. Pant SC, Singh P. Genetic variability in Indian mustard. Agricultural Science Digest. 2001; 21(1):28-30.
8. Rai SK, Verma A, Pandey DD. Genetic variability and character association analysis in Indian mustard (*Brassica juncea* (L.) Czern and Coss.). Annals of Agri. Bio. Res. 2005; 10(1):29-34.
9. Upadhyay DK, Kumar K. Analysis of heritability and genetic advance in relation to yield and its components in Indian mustard (*Brassica juncea* L. Czern and Coss.) under normal and late sown conditions. International Journal of Plant Sciences. 2009; 4(1):12-14.
10. Yadav RK, Abhinav Chakravarty, Narendra Kumar, Yadav JR, Ram Krishna. Genetic variability and component analysis of some metric traits under sodic soil condition in Indian mustard [*Brassica juncea* (L.) Czern and Coss.]. Progressive Agric. 2012; 12(2):396-401.