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Heritability, genetic advance and correlation coefficient analysis in Indian mustard (*Brassica Juncea* (L.) Czern & Coss)

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Abstract
Estimate of higher heritability coupled with higher genetic advance shows by for number of primary branches, number of secondary branches, number of siliquae per plant, number of seeds per siliquae, harvest index and 1000-seed weight. Seed yield per plant have significantly and positive correlatation with plant height, number of primary branches, number of secondary branches, number of seeds per siliqua, biological yield, harvest index, 1000-seed weight and oil content.

Keywords: Brassica, correlation, genetic advance, heritability and selection parameters.

1. Introduction
Oilseed crops play an important role in agricultural economy of India. Our country is the fourth largest oil economy in the world after the U.S., China and Brazil in terms of vegetable oils. Annual commercial cultivation of seven edible and two non-edible oilseed crops along with many other minor oilseed crops has been possible due to favorable agro ecological conditions. Rapeseed–mustard group of crops is the major oilseed crop of India. India holds the premier position in rapeseed-mustard economy of the world with 2nd and 3rd rank in area and production, respectively. Rapeseed-mustard oil is used primarily for edible purposes and is the principle cooking oil in the mustard growing areas of the country. Besides, seeds are used as condiments and in preparations of salad, juices, curries and pickles. The meal cake left after oil extraction forms important cattle feed and may also be as organic manure.

2. Materials & Methods
The experimental material consisting 83 treatments (60 F_1s +20 lines + 3 testers) were sown in Randomized Block Design with three replications on 27 sep. 2012. The entries were sown in a single row plot of 3 m. with inter and intra-row spacing of 45 cm. and 15 cm. respectively. To avoid the border effects, the plots falling on the border were surrounded by non-experimental rows of varieties/strains. Recommended agronomic practices were adopted to raise a good crop. Observations on the following characters were recorded on five randomly selected plants leaving border plants in each replication namely, days to 50% flowering, days to maturity, plant height, number of primary branches per plant, number of secondary branches per plant, number of siliquae per plant, number of seeds per siliqua, biological yield per plant, 1000-seed weight, harvest index, oil content and seed yield per plant. Heritability in narrow sense was calculated using the formulae given by Kempthorne, 1957) [8] and expected genetic advance was calculated using the formulae given by Johnson *et al*. 1955) [7].

3. Results & Discussion
The estimates of narrow sense heritability and genetic advance in per cent over mean in F_1s generation of all the 12 character are presented in Table-1. The estimates of heritability were observed as high for days to flower, days to maturity, number of primary branches, number of secondary branches, number of siliquae per plant, number of seeds per siliqua, harvest index, 1000-seed weight, oil content and seed yield per plant. Moderate heritability estimates were observed for plant height and biological yield. The estimates of genetic advance in per cent over mean of the characters ranged from 2.37 (oil content) to 36.41 (number of primary brances). High genetic advance were recorded for number of primary branches, number of secondary branches, number of siliquae per plant, number of seeds per siliquae, harvest index, 1000-seed weight and seed yield per plant. Moderate genetic advance were recorded for days

to flower, days to maturity. Low genetic advance were exhibited for three attributes *viz;* plant height, biological yield and oil content. The results obtained are similar to the results obtained by Singh *et al*. (2003b) [15], Arifllah *et al*., 2013 [2] and Singh *et al*. (2013) [15].

The estimates of correction coefficient in F_1s generation of all the 12 character are presented in Table-2. Among F_1s the association of days to flower at genotypic level was positive and significant with days to maturity, plant height, biological yield and 1000- seed. Days to maturity showed positive and significant interrelationship with days to flowering. Plant height had significant and positive interrelationship with days to flowering, number of primary branches, number of secondary branches, number of siliquae per plant, number of seeds per siliqua, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of primary branches showed positive and significant interrelationship with plant height, number of secondary branches, number of siliquae per plant, number of seeds per siliqua, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of secondary branches had positive and significant association with day to flowering, plant height, number of primary branches, number of siliquae per plant, number of seeds per siliqua, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of siliquae per plant had positive and significant relationship with days to maturity, number of primary branches and 1000-seed weight. Number of seeds per siliquae had positive and significant association with plant height, number of primary brances, number of secondary branches, biological yield, harvest index, 1000- seed weight, oil content and seed yield per plant. Biological yield had positive and significant relationship with days to flowering, plant height, number of primary brances, number of secondary branches, number of siliqua per plant, number of seeds per siliquae, harvest index, 1000-seed weight, oil content and seed yield per plant. Harvest index showed positive and significant relationship with days to maturity, plant height, number of primary branches, number of secondary branches, number of siliqua per plant, number of seeds per siliquae, biological yield, 1000-seed weight, oil content and seed yield per plant. 1000-seed weight had positive and significant relationship with days to flowering, days to maturity, plant height, number of primary branches, number of secondary branches, number of siliqua per plant, number of seeds per siliquae, biological yield, harvest index, oil content and seed yield per plant. Oil content had positive and significant relationship with plant height, number of primary branches, number of secondary branches, number of siliqua per plant, number of seeds per siliquae, biological yield, harvest index, 1000-seed weight and seed yield per plant. Seed yield per plant had positive and significant relationship with plant height, number of primary branches, number of secondary branches, number of siliqua per plant, number of seeds per siliquae, biological yield, harvest index, 1000-seed weight and oil content. Among F_1s the association of days to flower at phenotypic level was positive and significant with days to maturity, plant height, number of secondary branches and biological yield. Days to maturity had positive and significant association with days to flower, number of silquae per plant, harvest index and 1000-seed weight. Plant height had positive and significant association with days to flowering, number of primary branches, number of secondary branches, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of primary branches had positive and significant interrelationship with plant height, number of secondary branches, number of siliquae per plant, number of seeds per siliquae, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of secondary branches had positive and significant association with plant height, number of primary branches, number of seeds per siliqua, biological yield per plant, harvest index, 1000-seed weight oil content and seed yield per plant. Number of sihquae per plant had positive and significant association with plant height, number of primary branches, number of secondary branches, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Number of seeds per siliqua had positive and significant association with plant height, number of primary branches, biological yield, harvest index, 1000-seed weight, oil content and seed yield per plant. Biological yield per plant had positive and significant interrelationship with days to flowering, plant height, number of primary branches, number of secondary branches, number of seeds per siliquae, harvest index, 1000-seed weight, oil content and seed yield per plant. Harvest index had positive and significant association with plant height, number of primary branches, number of secondary branches, number of seeds per siliqua, biological yield, 1000-seed weight, oil content and seed yield per plant. 1000-seed weight had positive and significant association with days to flowering, plant height, number of primary branches, number of secondary branches, number of silique per plant, number of seed per siliquae, biological yield, harvest index, oil content and seed yield per plant. Oil content had positive and significant association with plant height, number of primary branches, number of secondary branches, number of seeds per siliquae, biological yield, harvest index and seed yield per plant. Seed yield per plant had positive and significant interrelationship with plant height, number of primary branches, number of secondary branches, number of seeds per siliquae, biological yield, harvest index, 1000-seed weight, and oil content. Similar results were observed by Singh *et al*. (2009c) [13], Singh *et al*. (2009) [13], Arifullah *et al*. (2013) [2] and Lohia *et al*. (2013) [9, 17].

Table 1: Grand mean, Heritability, Genetic advance and Genetic advance in per cent of mean of 12 attributes in F_1s generation involving 60 crosses of Indian mustard

Characters	Parameters			
	Grand mean	Heritability estimates in per cent	Genetic advance	Genetic advance in per cent over mean
Days to flowering	74.839	86.50	7.36	9.83
Days to maturity	123.61	82.10	12.30	9.95
Plant height	181.56	27.70	9.03	4.97
Number of primary branches per plant	11.15	80.10	4.06	36.41
Number of secondary branches per plant	21.08	76.70	4.48	21.25
Number of siliquae per plant	320.82	73.90	58.76	18.31

Number of seeds per siliquae	15.50	67.30	2.77	17.87
Biological yield(g)	82.50	29.60	4.33	5.24
Harvest index (%)	45.66	82.80	9.80	21.46
1000-seed weight (g)	4.90	85.70	1.17	23.87
Oil content (%)	40.16	39.50	1.10	2.73
Seed yield per plant (g)	37.69	87.60	9.90	26.26

Table 2: Genotypic (upper diagonal) and phenotypic (lower diagonal) correlation coefficients for combination of 12 characters among F_1s in Indian mustard.

Characters / rg / rp	Days of Flowering	Days to Maturity	Plant height	Number of Primary Branches	Number of secondary branches	Number of siliquae per plant	Number of seeds per siliqua	Biological yield per Plant	Harvest index	1000 seed weight	Oil content	Seed yield per plant
Days to flowering		0.126**	0.545**	-0.192	0.040**	0.019	-0.115	0.122**	-0.098**	0.166*	-0.229	-0.108**
Days to maturity	0.125**		-0.057	-0.464*	-0.381**	0.258**	-0.642*	-0.404**	0.380**	0.249*	-0.388	-0.469**
Plant height	0.403**	-0.021		0.307*	0.307**	0.042	0.144*	0.404**	0.380**	0.249*	0.139*	0.361**
Number of primary branches per plant	-0.166	-0.378	0.193**		0.725**	0.165**	0.871*	0.816**	0.815**	0.231*	0.673*	0.879**
Number of secondary branches per plant	0.011	-0.225	0.176**	0.577*		0.106	0.607*	0.647**	0.672**	0.230*	0.449*	0.717**
Number of siliquae per plant	-0.013	-0.202	0.049**	0.111*	0.090**		-0.014	0.101**	0.168**	0.229*	0.062*	0.181**
Number of seeds per siliquae	-0.086	-0.448	0.099**	0.643*	0.414**	-0.025		0.753**	0.776**	0.105*	0.624*	0.842**
Biological yield(g)	0.103**	-0.260	0.271**	0.487*	0.403**	0.058	0.465*		0.643**	0.136*	0.435*	0.780**
Harvest index (%)	-0.083	-0.362	0.229**	0.689*	0.539**	0.121	0.574*	0.325**		0.247*	0.697*	0.999**
1000-seed weight (g)	0.147**	-0.083	0.164**	0.181*	0.187**	0.193**	0.117*	0.096**	0.199**		0.194*	0.277**
Oil content (%)	-0.133**	-0.228	0.058**	0.391*	0.276**	-0.025	0.308*	0.217**	0.430**	0.100*		0.658**
Seed yield per plant (g)	-0.098	-0.396	0.256**	0.744*	0.575**	0.142	0.628*	0.560**	0.909**	0.191*	0.428*	

*Significant at p = 0.05, **Significant at p = 0.01

4. References

1. Adefris Teklewold. Diversity study based on quality traits, RAPD Markers, and Investigations of Heterosis in Ethiopian Mustard. Doctoral Dissertation.George-Augest University of Gottingen, Germany. 2005, 160.
2. Arifullah M, Munir M, Mahmood A, Ajmal KS, Hassan-ul- F. Genetic analysis of some yield attributes in Indian mustard (*Brassica juncea* L.) Afri. J. Pl. Sc. 2013; 7(6): 219-226.
3. Bhan S, Effect of soil moisture and nitrogen on mustard under Gangetic alluvium of Utterpradesh. Ind. J. Agron. 1979; 24:180-186.
4. Dewey OR, Lu KH. Correlation and path coefficient analysis of component of crested wheat grass seed production. Journal of Agronomy. 1959; 57:515-518.
5. Doweny RK, Agricultural and genetic potential of Cruciferous oilseed crops. Ame. Oil. Chem. Soc. J. 1971; 48: 728-732.
6. Falconer DS, Mackay FC, Introduction to quantitative genetics. (4th edition). Long man, New York,USA. 1996; 464.
7. Johnson HW, Robinson HF. Comstock RE. Genotypic and phenotypic correlations in soyabean and their implication. Journal of Agronomy. 1955; 47:477-483.
8. Kempthorne O. An Introduction to Genetical Statistics. John Wiley and Sons, London. 1957.
9. Lohia RS, Singh RK. Singh Mahak Studies on genetic variability, heritability and character association in Indian mustard [Brassica juncea (L.) Czern & Coss]. Progressive Research Journal. 2013; 8(1):75-77.
10. Nigussie Alemayehu, Yield and yield components of Ethiopian mustard and rapeseed as affected by some agronomic practices. An M.Sc. Thesis Presented to the School of Graduate Studies of Alemaya University. 1990, 112 p.
11. Robertson A, The sampling variance of the genetic correlation coefficient. Biometrics 1959; 15:469-485.
12. Sastri AB, Path analysis of yield components in Tobacco. Indian. J. Genet. 1974; 34:57-58.
13. Singh Mahak, Rao Mahesh, Rajshekhar, Dixit RK. Genetic variability and character association in Indian mustard (*Brassica juncea*). Journal of Oilseeds Research. 2009; 26:56-57.
14. Singh Mahak, Rao Mahesh, Shekhar Raj, Dixit RK. c. Genetypic variability and character association in Indian mustard (*Brassica juncea*). Journal of Oilseed Research 26 (Special issue): 2009; 56-57.
15. Singh Mahak, Srivastava RL, Prasad Lalta, Dixit RK. Correlation and path analysis in Indian mustard (*Brassica juncea*). Journal of Advanced Plant Science

2003; 16:311-316.
16. Singh P, Narayanan SS, Biometrical techniques in plant breeding. Kayani Publishers, New Delhi, 1993.
17. Singh RK, Lohia RS. Singh Mahak Study of gene action on inheritance of seed yield and its contributing traits in Indian mustard [*Brassica juncea* (L.) Czern & Coss]. Progressive Research Journal. 2013; 8(1):78-81.
18. Singh TP, Singh KB, Association of grain yield and its components in segregating populations of green gram. Indian J Genet. 1973; 33:112-117.
19. Wright S. Correlations and causations. J. Agri. Res. 1921; 20:557-587.