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Morphological Evaluation of Variability, Heritability and Genetic Advance in relation to Seed yield and its Attributing Traits in Indian Mustard [*Brassica juncea* (L.) Czern and Coss.]

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ABSTRACT: The present study was distributed for analyses the genetic heritability, variability and genetic advance for 12 quantitative traits. Use Randomized Block Design (RBD) with three replications for grown the 45 genotypes. Recorded the observations on three randomly selectedplants from each genotype in each replication for the 12 characters *viz*. days to 50% flowering,seed filling period, days to maturity, length of main shoot, number of pods on main shoot, number of primary branches/plant, number of secondary branches per plant, plant height, number of seeds per pod, grain yield/plant, test weight and oil content. The high genotypic coefficient of variation (GCV) and phenotypic coefficient of variation (PCV) was observed for number of secondary branches/plant, grain yield per plant and number of primary branches/plant. There was least influence of environment within the expression of those traits. High heritability as well as high genetic advance recorded for number of secondary branches / plant,grain yield/ plant, number of primary branches/plant, length of main shoot, plant height, number of pods on main shoot, days to 50% flowering, test weight and number of seeds per pod. As a result, genotypes selection will be done directly through these characters for furtherimprovement of genotypes of *Brassica juncea*. Based on the findings of the preceding research,it will be concluded that due weightage should incline to number of secondary branches/plant,grain yield/plant and number of primary branches / plant while enforcing genetic improvementthrough selection in mustard.

Keywords: Variability, heritability, genetic advance, Indian mustard.

INTRODUCTION

The oilseed *Brassica* crop is extremely important to our country's agricultural economy. chinese mustard, *B. napus, B. campestris syn rapa, and B. carinata*, all of which belong to the tribe Brassiceae of the mustard family (*Brassicaceae*), are grown everywhere on the planet. The world's estimated rapeseed-mustard area, production, and yield were 36.59 M/ ha, 72.37 MT, and 1980 kg/ha, respectively during 2018–19. India accounts for 19.8% of total acreage and 9.8% of total production globally. *Brassica juncea* also called Rai, Raya, or Laha, could be a major *rabi* oilseed crop in India, accounting for around 7% of worldwide production. After soybean, it's India's second most generally farmed oilseed crop accounting for quite 80% of total rapeseed-mustard soil. However, this crop's productivity hasbeen low, while oil demand has risen in tandem with the increase in population and economic status. This necessitates the event of novel strategies to extend the yield of this important oilseed crop. The genetic diversity within the gene pool determines what proportion yield may be increased in any crop. Mustard oil cakes are used for the feed of cows and buffaloes. It's wide selection of tastes from spicy to sweet and pungency also varies well from slightly to highly pungent. There is increasing interest in preparation of detoxified high functional mustard cake which is a good source of proteins and minerals. The seed of *Brassica juncea* contains 36 to 40 % oil and 38 to 41% protein and also have carbohydrates 4.51g, sugar 1.41g, dietary fiber 2g, fat 0.47g and protein 2.56g per 100g seeds. Indian cultivars have sufficient amount of two essential fatty acids, linoleic and linolenic.

Mustard oil has isothiocyanates contained answerable for its flavour and pungency (Park *et al*., 2018) mustard is that the nutritious and healthiest cooking medium because it contains 38 to 43 % oil, which is yellow and fragrant (Patel *et al*., 2012). The goals of Plant breeding is generating cultivars with higher yield require a more genetic variation (Joshi and Dhawan 1966), Pest resistance, greater acceptance, and desired quality (Nevo *et al*., 1982). The advance of a crop is basically passionate about the traits and magnitude of accessible genetic variability, heritability and therefore the transfer of desired characters into new varieties. The breeding programmes is success to enhanced when variability within the present genotypes is high, which permits the plant breeder to rapidly produce new varieties or improve existing ones.

MATERIALS AND METHODS

The materials were collected for the present investigation consisted of 45 diverse strains of Indian Mustard (*Brassica juncea* L. Czern and Coss, 2n= 36) from the Department of Genetics and Plant Breeding, CSA University, Kanpur, IARI, New Delhi and CCSHAU, Hisar. Some of them were released varieties for different zones and other promising strains which were in advance stage of testing in All India coordinated or state varietal trials. Randomized Block Design (RBD) with three replications were used to grown all the 45 genotypes. The length ofthe rows was kept 4.0 meter and spacing between R × R 30 cm and P × P10 cm. Three competitive plants were selected randomly from each entry in each replication and were tagged for recording detailed field observations later on the data on yield and its components were recorded on these randomly selected plants except days to 50% flowering and days to maturity which were recorded on the plot basis. The experimental data were subjected to statistical analysis as following standard statistical procedure described Panse and Sukhatme (1969) toassess component of variance and coefficient of variation. Heritability – Allard (1960) and genetic advance - Johnson *et al*. (1955).

RESULTS AND DISCUSSION

The importance of variance was investigated using the analysis of variance across 45 distinct *Brassica juncea* germplasm. The data was displayed in Table 1. For all 12 traits studied, including days to 50% flowering, seed filling period, days to maturity, length of main shoot, number of pods on main shoot, number of primary branches/plant, number of secondary branches/plant, plant height, number of seeds/pod, grain yield/plant, test weight, and oil content, the RBD analysis of variance revealed extremely significant differences between the materials used in this study. For these qualities, the phenotypic coefficient of variance was higher than the genotypic coefficient of variation. Number of secondary branches/plant (34.66%) and (34.96 %), grain yield/plant (31.80 %) and (32.12 %), and number primary branches/plant (20.25 %) all had significant GCV and PCV (20.74 %). Synrem *et al.* (2014); Singh *et al*. (2014) made similar observations. Moderate GCV and PCV number of pods on main shoot (17.63%) and (18.14%), days to 50% flowering (15.84%) and (16.43%), test weight (14.66%) and (15.31%), number of seeds per pod (14.03%) (15.31 %). PCV and GCV levels that are high and moderate suggest that these features can yet improve genotypes. It's worth noting that, for all of the qualities tested, PCV estimations were often not significantly higher than their corresponding GCV indicating that, in the manifestation of these traits, environment affect not much and additive gene effects, implying that genotypes can be improved and chosen for these characteristics The findings on heredity in general for seed yieldand attributing factors found that heritability estimates ranged from 51.61 % (oil content) to 98.30 % (number of secondary branches/plant). The character number of secondary branches/plant (98.30 %) had the highest heritability in the broad sense, followed by grain yield/plant (98.02 %), plant height (95.25 %), length of main shoot (95.05 %), number of pods on main shoot (94.40 %), days to 50 % flowering (92.93 %), test weight (91.69 %), number of seeds/ pod (90.92 %), days to mammalian reproduction (90.92 %), days (84.83 %). Oil content was estimated to have a low heritability in a wide sense (51.61 %). In agreement with the findings of previous researchers such as Roy *et al.* (2015); Akoju *et al*. (2020); Rout *et al* (2021). The genetic advance was arbitrarily divided into three categories: high GA (more than 20%), moderate GA (10-20%), and low GA (less than 10%), (below 10 per cent). Number of secondary branches/plant (70.79 %), grain yield/plant (64.86 %), number of primary branches/plant (40.73 %), length of main shoot (39.94 %), plant height (39.72 %), number of pods on main shoot (35.28 %), days to 50% flowering (31.46 %), test weight (28.91 %), and number of seeds /pod(27.57 %) all had high expected GA (>20 %) Seed filling period (11.43%)had a moderate GA (10-20%), although days to maturity (7.28%) and oil content estimation had a low GA in percent age of mean (10) (0.79 percent). For number of secondary branches /plant, grain yield / plant, number of primary branches / plant, length of main shoot, plant height, number of pods on main shoot, days to 50% flowering, test weight, and number of seeds/ pod, there was a high heritability combined with a high GA. As a result, for future enhancement of *Brassica juncea* genotypes, direct selection of germplasm can be done using these features. Lodhi *et al*. (2013) Jat *et al*. (2019); Yadav *et al*. (2020) have all reported similar findings Lakra *et al*. (2020). For the seed filling stage, there was a high heritability combined witha modest GA, implying that there could be more.

Table 1: Analysis of variance (ANOVA) for 12 traits in (*Brassica juncea* L.).

Source of variation	Replication	Treatment	Error
DF	2	44	88
Days to 50% flowering	17.53	214.03**	5.30
Seed filling period	8.59	84.15**	4.73
Days to maturity	6.01	83.31**	3.30
Plant Height (cm)	41.68	3998.59**	65.35
No. of Primary branches/ plant	0.16	8.88**	0.14
No. of Secondary branches / plant	1.46	82.49**	0.47
No. of Pods on main shoot	11.30	232.60**	4.51
Length of Main Shoot	25.03	726.33**	12.40
Test weight (g)	0.03	1.84**	0.05
No. of Seed / pod	1.020	9.166**	0.295
Oil Content (%)	0.049	0.171**	0.041
Grain yield/ plant (g)	2.82	368.00**	2.46

Table 2: Range, Heritability, Coefficient of variation, GA and GA mean for 12 characters inIndian Mustard.

Characters	Range	Heritability (%)	GA	GA% mean	GCV (%)	PCV (%)
Days to 50%flowering	30.67-68.33	92.93	16.56	31.46	15.84	16.43
seed filling period	75.00-99.00	84.83	9.76	11.43	6.02	6.54
Days to maturity	121.67-147.67	88.98	10.04	7.28	3.75	3.97
Plant Height (cm)	78.11-236.67	95.25	72.80	39.72	19.76	20.24
No. of Primarybranches per plant	4.44-12.33	95.31	3.43	40.73	20.25	20.74
No. of Secondarybranches per plant	0.00-23.78	98.30	10.68	70.79	34.66	34.96
No. of Podsonmain shoot	29.44-71.00	94.40	17.45	35.28	17.63	18.14
Length of MainShoot	31.44-105.22	95.05	30.98	39.94	19.88	20.40
Test weight (g)	4.00-7.27	91.69	1.52	28.91	14.66	15.31
No. of Seed per pod	9.83-21.80	90.92	3.38	27.57	14.03	14.72
Oil Content (%)	38.68-39.67	51.61	0.31	0.79	0.53	0.74
Grain yield perplant (g)	14.64-55.20	98.02	22.51	64.86	31.80	32.12

CONCLUSION

Variance analysis demonstrated that the current set of breeding material had considerable genetic variance, and research into genetic factors using these genotypes worth valuable results. The current research into variability, heritability, and genetic advance suggested that to improve the grain yield per plant these traits could be used directly.

REFERENCES

Allard, R. W. (1960). Principles of Plant Breeding.*John Wiley and Sons Inc.* New York.

Jat L., Rai, S. K., Choudhary, J. R., Bawa, V., Bharti, R., Sharma, M. and Sharma M. (2019). Phenotypic Evaluation of Genetic Diversity of Diverse Indian Mustard (*Brassica juncea* L. Czern and Coss) Genotypes using Correlation and Path Analysis. *International Journal of Bio-resource and Stress Management, 10*(5): 467-471.

Johnson, H. W., Robinson, H. F. and Comstock, R. E. (1955). Estimates of genetics and environmental variability in soyabean. *Journal of Agronomy*, *47*: 314-318.

Joshi, A. H. and Dhawan, N. L. (1966). Genetic improvement of yield with special reference to self-fertilizing crop. *Indian Journal of Genetics and Plant Breeding, 26A*: 6.

Lakra, A., Tantuway, G., Tirkey, A. E. and Srivastava, K. (2020). Genetic variability and Trait association studies in Indian mustard (*Brassica juncea* L. Czern & Coss *International Journal of Current Microbiology and Applied Sciences, 9*(01): 2556-2563.

Lodhi, B., Thakral, N.K., Avtar, R. and Singh, A. (2013). Genetic variability, association and path analysis in Indian mustard (*Brassica juncea*). *Journal of Oilseed Brassica, 5*(1): 26-31.

Nevo, E., Golenberg, E., Beilies, A., Brown, A. H. D. and Zohary, D. (1982). Genetic diversityand Environmental associations of wild wheat in Israel *Theoretical and Applied Genetics, 62*: 241-254.

Park, K. Y., Kwon D. Y., Lee, K. W., and Park, S. (2018). Korean Functional Foods: Composition, Processing and Health Benefits. CRC Press.

Panse, V. G. and Sukhatme, P. V. (1969). Statistical methods for agricultural workers. *Indian Council of Agricultural Research,* New Delhi. 282-301.

Patel, A. M, Prajapati, D. B., and Patel, D. G. (2012). Heterosis and combining ability studies in Indian mustard (*B. juncea* L.). *Indian Journal Science Research Technology, 1*: 38-40.

Robinson, H. F., Comstock, R. E. and Harvey, P. H. (1949). Estimates of heritability and degree of dominance in corn. *Journal of Agronomy*, *41*: 353-359.

Rout, S., Kerkhi, S. A. and Gupta, A. (2021). Estimation of genetic variability, heritability and genetic advance in relation to seed yield and its attributing traits in Indian mustard [*Brassica juncea* (L.) Czern and Coss.] *Journal of Pharmacognosy and Phytochemistry*, *8*(3): 4119-4123.

Roy, S. K., Kale, V. A. and Nagnathwar, V. A. (2015). Assessment of genetic variability of rapeseed-mustard germplasm under Terai region of West Bengal. *Electronic Journal of Plant Breeding*, *6*(4): 1132-1136.

Saikrishna Akoju, B. Arunkumar, P. H. Kuchanur, Hasan Khan and Ayyanagouda Patil (2020). Genetic Variability, Association and Path Analysis in Indian Mustard [*Brassica juncea* (L.) Czern & Coss.] for Yield and its Component Traits. *International Journal of Current Microbiology and Applied Sciences, 9*(11): 1373-1384.

Singh, R., Semwal, D. P. and Bhatt, K. C. (2015). Genetic Variability and Diversity Pattern for Agromorphological Traits in Indian Mustard Germplasm. *Indian Journal of Plant Genetics Resources, 29*(1): 52-58.

Synrem, G. J., Rangar, N. R., Myrthong, I. and & Bahadure, D. M. (2014). Variability studies in intraspecific crosses of Indian mustard *([Brassica juncea* (L.) Czern & Coss.)] genotypes. *IOSR Journal of Agriculture and Veterinary Science*, *7*(9): 29-32.

Yadav, R. K., Yadav, Ram, G., Gobind and Shweta (2020). Genetic variability and path coefficient analysis for seed yield and its related attributes in Indian mustard (*Brassica juncea* L. czern and coss.) under late sown condition. *Progressive Agriculture*, *20*(1and 2): 117-12.

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