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# Genetic Variability in Various Indigenous and Exotic Varieties/Accessions of *Brassica* Species

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## bstract

e study was conducted to examine the genetic potential of Brassica varieties/accessions collected from NARC, Islamabad the development of desirable types to meet the preset requirement of edible oil of the country. This research was carried t on ten varieties/accessions of *Brassica* species for recording genetic variability in different agro-morphological characters. ta were recorded on various quantitative characters to estimate the genetic variability in varieties/accessions. A large ount of genetic variability was recorded between varieties/accessions for the number of primary and secondary branches, mber of pods per plant, plant height, seed yield per plant. The results revealed that a lot of variability exists among the ious accessions tested which has the potential to be used for genetic improvement of *Brassica* species.

## troduction

ong conventional oilseed crops rapeseed and mustard oil s remained an important sources of edible oil in the untry. Unfortunately desirable varieties/types are not ilable. Infact the most probable reasons are both lack of per research and development work and necessary asures to overcome. The quality and nutritional value of eseed and mustard oil has been much recognized when nadian's evolved "Canola" types. The evaluation of anola" has opened a new avenue for the countries who engaged in the production of rapeseed and mustard oil. an effective breeding program, information concerning extent and nature of genetic diversity within a crop ecies is essential. It is particularly useful for aracterizing individual accession and cultivars and as a neral guide in the selection of parents for studying the netic variability of crop germplasm including rphological triats (Gepts, 1993). The material under dy showed considerable amount of genetic variation for erent agronomic characters viz., number of primary nches per plant, number of secondary branches per plant wakar and Singh, 1993), plant height, pods per plant illon *et al.* 1990 and Wani and Zarger, 1995) 1000-seed ght and seed yield per plant, (Chowdhury *et al.*, 1987 Singh *et al.*, 1987). This genetic variability can be sed for the selection and development of good forming lines or varieties.

## terials and Methods

following ten Brassica varieties/accession viz. Brown a, Indian raya I, Indian raya II,m Poorbi raya, RI-18, RLM-4, RLM-189, RS-300 and RNS were used for present estigations at Post Graduate Agricultural Research tion (PARS), Faisalabad. Randomised Complete Block sign was used, with four replication. Row to row ance of 45 cm and plant to plant distance of 25 cm was ntained. Recommended doses of fertilizer and cultural ctices were performed during the crop season. Data e collected on 10 randomly selected plants from three dle rows in each replication per accession. Data were orded on number of primary and secondary branches, mber of pods per plant, pod length, plant height, days to maturity, 1000-grain weight and seed yield per plant.

**Statistical Analysis**: The data were analyses statistically by using analyses of variance as given by Fisher (1958). Mean (X) and standard deviation (SD) were calculated according to standard techniques (Steel and Torrie, 1980).

## Results and Discussions

Analysis of variance for each character are presented in Table 1, the ranked means of all the agronomic characters recorded are presented in Table 2 and Genotypic and Phenotypic coefficients of variability are provided in Table 3.

**Number of primary branches per plant**: Mean values for number of primary branches per plant varied from 6.25 to 8.20 (Table 2). Minimum number of primary branches were recorded in RNS, while RLM-514 produced the maximum number of primary branches, followed by RL-18. Table 2 also indicated that RLM-514 was significantly different from RS-300 and RNS for number of primary branches per plant, whereas, RLM-514 was non-significantly different from RL-18, Indian raya-II, Poorbi raya, Indian raya-I, L-18, RLM-189 and Brown raya. Table I revealed that number of primary branches was highly variable character as suggested by the high F value. Genotypic coefficient of variability was 5.94 percent and phenotypic coefficient of variability was 8.73 per cent (Table 3). This also indicated that the number of primary branches per plant was highly variable character. These results agree with the findings of Narendra *et al.* (1988) and Andrahennadi *et al.* (1991), who also reported the similar results while working on *Brassica* species.

**Number of secondary branches per plant**: For this character the mean value ranged between 15.63 to 30.40. The minimum secondary branches were recorded in Indian raya I, whereas, the maximum in RLM-514. It is also clear from the Table 2 that the accession RLM-189 was statistically non-significant from all other varieties/ accessions with regard to mean values of the number of secondary branches per plant. F value was moderately high. Genotypic and phenotypic coefficients of variability were 15.49 and 19.49

Table 1: Mean squares from the analysis of variance of indicated plant characters among ten varieties/accessions of *Brassica* species.

| Characters | Mean Squares | | |
|---|---|---|---|
| | Block | Variety | Error |
| Primary branches per plant | 1.039 | 1.545ns | 0.828 |
| Secondary branches per plant | 32.860 | 68.295* | 25.184 |
| Days taken to maturity | 3.882 | 19.624** | 5.472 |
| Plant height (cm) | 34.300 | 729.579 ** | 60.368 |
| Number of pods per plant | 16407.327 | 56985.157* | 18402.60 |
| Pod length (cm) | 0.083 | 0.059* | 0.02 |
| 1000-seed weight (g) | 0.286 | 0.179* | 0.076 |
| Seed yield per plant (g) | 21.545 | 34.789* | 13.678 |
| d.f | 3 | 9 | 27 |

* = Significant at 0.05, ** = Significant at 0.01 an ns = Non-significant

Table 2: Means for Characters studied in *Brassica* species

| Varieties/ accession | Primary branches | Secondary branches | Plant height (cm) | Days to maturity | No. of pods per plant | Pod length (cm) | 1000-seed weight (g) | Seed yield per plant (g) |
|---|---|---|---|---|---|---|---|---|
| RLM-514 | 8.02a | 30.40a | 171.40d | 165.81a | 807.38a | 3.91abc | 3.14ab | 19.99a |
| RL-18 | 7.93ab | 18.33bb | 189.60b | 163.34ab | 440.23b | 4.02ab | 3.10ab | 10.37b |
| Indian raya II | 7.40abc | 20.95b | 158.18e | 161.36bc | 582.78b | 4.06a | 2.74b | 15.27ab |
| Poorbi raya | 7.30abc | 22.43b | 176.50cd | 161.02bc | 488.93b | 3.78c | 2.83b | 13.06b |
| Indian raya I | 7.25abc | 15.63ab | 202.95a | 165.32a | 395.68b | 3.70c | 3.35a | 100.77b |
| L-18 | 6.85abc | 16.33b | 193.28ab | 160.67bc | 410.85b | 3.71c | 3.23ab | 10.22b |
| RLM-189 | 6.80abc | 22.95b | 186.78bc | 165.37a | 568.30b | 3.78c | 2.97ab | 12.87b |
| Brown raya | 6.78abc | 21.18b | 165.53de | 163.06abc | 518.65b | 3.88abc | 3.41a | 12.04b |
| RS-300 | 6.42bc | 22.30b | 175.53cd | 162.55abc | 527.45b | 3.89abc | 3.06ab | 12.68b |
| RNS | 6.25c | 21.48b | 176.90cd | 159.34c | 452.13b | 3.93abc | 3.14ab | 11.04b |

Means sharing the common letters in a column do not differ significantly from each other by using Duncan's New Multipl Range Test at 0.05 probability.

Table 3:Genotypic ad phenotypic coefficient of variability among ten varieties/accessions of *Brassica* species.

| Characters | Coefficient of Variability | |
|---|---|---|
| | Genotypic | Phenotypic |
| Primary branches per plant | 5.94 | 8.73 |
| Secondary branches per plant | 15.49 | 19.49 |
| Days taken to maturity | 1.16 | 3.47 |
| Plant height (cm) | 7.19 | 7.52 |
| Number of pods per plant | 18.91 | 22.98 |
| Pod length (cm) | 1.65 | 2.91 |
| 1000-seed weight (g) | 5.19 | 6.89 |
| Seed yield per plant (g) | 17.91 | 22.98 |

percent respectively (Table 3). These high values indicated that the number of secondary branches was also a highly variable character, which is evident from the high genotypic coefficient of variability. Similar results were observed by Diwakar and Singh (1993) and Yadava *et al.* (1985) while working on *Brassica juncea*. From these results it can be concluded that there are better chances of making selection for number of secondary branches per plant.

**Plant height (cm):**A number of researcher has investigated variability for plant height while working with *Brassica juncea* and other Brassica crops. These include Dhillon *et al* (1990), Andrahennadi *et al.* (1991), Diwakar and Singh (1993) and Barua *et al.* (1996) who reported that thi character was highly variable while working o differen *Brassica* species.

Plant height varied from 158.18 to 202.95 cm in all th tested accession. The variety Indian raya-I was the talle and Indian raya-II was the shortest among all th accessions. Highly significant results were recorded for th character as manifested by the high F-value (Table 1 Genotypic and phenotypic coefficients of variability we 7.19 and 7.52 per cent respectively (Table 3). Th indicated moderate degree of variation for this characte which can be utilised for selection and hybridization of hi yielding varieties.

**Days of Maturity:** The mean number of days to matur ranged from 159.34 to 165.81. Accession RLM-514 to the maximum days to maturity followed by accession RL 189. Accession RNS took the minimum days to maturity all the accessions tested. It is also evident form the Ta 2 that the accession RLM-514 was statistically n significant from varieties/accessions RLM-189, Indian ray RL-18, Brown raya and RS-300 for this charac

notypic and phenotypic coefficients of variability were 6 and 1.36 percent (Table 3). These low values of efficient of variability manifested low degree of genetic iation. These results don't agree with Uddin *et al.* (1995) o found moderate variability for this character while rking on *Brassica juncea*. Whereas results are consistent h the results of Hussain (1990) who also reported less efficient of variability for the days taken to maturity while rking on various mustard varieties.

**mber of pods per plant:** A great deal of variability was served for the character umber of pods per plant among tested accession (Table 2). The number of pods per nt fall in the ranged from 395.68 to 807.38. RLM-514 statistically the maximum and Indian raya-I the imum number of pods per plant. The material used in se investigations has the high genotypic and phenotypic efficient of variability for the number of pods per plant ble 3). Andrahennadi *et al.* (1991), Chowdhury and swani (1991) and Wani and Zarger (1995) had similar servations during their studies on *Brassica campestris* and ssica *juncea* respectively who found character number od per plant, promising for the improvement of yield.

**l length (cm):** Pod length plays an important role in eding varieties in any crop species, which leads to better d. In the present studies the mean values for pod length ged between 3.7 cm to 4.06 cm. Indian raya-II exhibited largest pod size, the shortest pods were recorded in ian raya-I. Indian raya-II was statistically significantly ferent from Poorbi raya, Indian raya-I, RLM-189 and L-18, ile statistically non-significant from all the other ieties/accession. Genotypic and phenotypic coefficient variability were 1.65 and 2.91 percent (Table 3). These v values of coefficient of variability suggest that there s less genetic variability present in tested material for l length. These results are not in agreement with the dings of Diwakar and Singh (1993) and Barua *et al.* 996) who found high variability in pod length while rking on *Brassica juncea* and *Brassica campestris* spectively.

**00-seed weight:** The mean values for 1000-seed weight nged from 2.73 to 3.14 g. Brown raya exhibited the ghest seed weight followed by Indian raya-I. Indian raya-II d the lowest 1000-seed weight of all the tested cessions. Table 1 showed that 1000-seed weight was atistically significant as exhibited by the F-value. enotypic and phenotypic coefficient of variability values ere also moderately high (Table 3). These values indicated at the varieties/accessions were very inconsistent in rformance for 1000-seed weight. These results conform the findings of Andrahennadi *et al.* (1991), Diwakar and ngh (1993), Barua *et al.* (1996) and Uddin *et al.* (1995) ho observed high variability for 1000-seed weight while orking on different *Brasssica* species.

**Seed yield per plant (g):** Seed yield is the most important trait of any crop species, which is collective outcome of all the other plant characters. These characters contribute directly and indirectly to the yield potential of a crop species. All the characters described in the preceding pages are the yield components and are equally important. The mean value indicated that RLM-514 out yielded all the varieties/accessions with a high margin in seed yield per plant followed by Indian raya-II. Whereas, L-18 was the lowest yielded. Analysis of variance showed (Table 1) that variability for seed yield was highly significant as exhibited by the high F-value. Genotypic coefficient of variability was 17.91 percent while phenotypic coefficient of variability was 22.98 percent. These high values of coefficient of variability suggest that seed yield per plant was highly variable character in the material under investigation and can be utilised for the improvement and development of new high yielding varieties through the procedures of selection and hybridization. Singh *et al.* (1987) Thąkral *et al.* (1987), Chowdhury and Goswani (1991) and Uddin *et al.* (1995) reported high variability for seed yield per plant while working on different Brassica types. Results do not agree with the findings of Triboi (1988) who found less variation for seed yield while working on different cultivars of winter rape.

## References

Andrahennadi, C. P., L. A. Weerasena and M. D. R. S. Abeyratne, 1991. Evaluation of brown mustard germplasm in Sri Lanka. Cruciferae-Newsletter, 14-15: 62-63.

Barua, P. K. B. Langthasa and R. K. Chowdhury, 1996. Genetic diversity in Indian Rapeseed (*Brassica campestris* L.) Deppt. Plant Breeding and Genetic Assam Agric Univer. Jorhat. Indian. J. Oilseed Res., 13: 113-115

Chowdhury, P. R. and G. D. Goswani, 1991. Genetic variability studies in Indian mustard *Brassica juncea* L Czern, and Coss. Environment and Ecology., 9: 1003-1006.

Chowdhury, M. A., A. J. Miah, Lurfurr-Rahman and Ataur-Rahman, 1987. Correlation and path coefficient analysis of nine important characters of mustard (*Brassica juncea* L. Czern and Coss.). Bangladesh J. Agric., 12: 149-154.

Dhillon, S. S., K. S. Labana, S. Balwant and K. L. Ahuja, 1990. Association analysis in Indian mustard (*Brassica juncea* L. Czern and Coss). J. Res., Punjab Agric. Univ., 27: 385-388.

Diwakar, M. C. and A. K. Singh, 1993. Heritability and genetic advance in segregating population s of yellow seeded Inda mustard (*Brassica juncea* L. Czern & Coss). Univer. of Agric. and Tech. Kanpor 208 002. Uttar Pradesh. India. Deptt. of Plant Breeding and Genetic. Annuals of Agric. Res., 14: 247-248.

Fisher, R. A., 1958. Statistical methods for Research Workers. Olier and Boyd, London. 13th Ed. P. 248-298.

Gepts, P., 1993. The use of molecular and biochemical markers in crop evolution studies. In: M. K. Hecht (Ed), Evolutionary Biology, Vol.27, pp. 51-94, Plenum Press, New York.

Hssain, A., 1990. Estimation of correlation and genetic variability in various mustard varieties. M.Sc. (Hons.) Agric. Thesis, Deptt. P.B.G., Univ. of Agri., Faisalabad.

Narendra, K., J. K. Bisht, M. C. Josh, 1988. Correlation and discriminant function analysis in Indian mustard (*Brassica juncea* Subsp. juncea). Indian J. Agric. Sci., 58: 51-52.

Singh, R. P., B. P. S. Malik and D. P. Singh, 1987. Variation for morphophysiological characters in genotypes of Indian mustard. Indian J. Agric. Sci., 57: 225-230.

Steel, R. G. D. and J. H. Torrie, 1980. Principles and Procedures of Statistics. A biometrical approach. McGraw Hill Book Co., New York.

Thakral, N. K., K. Parkash, R. K. Arora and S. K. Thakral., 1987. Genetic variability with respect to seed yield and some growth attributes in Indian rape. International Rapeseed Congress, Poland 11-14th May, 1986.

Triboi, B. A. M., 1988. Yield development in different winter rape cultivars. Paris, France; Centre Technique Interprofessional des Oleagineux Metroplitains 130-133.

Uddin, M. J., M. A. Z., Chowdhury and M. F. U. Mia, 1995. Genetic variability character association and path analysis in Indian mustard (*Brassica juncea* L.). Annuals of Bangladesh Agriculture. 5: 51-54.

Wani, S. A. and G. H. Zargar., 1995. Genetic association of yield and its components in Indian mustard (*Brassica juncea*) grown under Kashmir valley conditions. Indian J. Agric. Sci., 65: 902-903.

Yadava, N., P. R. Kumar and R. K. Behl, 1985. Genetic variability and selection indices in brown sarson. Cruciferae Newsletter, 10: 62-65.