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COMPARATIVE PERFORMANCE AND GENETIC VARIABILITY AMONG HYBRID VARIETIES OF MUSTARD FOR RAEBERELI DISTRICT UNDER CENTRAL ZONE UTTAR PRADESH

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Abstract: Variation for ten different characters among five private sector mustard hybrids were analyzed during the Rabi season of 2016-17 at Krishi Vigyan Kendra, Dariyapur, Raebareli under UPCAR, Lucknow trial. The experiment was laid down in a randomized complete block design with four replications. Wide variations for all the characters indicating sufficient genetic variability to exploit in breeding programme. The highest seed yield was recorded in hybrid (Bayer 5222) was 1276.7 kg per hactare. Maximum values for genotypic (28.98) and phenotypic (29.27) coefficient of variation was observed for seed yield. Higher values of phenotypic co-efficient of variation and genotypic co-efficient of variation were observed for number of secondary branches, number of siliqua per plant , plot yield and seed yield indicating the existence of higher magnitude of variability among the test genotypes for effective selection in respect of the above characters. Higher heritability estimates values were recorded for characters like plot yield, number of raceme per plant, number of secondary branches, seed yield ,oil content and number of siliqua per plant, indicating these traits were less influenced by environmental factors and selection for them is fairly easy. Higher values of expected genetic advance as per cent of mean was recorded for seed yield , number of siliqua per plant, no. of secondary branches and number of raceme per plant, indicating that selection would be more useful to improve these traits. High heritability values coupled with high genetic advance was observed in case of seed yield, number of siliqua per plant, no. of secondary branches and number of raceme per plant indicating that selection for these traits would be effective in Indian mustard hybrid improvement. In such cases, the present investigation revealed that the hybrid variety of mustard Bayer 5222 is best suited variety and could be adopted by the farmers of central zone of Uttar Pradesh for fetching more yield ultimately oil.
Keywords: Mustard, Hybrids, Variability, Seed Yield

Indian mustard [Brassica juncea (L.) Czern & Coss] is an important oil seed crop in the country and plays a vital role regarding edible oil demand of the country. In India, rapeseed-mustard occupy 5.99 million ha area with production of 6.31 million tones and productivity of rapeseed-mustard in India 1053 kg/ha which is very less as compared to world's productivity 1856 kg/ha (Anonymus 2016) Rajasthan followed by Haryana, Uttar Pradesh, and Madhya Pradesh West Bengal, Gujarat and Assam are the major mustard producing states of India. Sustainable increase in mustard production and productivity needs continuous

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development of new varieties for efficient system of production to the farmers. It has two diverse gene pools of Indian and east European region therefore, the hybrids between the lines of the two gene pools are significantly heterotic for yield (Srivastava et al. 2001). Development of hybrid varieties through exploitation of heterosis has enhanced productivity in many crop plants (Havey, 2004). Therefore, use of hybrid varieties in mustard can break the yield barriers in mustard growing areas. Along with this the variability present in mustard species and relatives are important source for exploitation desired characters as well as development of high yielding mustard hybrids. Heterosis breeding could be a potential alternative for achieving quantum jumps in production and productivity of mustard. The magnitude of heterosis particularly for yield is of paramount importance and there by higher output of oil in mustard. Now a day's demand of edible oil has been increased with increasing population whereas, in contrary there is short supply of edible oils in the country. This shortfall can be minimized by using mustard hybrids. Keeping above in view the present investigation was carried out to test the private sector mustard hybrids to know it's yield potential and oil recovery for the profitability at farmer's field.

MATERIAL AND METHODS

The experimental material comprising of five Indian mustard hybrids (Bayer5222, Pioneer 45S46, Pioneer 45S42, Bayer Kesari Gold and Pioneer 45S35) of private seed industries were grown in Randomized Block Design with four replications at the technology cafeteria of Krishi Vigyan Kendra, Dariyapur, Raebareli (C.S. Azad University of Agriculture & Technology, Kanpur) during *Rabi* season of 2016-17. The land type of the experimental field was sandy loam in texture and with pH 7.6. Each genotype was sown in a plot consisting of single row of 6m length in four replications with inter and intra row spacing of 45cm×15cm. The fertilizers were supplied as N: P: K: Zn (20:60:0:20). Half dose of Nitrogen and full doses of Phosphorus and Zinc applied at the time of final land preparation and half dose of nitrogen three weeks later as broadcasting. Recommended package of practices for Indian mustard were followed to raise a healthy crop. Data were recorded on five randomly selected competitive plants of each variety in all the replications for characters *viz.,* days to maturity, number of secondary branches, number of raceme per plant, number of siliqua per plant, plant height, and number of grains per siliqua and test weight while characters like days to maturity, plot yield, seed yield and oil content were recorded on plot basis. Data collected for each trait were subjected to analysis of variance for Randomized Complete Block Design as suggested by Panse and Sukhatme (1957). To estimate the extent of variability, genotypic and

phenotypic co-efficients of variability were estimated according to the method suggested by Burton (1952). The broad sense heritability and genetic advance as per cent of mean were calculated as proposed by Jonson *et al.* (1955).

RESULTS AND DISCUSSION

The result on analysis of variance using Randomized Complete Block Design revealed that the hybrids exhibited highly significant differences for all the characters studied. This suggested that adequate scope is available for development of superior hybrids for enhancing genetic yield potential of *Brassica juncea.* The mean performance of hybrids as shown in Table 1 showed highest number of siliqua per plant (327.5), test weight 6.8 gram), seed yield 1276.7kg/ha and oil content (41.75 percent) for hybrid Bayer 5222. This exhibited that mustard hybrid Bayer 5222 will perform well in Raebareli district or central zone of Uttar Pradesh. The farmers of central zone of Uttar Pradesh can get more yield and oil from mustard crop by adopting this hybrid. Genetic parameters (Table 3) were studied for studying yield and yield contributing traits, based on genetic variability estimates *viz.,* mean, range, phenotypic co-efficient of variation (PCV), genotypic co-efficient of variation (GCV), heritability (h^2), genetic advance (GA) and genetic advance as per cent of mean (GAM). It was observed that all the characters studied exhibited wide range of variation, with most pronounced range for most of traits except days to maturity, number of grains per siliqua and oil content reflecting narrow range of variation for these traits. Higher estimates of phenotypic co-efficient of variation than genotypic co-efficient of variation for all the traits reflected influence of environmental factor on these traits with variable effect. The estimates of phenotypic co-efficient of variation and genotypic co-efficient of variation were high for number of secondary branches, number of siliqua per plant, plot yield and seed yield, was earlier reported by Kardam and Singh (2005). It was interesting to note that the smallest differences were observed between PCV and GCV values of characters such as, days to maturity, plot yield, seed yield and oil content, suggesting lesser influence of environmental factors on their expression. Relatively higher differences between PCV and GCV values were recorded with respect to characters like plant height and number of grains per siliqua. The results revealed that these characters were more influenced by environmental factors than rest of the characters studied. The heritability estimate was more than 50 per cent for all the characters considered in this study (Table 2) except for Plant height. Very high values of heritability estimates were recorded for characters like plot yield (99 %), number of raceme per plant (96 %), number of secondary branches (95 %), seed yield (95 %), oil content (95 %)

and number of siliqua per plant (86 %) indicating the possibility of improvement through selection. The expected genetic advance as per cent of mean from selecting the top 5 per cent of the genotypes ranged from 0.04 per cent for germination percent to 59.4 per cent for plot yield (Table 2). This indicated that selecting the top 5 per cent of the base population would result an increase of 1.53 per cent for days to maturity to 59.40 per cent for plot yield over the base population mean. Higher values of expected genetic advance as per cent of mean was recorded for seed yield, number of siliqua per plant, no. of secondary branches and number of raceme per plant, indicating that selection would be more useful to improve these traits. Keeping in view that consideration of heritability and genetic advance together prove more useful in predicting the resultant effect of selection on phenotypic expression of character (Johnson *et al.,* 1955). These above four characters were identified, have high heritability values coupled with high genetic advance. These characters reflected greater contribution of additive genetic component which may be exploited in selection in early segregating generations for the development of improved genotypes. The findings of Mahla *et al.* (2003), Singh (2004) were in accordance with the present investigation. The result of this study indicated that selection for days to maturity, plant height, test weight, number of grains per siliqua plot yield and oil percentage would be less effective as compared to selection for the characters that showed high heritability and high genetic advance in this crop improvement programme.

Table 1: Analysis of variances in Randomized Complete Block Design for ten characters in mustard hybrids

Sources	df	DM	NSB	NRPP	NSPP	PH	NGPS	TW	PY	SY	OP
Replication	3	12.93	3.33	3.33	90.85	47.6	6.27	0.20	0.008	2901.63	0.64
Genotypes	4	6.00**	102.8**	128.8**	7754.45**	390.38*	6.80**	3.04**	2.44**	273007.13**	6.21**
Error	12	0.60	1.33	1.33	306.02	136.14	0.77	0.09	0.005	1382.47	0.07
CV %		**0.60**	**5.55**	**4.48**	**6.62**	**9.81**	**6.34**	**5.13**	**2.65**	**4.13**	**0.68**

* and ** indicate significance of values at P=0.05 and 0.01, respectively

Table 2. Comparative performance of means for ten different characters in mustard hybrids

Variety	DM	NSB	NRPP	NSPP	PH	NGPS	TW	PY	SY	OP
Bayer5222	130	23	28	327.5	120.5	14	6.80	3.825	1276.70	41.75
Pioneer 45S46	129	28	34	227.5	132.8	15	5.52	2.325	776.73	39.82
Pioneer 45S42	132	16	21	291.8	122.8	13	6.50	3.175	1060.00	41.15
Bayer Kesari Gold	130	21	26	246.0	111.0	15	5.10	2.203	733.20	39.30
Pioneer 45S35	129	16	20	228.0	108.0	12	4.80	1.950	649.90	38.80

DM- Days to maturity, NSB- No. of secondary branches, NRPP- Number of raceme per plant, NSPP- No. of siliqua per plant, PH- Plant Hieght, NGPS- No. of grains per siliqua, TW- Test Weight (g.), PY- Plot Yield (g.) , SY- Seed Yield (Kg/ha.), OP- Oil Percentage

Table 3 : Estimates of mean, range of mean, genotypic (GCV) and phenotypic (PCV) co-efficient of variation, genotypic, phenotypic and environmental variances, Heritability in broad sense (^{h2} B), genetic advance (GA) and genetic advance as per cent of mean (GAM) for different characters of mustard hybrids

Character	Range		Mean	V_g	V_e	V_p	GCV	PCV	h^2	GA	GAM
	Min	Max.									
Days to maturity	128	134	130.00	1.36	0.60	1.96	0.89	1.07	0.69	1.99	1.53
No. of secondary branches	15	30	20.80	25.37	1.33	26.70	24.21	24.84	0.95	10.11	48.62
Number of raceme per plant	19	36	25.80	31.87	1.33	33.20	21.88	22.33	0.96	11.39	44.16
No. of siliqua per plant	220	350	264.15	1862.11	306.02	2168.13	16.34	17.63	0.86	62.38	31.19
Plant height (c.m.)	104	150	119.00	63.57	136.14	199.71	6.69	11.88	0.32	9.26	7.79
No. of grains per siliqua	11	17	13.80	1.51	0.77	2.28	8.89	10.92	0.66	2.08	14.93
Test weight(g)	4.5	7.2	5.75	0.74	0.09	0.83	14.96	15.81	0.69	1.67	29.14
Plot yield(g)	1.9	3.9	2.70	0.61	0.01	0.62	28.96	29.08	0.99	1.60	59.40
Seed yield (kg/ha)	620.4	1313.3	899.30	67906.18	1382.47	69288.64	28.98	29.27	0.95	531.43	59.09
Oil percentage (%)	38.5	42.0	40.17	1.53	0.08	1.61	3.08	3.16	0.95	2.49	6.20

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REFERENCES

[1] Burton, G.W. and Devane, E.H. (1952) Estimating heritability in tall fescue (Festuca arundinaceae) from replicated clonal material," Agronomy Journal, 1952, 45: 478-481.

[2] Johnson, H.W., Robinson H.F and Comstock, R.E. (1955) Estimation of genetic and environmental variability in soybean. Agronomy Journal, 1955, 47: 314-318. [8] Kumar., Krishnapal

[3] Panse, V.G and Sukhatme, P.V. (1957) Genetics and quantitative characters in relation to plant breeding, Indian Journal of Genetics, 17: 312-328.

[4] Srivastava, A., Gupta, V., Pental, D., Pradhan, A.K. (2001) AFLP-based genetic diversity assessment amongst agronomically important natural and some newly synthesised lines of Brassica juncea. Theor. Appl. Genet. 102: 193-199. Sodhi, Y. S., Mukhopadhyay, A., Arumugam, N., Verma, J. K.,

[5] Mahla, H.R., Jambhulkar, S.J., Yadav, D.K. and Sharma, R. (2003) Genetic variability, correlation and path analysis in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. *Indian J. Gen. Plant Breed*., 63: 171-172.

[6] Singh, B. (2004) Character association and path analysis under dry land condition in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. *Cruciferae Newsletter*, 25: 99-100.

[7] Havey, M.J. (2004) The use of cytoplasmic male sterility for hybrid seed production. In H. Daniell, C. Chase eds, Molecular Biology and Biotechnology of Plant Organelles. Springer Publisher, Dordrecht, The Netherlands, pp 617-628.

[8] Kardam DK, Singh V.V. (2005) Correlation and path analysis in Indian mustard (Brassica juncea L.) grown under rainfed condition. J. Spices Aromatic Crop. 14(1): 56-60.

[9] Rai, S.K., Verma, A. and Pandey, D. (2005) Genetic variability and character association analysis in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. *Ann. Agri. Bio. Res*., 10: 29-34.

[10] Tusar, P., Maiti, S. and Mitra, B. (2006) Variability, correlation and path analysis of the yield attributing characters of mustard (*Brassica* sp.). *Res. Crops,* 7(1): 191-193.

[11] Anonymous. 2016. http,//www.indiastat.com/agriculture/2.

[12] Asheesh Kumar Tiwari, Sanjay Kumar Singh, Amit Tomar and Mahak Singh (2017) Heritability, genetic advance and correlation coefficient analysis in Indian mustard (*Brassica Juncea* (L.) Czern & Coss), *Journal of Pharmacognosy and Phytochemistry,* 6(1):356-359