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Stability analysis for yield and yield attributes in Indian mustard [*Brassica juncea* L.]

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Abstract
An experiment was conducted on twenty genotypes of Indian mustard (*Brassica juncea* L) in three different environments created by three dates of sowing i.e. 20th September, 10th October, 30th October, 2022 during *Rabi* 2022-2023 in randomized block design with three replications to estimate genotype x environment interaction and stability parameters for days to 50 percent flowering, days to maturity, plant height (cm), primary branches per plant, secondary branches per plant, number of siliquae per plant, number of seeds per siliqua, length of siliqua (cm), seed yield per plant (g), test weight (g) and oil content (percent). The stability analysis was carried out according to Eberhart and Russell model (1966). The environmental effects were significant for all the traits, while genotype x environment interaction was significant for almost all the traits except length of siliqua. Genotypes RH 0406 and NRC HB 101 had below average stability for seed yield per plant (g) & other most of the yield contributing characters and suitable for better environment (environment-I). Genotypes Pusa Mustard 26 and Pusa Double Zero Mustard 31 had above average stability for seed yield per plant (g) and suitable for poor environment (environment-III). Genotypes Pusa mustard 25 and Divya-33 were found most stable for seed yield per plant, which can be grown in wide range of environments (all three dates of sowing).

Keywords: Genotype, environment and stability

Introduction

Indian agriculture has a long and illustrious history. The great majority of the population depends on agriculture and related industries for a living, and the country's geographic location is ideal for agriculture. Oil seeds rank as India's second-largest agricultural product after grains. It contributes 14% of the gross cultivated area, approximately 1.5% of the gross national production, and 8% of the value of all agricultural commodities in India's agricultural sector (Dubey *et al.* 2021) [6]. Many agri-based enterprises rely on these crops for fundamental raw ingredients. The mustard plant, *Brassica' juncea* L., is one of the Brassica genus and is a source of several vegetables, condiments, and oilseeds. Most of the mustard used in food is cultivated in China and Japan. China and Japan are major producers of mustard. In contrast, oilseed mustard is more significant than other types of vegetables and condiments in the Indian subcontinent than it is on the Canadian prairies (Chen *et al.*, 1997) [4]. The interplay between genetics and surroundings environment produce a character's phenotypic manifestation. Because the genotype x environment (G x E) interaction effect is confounded with the genotype effects, therefore, genetic parameter estimates derived in one environment are biased. To obtain an accurate picture of how different traits manifest themselves, it is crucial to include the G x E interaction when estimating various genetic factors. Based on these considerations, it is necessary to create varieties that would provide consistent yield from season to season and location to location, even when faced with moisture stress.

The stability of a variety is as consistent performance throughout time. Given the significance of the mustard crop, many cultivars have been made available in various agro climatic regions of India. The released genotypes are more effective in their intended settings and because different micro and macro-environments have varied impacts on the genotypes, they yield differently in different zones.

The examination of varietal trials is frequently used in relation to the phrase "stability analysis." The resultant regression coefficient or slopes may be used to determine whether each variety is resilient to environmental changes or is susceptible to them. The discovery of a substantial genotype × environment (G × E) interaction suggests that not all genotypes respond to environmental changes in the same way. This implies that the genotype that performs well in one environment may not perform best in another. The breeder looks for a cultivar that has general adaptability and universal performance over the range of environments. If the interaction components are relatively large compared to the genotypic components and if they are related to predictable environmental factors, Since it may be useful to assess the actual performance of genotypes to be aware of the stability of the yield in mustard (Abdelrahman *et al.*, 2002) [1].

Material and Methods

The material for the present investigation consisted of a set of 20 germplasm lines including two checks i.e. Pusa Mustard 26 and Pusa Double Zero Mustard 31 which were obtained from the Directorate of Rapeseed-Mustard Research, Sewar, Bharatpur, Rajasthan. This investigation was conducted at R.B.S. College of Agriculture, Bichpuri, Agra, Uttar Pradesh during *rabi* 2022-23. Geographically, Bichpuri, Agra is situated at 26^0-44' N latitude and 78^0-32' E longitude and at an altitude 170 meters above mean sea level. These entries were evaluated in randomized block design with 3 replications. In each replication each entry was sown in a plot of two rows, each row consisting with 4 meter length and plant to plant distance were maintained at 10 cm by thinning after 15 days of sowing. The sowing was done in three different environments which were created by sowing on three different dates i.e. 20th September (environment-I), 10th October (environment-II), and 30th October (environment-III), 2022.

Ten competitive plants were randomly selected and tagged before flowering from each plot in replication/ environment to record the data on different morpho-physiologcal characters viz. days to 50% flowering, days to maturity, plant height (cm), primary branches per plant, secondary branches per plant, number of silique per plant, length of siliqua, seeds per siliqua, seed yield per plant (g), test weight (g) and oil content (percent). Data on days to 50 percent flowering and days to maturity were, however, recorded on whole plot basis. Observations were recorded as describe below: The data on each character for the genotypes were subjected to standard statistical analysis of variance for each environment separately (Panse and Sukhatme, 1985) [15]. Later the data were subjected to pooled analysis of variance.

Results and Discussion

The pooled analysis of variance showed significant differences among genotypes for all the traits. The environmental effects were also significant for all the traits, while genotype x environment interaction was significant for almost all the traits except length of siliqua. It indicated the differential influence of environment on the genotypes with respect to most of the characters including seed yield (Table 1). The importance of the variation resulting from the genotype x environment interaction showed that genotypes performed differently for various traits in various contexts. Therefore, it was crucial to understand the origin or reason behind difference in the genotypes' performance over the environments. Similar finding of significant G x E interaction also have been reported by Mahla *et al.* (2003) [13], Khan *et al.* (2008) [11], Badiger *et al.* (2009) [2], Jat *et al.* (2014) [9], Jat and Jakhar (2015) [8] and Ram *et al.* (2017) [16]. This criterion was used in the current study to divide the genotype identities into three groups, with bi = 1 denoting average stability, bi < 1 denoting above average stability, and bi > 1 denoting below average stability. In regions where water stress, edaphic or atmospheric adversities are predominate during the growing season, particularly in the later parts of the crop growth, the early flowering of mustard is a highly desirable trait so that the genotype may escape the adversities and mature before such stresses occur. All of the genotypes exhibited stable S^2di values that were not significant for this character. The three genotypes with the lowest means compared to the overall mean and regression coefficients that are closest to unity are genotypes Pusa Mustard 27, PBR-357, and RH-0749 (Table 2). Similarly, early maturity is also a desirable character like early flowering in mustard to escape the crop from environmental adversities. All the genotypes showed non-significant S^2di values exhibiting stability for this particular trait. Genotypes namely, Coral PAC 432, PYS-1, Pusa Mustard 27, PBR-357, RLC-2, Pusa Mustard 28, Pusa Double Zero Mustard 31, PBR-378, Raj Vijay Mustard-2 and PM-29 were most desirable and stable for this trait because these genotypes had the mean lower than general mean and regression coefficient close to unity. RH-0749 was suitable for poor environment e.g environment-III as these had low mean and low regression coefficient, thus exhibiting above average stability (Table 2). Similar results were observed for flowering and maturity by Kumawat and sharma (2022) [12] in mustard.

Tallness is desirable and tall plant is expected to bear more siliqua. Positive association between seed yield and plant height in mustard has been reported by Ram *et al.* (2017) [16]. In the present investigation 45 percent genotypes exhibited non-significant deviation from regression indicating, their general stability for plant height. Divya-33 having highest means and unity regression is most desirable among the genotypes evaluated. Pusa Double Zero Mustard 31 and RH-0749 exhibited below average stability as they had higher mean value with regression coefficient higher than unity. NRCDR 601, Pusa Double Zero Mustard 31, RH 0406 and NRC HB 101 exhibited above average stability (Table 2).

The S^2di estimates of all the genotypes for primary branches per plant were non-significantly deviated from zero indicating their general stability for this trait. PYS-1, Pusa Mustard 27, RH 0406, NRC HB 101, Giriraj were found most stable as these genotypes had high mean and regression coefficient close to 1 and S^2di close to zero. Pusa mustard 25 and RH-0749 having below average stability were suited for better management condition. Pusa Mustard 26 and Pusa Double Zero Mustard 31 had above average stability and suitable for poor environment (Table 3)

S^2di estimates of all the genotypes for secondary branches per plant per plant were non-significantly deviated from zero indicating their general stability for this trait. Genotype RLC-2, Pusa Double Zero Mustard 31, NRC HB 101 and PM-29 were most stable genotypes. Pusa mustard 25 and Giriraj, exhibited high mean and higher regression coefficient thus better suited for the better environmental condition. Pusa Double Zero Mustard 31 had above average stability thus suitable for poor environmental conditions. Kamdi *et al.* (2022) [10] was found similar result for secondary branches per plant in mustard (Table 3).

Yadava *et al.* (2010) [18] reported positive association between seed yield per plant and number of siliquae per plant. Genotypes, Pusa Mustard 26 and NRC HB 101 had above average stability thus suitable for poor environmental conditions. Genotypes, Pusa Mustard 26 and Pusa Double Zero Mustard 31 were suitable for better environment as these genotypes had high mean and high regression coefficient with non-significant S^2di value thus exhibiting below average stability. RLC-2, Pusa Double Zero Mustard 31, PM-29 and 20 Coral PAC 432 were suitable for better environment as these genotypes had high mean and higher regression coefficient thus exhibiting below average stability. Pusa Mustard 26 and Pusa Double Zero Mustard 31 had above average stability and suitable for poor environments.

The S^2di estimates for seed yield were non-significant for all genotypes indicating general stability for seed yield. Similar results for non-significant S^2di were obtained by Kumawat and Sharma (2022) [12]. Pusa mustard 25 and Divya-33 were found most stable as these genotypes had high mean, bi close to 1 and S^2di was non-significant. NRCDR 601, RH 0406 and NRC HB 101 were suitable for better environment condition as these genotypes had high mean and higher regression coefficient thus exhibiting below average stability and suitable for better environment. Pusa Mustard 26 and Pusa Double Zero Mustard 31 had above average stability and suitable for poor environment (Table 4).

Those genotypes, which have high test weight (percent), are expected to be high yielders. In the present investigations, On the basis of mean and regression coefficient RLC-2, Pusa Double Zero Mustard 31, PM-29 and PM-29 exhibited high mean and higher regression coefficient thus better suited for the better environmental condition. Pusa Double Zero Mustard 31 and RH 0406 had above average stability thus suitable for poor environmental condition (Table 4).

The S^2di associated with most of genotypes were non-significant except Pusa mustard 25 and NRCDR 601 for oil content (Table 4). Pusa Double Zero Mustard 31 was considered to be most desirable and stable genotypes as these genotypes had high mean, bi close to 1 and S^2di was non-significant. NRC HB 101 and Giriraj had high mean than general mean and regression coefficient more than unity so they are suitable for better management condition. RLC-2, Pusa Double Zero Mustard 31 and PM-29 and had above average stability thus suitable for poor environmental conditions. Stable genotypes for oil content were also confirmed by Gazal *et al.* (2013) [7] and Srivastava and Srivastava (2020) (Table 4).

The genotypes which had higher mean for seed yield and bi = 1 are Pusa mustard 25 and Divya-33. These genotypes can be evaluated in advanced breeding traits for direct release. Genotypes NRCDR 601, RH 0406 and NRC HB 101 are also having superior performance and also responsive to optimum sowing conditions as they are having greater mean with high regression coefficient, thus these genotypes should be used in hybridization programme to generate superior gene pool. Dhillon *et al.* (2001) [5] and Brar *et al.* (2007) [3] have also reported that the genotypes stable over environments can be used successfully for developing stable strains having wider adaptability in the future breeding programme.

Table 1: Pooled analysis of variance showing mean squares for yield and its component traits in mustard

Source	d.f.	Mean Sum of Squares										
		Days to 50% flowering	**Days to maturity**	**Plant height (cm)**	**Primary branches per plant**	**Secondary branches per plant**	**Number of siliquae per plant**	**Number of seeds per siliquae**	**Length of siliqua (cm)**	**Seed yield per plant (g)**	**Test weight (g)**	**Oil content (percent)**
Environment	2	596.91*	3038.54**	1611.52**	51.855**	676.10**	59978.49**	280.40**	3.79**	278.36**	10.30**	546.59**
Rep in Env	6	0.22	1.11	1.05	0.246	0.17	1.58	0.59	0.01	0.69	0.01	0.16
Genotypes	19	36.10**	42.88**	926.23**	11.055**	60.33**	1008.37**	53.95**	1.66**	21.34**	1.62**	63.21**
Genotype × environment	38	1.48**	6.78**	33.44**	0.321**	3.07**	1k70.57**	1.42**	0.02	1.62**	0.03**	5.28**
Error	114	0.83	0.69	2.74	0.104	0.47	3.30	0.31	0.02	0.36	0.02	0.38

Table 2: Mean values and stability parameters (b_i and S^2d_i) of the mustard genotypes for days to 50 percent flowering and days to maturity and plant height

Genotypes	Days to 50% flowering			Days to maturity			Plant height		
	Mean	**bi**	**S^2d_i**	**Mean**	**bi**	**S^2d_i**	**Mean**	**bi**	**S^2d_i**
Pusa mustard 25	51.89	0.98	-0.88	130.00	1.17	-0.73	160.45	0.97	1.54
Coral PAC 432	48.22	1.26	-0.89	126.78	0.97	-0.79	201.68	1.03	0.63
NRCDR 601	50.67	1.02	-0.93	128.11	1.19	-0.86	212.78	0.52	0.15
PYS-1	47.56	0.92	-0.65	125.33	1.01	-0.93	218.64	1.11	22.03**
Pusa Mustard 26	50.33	0.56	-0.93	131.22	0.47	-0.52	220.59	0.64	6.19**
Pusa Mustard 27	49.78	0.99	-0.03	127.78	1.09	-0.37	190.52	1.35	-0.46
PBR-357	48.11	1.06	-0.90	125.89	1.02	-0.42	203.55	0.49	-0.37
RLC-2	49.11	0.86	-0.91	127.11	1.07	-0.91	212.47	0.76	25.27**
Pusa Mustard 28	46.89	1.18	-0.92	124.67	1.05	-0.82	212.06	0.54	-0.32
Pusa Double Zero Mustard 31	49.56	0.62	-0.93	130.22	0.58	-0.93	212.78	0.36	2.01
Coral 437	47.00	1.20	-0.91	126.00	1.07	-0.61	218.43	1.22	3.16*
PR 20061	49.22	1.18	-0.92	127.33	1.12	-0.61	219.80	1.68	8.86**
PBR-378	47.78	1.32	-0.87	127.11	1.05	-0.52	216.01	2.29	8.68**
RH 0406	50.89	0.80	-0.92	128.89	0.99	-0.90	217.02	0.77	-0.84
NRC HB 101	54.22	1.26	-0.89	133.67	0.88	-0.82	231.58	0.61	-0.92
Raj Vijay Mustard-2	49.11	0.76	-0.83	127.44	0.99	-0.93	218.68	0.91	37.14**
Divya-33	50.00	0.94	-0.86	128.56	0.93	-0.69	231.20	1.09	5.38
RH 0749	48.11	1.02	-0.38	127.00	0.84	-0.93	224.89	1.39	-0.93
PM 29	49.33	1.12	-0.91	127.89	1.07	-0.25	207.61	1.38	45.92**
Giriraj	53.78	0.96	-0.93	130.56	1.44	-0.36	208.02	0.81	18.19**
Mean	49.58			128.08			212.74		

Table 3: Mean values and stability parameters (b_i and S^2d_i) of the mustard genotypes for secondary branches per plant, siliqua per plant and number of seed per siliqua

Genotypes	Secondary branches per plant			Siliqua per plant			Number of seeds per siliqua		
	Mean	**Bi**	**S^2d_i**	**Mean**	**bi**	**S^2d_i**	**Mean**	**bi**	**S^2d_i**
Pusa mustard 25	24.00	1.49	-0.61	340.78	1.22	4.57*	15.20	1.35	-0.87
Coral PAC 432	16.46	0.98	-0.92	340.63	0.98	6.52**	12.57	0.94	-0.92
NRCDR 601	17.93	1.00	-0.71	344.38	1.06	15.80**	14.70	0.92	-0.93
PYS-1	19.69	0.93	-0.60	340.01	0.99	-0.18	11.39	0.97	-0.81
Pusa Mustard 26	16.73	0.41	-0.47	379.61	0.54	2.76	18.24	0.31	-0.33
Pusa Mustard 27	18.84	0.99	-0.75	346.70	0.77	16.57*	13.31	1.01	-0.42
PBR-357	17.92	0.97	-0.90	343.38	0.89	0.65	11.70	0.97	-0.92
RLC-2	21.86	0.99	-0.93	341.28	0.94	16.22**	13.04	1.03	-0.87
Pusa Mustard 28	18.28	0.97	-0.90	338.93	0.99	1.81	10.33	0.85	-0.72
Pusa Double Zero Mustard 31	23.13	0.50	-0.81	368.92	0.54	0.61	18.26	0.55	-0.55
Coral 437	25.09	0.99	-0.87	340.23	1.00	-0.33	11.19	0.90	-0.92
PR 20061	17.10	1.14	-0.70	338.52	0.98	67.54**	12.97	1.40	-0.90
PBR-378	19.01	0.97	-0.51	340.06	0.98	10.33**	11.92	0.94	-0.89
RH 0406	19.71	0.68	0.59	343.42	0.99	-0.68	14.48	0.92	-0.93
NRC HB 101	22.96	1.06	-0.50	343.00	1.42	10.79**	17.58	1.50	-0.85
Raj Vijay Mustard-2	18.45	0.97	-0.90	336.42	1.28	7.01**	12.61	1.08	-0.93
Divya-33	18.83	1.51	0.53	343.20	0.98	-0.63	13.87	0.93	-0.92
RH 0749	17.12	1.05	-0.49	340.64	1.04	0.65	11.86	0.88	-0.63
PM 29	20.24	0.99	-0.76	345.62	1.01	31.20**	12.58	1.58	-0.64
Giriraj	22.54	1.43	-0.68	337.91	1.40	29.65**	17.61	0.95	-0.92
Mean	19.80			344.68			212.74		

Table 4: Mean values and stability parameters (b_i and S^2d_i) of the mustard genotypes for length of siliqua, test weight, seed yield per plant and oil content

Genotypes	Length of siliqua			Test weight			Seed yield per plant			Oil content		
	Mean	bi	S^2d_i	Mean	bi	S^2d_i	Mean	bi	S^2d_i	Mean	bi	S^2d_i
Pusa mustard 25	4.38	1.26	-0.93	3.10	1.19	-0.93	12.54	1.02	-0.85	46.49	0.94	4.45*
Coral PAC 432	4.63	1.01	-0.93	3.35	1.04	-0.93	10.67	0.84	-0.92	36.24	0.95	-0.90
NRCDR 601	4.48	0.96	-0.93	3.34	0.40	-0.92	11.83	1.24	-0.92	36.20	0.69	6.06**
PYS-1	4.87	1.09	-0.93	3.59	1.09	-0.93	9.18	0.75	-0.91	39.36	0.89	-0.82
Pusa Mustard 26	6.20	0.37	-0.93	3.52	1.07	-0.93	14.51	0.49	-0.88	35.83	0.51	-0.57
Pusa Mustard 27	4.87	1.09	-0.93	3.59	1.09	-0.93	11.15	1.03	-0.83	38.66	0.89	-0.61
PBR-357	4.74	1.05	-0.93	3.46	1.06	-0.93	9.85	0.93	-0.92	37.68	0.93	-0.93
RLC-2	5.12	1.17	-0.93	3.83	1.14	-0.93	10.78	0.88	-0.85	42.21	0.61	-0.92
Pusa Mustard 28	4.77	1.06	-0.93	3.49	1.07	-0.93	8.64	0.99	-0.93	38.05	0.93	-0.93
Pusa Double Zero Mustard 31	5.81	0.30	-0.92	4.55	0.67	-0.93	14.21	0.37	-0.77	42.37	0.46	-0.70
Coral 437	5.39	1.27	-0.93	4.10	1.19	-0.93	9.71	0.66	-0.82	44.81	0.93	-0.93
PR 20061	4.73	1.04	-0.93	3.44	1.06	-0.93	10.90	1.25	-0.91	36.35	1.43	-0.41
PBR-378	4.80	1.07	-0.93	3.52	1.07	-0.93	9.99	0.81	-0.18	38.75	0.91	-0.68
RH 0406	4.81	1.07	-0.93	4.91	0.65	-0.93	11.63	1.38	-0.92	38.92	0.88	-0.50
NRC HB 101	4.95	0.62	-0.91	3.63	1.12	-0.91	12.98	1.49	-0.25	41.65	1.76	-0.48
Raj Vijay Mustard-2	4.79	1.06	-0.93	3.51	1.07	-0.93	10.64	1.03	-0.92	38.21	0.93	-0.93
Divya-33	4.95	1.12	-0.93	3.77	0.70	-0.93	11.45	0.90	-0.92	38.39	1.17	0.15
RH 0749	4.73	1.04	-0.93	3.45	1.06	-0.93	9.89	0.83	-0.76	36.50	0.96	-0.41
PM 29	5.00	1.13	-0.93	3.71	1.11	-0.93	10.42	1.36	-0.61	40.52	0.66	-0.78
Giriraj	5.24	1.22	-0.93	3.95	1.16	-0.93	11.65	1.34	-0.55	41.30	1.99	-0.17
Mean	4.96			3.69			11.13			39.42		

Conclusion

Thus, it may be concluded that genotypes RH 0406 and NRC HB 101 had below average stability for seed yield per plant (g) & other most of the yield contributing characters and suitable for better environment (environment-I). Genotypes Pusa Mustard 26 and Pusa Double Zero Mustard 31 had above average stability for seed yield per plant (g) and suitable for poor environment (environment-III). Genotypes Pusa mustard 25 and Divya-33 were found most stable for seed yield per plant, which can be grown in wide range of environments (all three dates of sowing).

References

1. Abdelrahman AM, Abdalla MS, Ali BM, Prakash V, Sabudin RKZ. Improving the performance of TCP in LEO satellite environment. Information Technology Journal. 2002;1:250-254.
2. Badiger PK, Naik VR, Parameshwarappa KG, Patil MS. Genotype × environment interactions and stability analysis of non-spiny breeding lines in safflower. Karnataka Journal of Agricultural Sciences. 2009;22(5):978-981.
3. Brar KS, Mittal VP, Singh P. G × E interaction and stability of elite strains in Indian mustard (*Brassica juncea* Czern & Coss.). Crop Improvement. 2007;34(1):33-36.
4. Chen BY, Cheng BF, Liu HL, Fu TD. The Chinese mustard (*Brassica juncea*) resources. Cruciferae News. 1997;19:7-8.
5. Dhillon SS, Brar KS, Singh K, Raheja RK. G × E interaction and stability of elite strains in Indian mustard. Crop Improvement. 2001;28(1):89-94.
6. Dubey S, Siddiqui MZ, Bhatt M, Shukla G, Singh SRDK. Effect of INM on quality, nutrient content and uptake of various nutrients by *Brassica juncea* L. (Indian mustard). International Journal of Chemical Studies. 2021;9(1):3625-3629.
7. Gazal A, Dar ZA, Zafar G, Habib M. Stability analysis for yield and its contributing traits in brown sarson (*Brassica rapa* L.) under Kashmir conditions in India. Journal of Oilseed Brassica. 2013;4(1):33-38.
8. Jat BL, Jakhar ML. Character association in taramira (*Eruca sativa* Mill.) under three environmental conditions. International Journal of Plant Sciences. 2015;10(1):49-52.
9. Jat BL, Jakhar ML, Kumar P. Estimation of variation, heritability and genetic advance in taramira (*Eruca sativa* Mill.). International Journal of Plant Sciences. 2014;9(1):31-34.
10. Kamdi S, Ingole H, Bhure S, Meshram M, Tajane D, Patil P. Stability analysis in Indian mustard. The Pharma Innovation Journal. 2022;SP-11(7):4351-4354.
11. Khan SH, Ahmed N, Jabeen KP, Wani KP, Kussain K. Stability analysis for economic traits in kale (*Brassica oleracea* var. *acephala* L.). Indian Journal of Genetics. 2008;68(2):177-182.
12. Kumawat GL, Sharma S. Stability analysis in Indian mustard [*Brassica juncea* (L.)]. The Pharma Innovation Journal. 2022;11(11):797-801.
13. Mahla HR, Jambhulkar SJ, Yadav DK, Sharma R. Genetic variability, correlation and path analysis in Indian mustard [*Brassica juncea* (L.) Czern and Coss]. Indian Journal of Genetics and Plant Breeding. 2003;63:171-172.
14. Anonymous. Mustard (*Brassica juncea* L.) genotypes through genotype × environment interaction and stability analysis suitable for Punjab, Pakistan. Journal of Agriculture and Basic Sciences. [No volume/issue/page details provided; please verify].
15. Panse VG, Sukhatme PV. Statistical Methods for Agricultural Workers. New Delhi: Indian Council of Agricultural Research; 1985. p. 1-381.
16. Ram G, Jakhar ML, Sastry EVD. Combining ability effects for yield and its attributes in *Eruca sativa* by using varietal diallel analysis. Annals of Agricultural Research. 2017;38(1):91-97.
17. Srivastava A, Srivastava K. Stability analysis in Indian mustard (*Brassica juncea* L. Czern & Coss.) over

normal and terminal heat stress environments. Plant Archives. 2020;20(1):3343-3347.
18. Yadava DK, Giri SC, Vasudev S, Yadav AK, Dass B, Raje RS, Vignesh M, Singh R, Mohapatra T, Prabhu KV. Stability analysis in Indian mustard (*Brassica juncea*) varieties. Indian Journal of Agricultural Sciences. 2010;80(9):761-765.