



E-ISSN: 2278-4136  
P-ISSN: 2349-8234  
JPP 2017; 6(5): 906-908  
Received: 01-07-2017  
Accepted: 02-08-2017

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## Mean performance, range and genetic variability analysis of parents and F<sub>1</sub>s for seed yield and its contributing traits in Indian mustard (*Brassica juncea* L. Czern & Coss)

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### Abstract

Highly significant differences were observed among the treatments for all the 12 characters under the study. This indicated the presence of an appreciable amount of variability in the base material as well as in the material generated. The appreciable variance among the parents and F<sub>1</sub>s was found for all the 12 characters. However, the magnitude varied from character to character.

**Keywords:** *Brassica*, Indian mustard, Mean, range and variability

### 1. Introduction

Rapeseed- mustard oil is used primarily for edible purposes and is the principal 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 an important cattle feed and may also be as organic manure. It is a fact that Indian mustard plays such a prominent role in agriculture economy but it has very low yields. There are several factors responsible for low yield at farmer's field. The important ones are delayed sowing, inadequate fertilizer application and various biotic and abiotic stresses. These situations are further aggravated by the fact that mustard is cultivated on marginal and sub-marginal lands and also predominantly as mixed crop under rainfed condition. The limited improvement in this crop has been mainly due to narrow genetic base and arbitrary choice of parents without understanding their genetic architecture and combining ability.

### 2. Materials & Methods

The present investigation comprised twenty lines namely; Varuna, Maya, Urvashi, Basanti, Rohini, Pusa Bold, Kranti, NDR-8501, Pusa Bahar, Pusa Barani, Pusa Jai Kisan, Vaibhav, Durgamani, Ashirwad, KR-5610, B-85, Vardan, Nav-gold, RH-30, RLM-198 used as female and four testers namely; Pusa Agrani, RK-9807, RK-9808 and Mathura Rai used as males of Indian mustard [*Brassica juncea* (L.) Czern & Coss]. 104 treatments (20 lines + 4 testers + 80 F<sub>1</sub>'s) were shown in three replications at the Oilseed. Research Farm of Chandra Shekhar Azad University of Agriculture & Technology, Kanpur during rabi 2010-2011. Each treatment was planted in two rows of 5 m length and 45 cm apart, plant to plant distance was maintained at 15 cm by thinning. All recommended agronomic practices were adopted for raising a good crop. Data were recorded for twelve qualitative and quantitative traits namely; days to flowering, days to maturity, plant height (cm), number of primary branches per plant, number of secondary branches per plant, number of siliquae per plant, number of seeds per siliqua, 1000-seed weight (g), biological yield per plant (g), harvest index (%), oil content (%) and seed yield per plant (g). Oil content (%) was estimated with the help of NMR method. Line x Tester analysis was analyzed as suggested by O. Kempthorne (1957)<sup>[7]</sup>. Fisher (1918)<sup>[6]</sup> divided the component of variance into additive, dominance and epistatic.

### 3. Results & Discussion

The analysis of variance for 24 parents and their 80 F<sub>1</sub>s was computed for all the 12 characters and mean sum of squares are presented in table-1. Highly significant differences were observed among the treatments for all the 12 characters under the study. This indicated the presence of an appreciable amount of variability in the base material as well as in the material generated. These results were also similar to Dharmendra *et al.* (2001)<sup>[2]</sup>, Chakravarty *et al.* (2006)<sup>[2]</sup>, Acharya & Pati (2008)<sup>[1]</sup>, Dholu *et al.* (2013)<sup>[4]</sup>, Prajapati *et al.* (2013)<sup>[8]</sup>, Singh

*et al.* (2013) [9] and Dutta (2014) [5].

The mean values of all the 12 characters in parents and F<sub>1</sub> progenies and variability (expressed in terms of variance and range) are presented in Table-2. The appreciable variance among the parents and F<sub>1</sub>s was found for all the 12 characters. However, the magnitude varied from character to character. In parents the variation was 71.00 to 86.33 for days to flower, 117.67 to 137.00 for days to maturity, 6.33 to 9.33 for Number of primary branches, 15.00 to 21.67, for number of secondary branches 291.33 to 336.67 for number of siliquae per plant, 170.00 to 190.67 cm. for plant height, 11.67 to 14.67 for number of seeds per siliquae, 72.33 to 84.00 gm for biological yield, 3.99 to 5.50 gm for 1000-seed weight, 32.00 to 45.33% for harvest index, 36.73 to 40.77% for oil content, and 25.33 to 36.00 gm for seed yield per plant. These results were also similar to Dharmendra *et al.* (2001) [3], Chakravarty

*et al.* (2006) [2], Acharya & Pati (2008) [1], Dholu *et al.* (2013) [4], Prajapati *et al.* (2013) [8], Singh *et al.* (2013) [9] and Dutta (2014) [5].

Among the F<sub>1</sub> hybrids, the range was 71.00 to 81.33 for days to flower, 101.00 to 130.33 for days to maturity, 10.33 to 14.67 for number of primary branches, 18.33 to 28.33 for number of secondary branches, 229.33 to 370.67 for number of siliquae per plant, 173.33 to 188.00 for plant height, 13.00 to 18.67 for number of seeds/ siliquae, 80.00 to 89.33 gm for biological yield, 3.13 to 5.81 gm for 1000-seed weight, 34.00 to 47.33% for harvest index, 37.71 to 40.54% for oil content and 28.33 to 39.33 gm for seed yield per plant. These results were also similar to Dharmendra *et al.* (2001) [3], Chakravarty *et al.* (2006) [2], Acharya & Pati (2008) [1], Dholu *et al.* (2013) [4], Prajapati *et al.* (2013) [8], Singh *et al.* (2013) [9] and Dutta (2014) [5].

**Table 1:** ANOVA for 12 characters involving parents and F<sub>1</sub>'s in Indian mustard: mean sum of squares.

Sources of variation	D.F.	Days to 50 % flowering	Days to maturity	Number of primary branches per plant	Number of secondary branches per plant	Number of siliquae per plant	Plant height (cm)
Replications	2	17.97**	128.82**	0.66	16.70**	170.66**	34.87**
Treatments	103	17.37**	146.86**	3.25**	12.27**	3457.22**	54.34**
Parents	23	124.00**	171.60**	1.87**	13.64**	675.91**	280.57**
Females	19	58.18**	68.71**	2.20**	114.69**	539.16**	126.89**
Males	3	14.52**	79.55**	0.30	6.77**	4.22**	343.99**
Female vs males	1	1703.02**	2402.50**	0.27	75.62**	5289.81**	3010.34**
Hybrid's	79	17.37**	146.86**	3.25**	12.27**	3457.19**	54.35**
Parents vs hybrid's	1	138.87**	2560.75**	1102.23**	833.42**	528.00**	670.50**
Error	206	2.76	2.87	0.78	1.55	329.11	16.18

**Table 1:** Continue.....

Sources Of variation	D.F.	Number of seeds Per siliquae	Biological yield per plant (g)	100-seed Weight (g)	Harvest Index (%)	Oil Content (%)	Seed Yield per plant (g)
Replications	2	0.15	1.28	0.086	2.37	4.10	8.05**
Treatments	103	2.99**	11.38**	1.09**	28.75**	1.69	17.98**
Parents	23	2.28**	43.08**	0.76	50.68**	3.38**	41.62**
Females	19	2.37**	29.52**	0.72	52.81**	3.35**	37.94**
Males	3	2.33**	3.22**	0.96	41.19**	4.33**	27.19**
Female vs males	1	0.54	420.33**	1.66**	38.67**	1.16**	154.70**
Hybrid's	79	2.99**	11.38**	1.09	28.75**	1.69**	17.98**
Parents vs hybrid's	1	579.51**	1486.34**	3.57**	13.71**	25.79**	603.64**
Error	206	0.80	8.27	0.030	2.53	0.44	2.82

**Table 2:** Mean and range of parents and F<sub>1</sub>'s for 12 characters in Indian mustard (*Brassica juncea* L. Czern & Coss).

S. No.	Characters	Mean		Range			
		Parents	F <sub>1</sub>	Min.	Max.	Min.	Max.
1.	Days to flower	78.133	74.375	71.00	86.33	72.00	76.58
2.	Days to maturity	130.50	121.08	117.67	137.00	111.25	128.33
3.	No. of primary branches	7.91	12.35	6.33	9.33	11.50	13.92
4.	No. of secondary branches	18.91	22.33	15.00	22.67	20.17	25.42
5.	No. of siliqua per plant	317.33	316.58	300.33	336.67	300.75	355.25
6.	Plant height (cm)	181.68	182.27	170.33	191.67	179.17	186.00
7.	No. of seeds / siliqua	13.06	16.26	11.67	14.67	14.42	17.58
8.	Biological yield/ plant (g)	79.64	83.75	72.00	84.00	81.83	85.42
9.	1000-seed weight (g)	4.82	4.99	3.99	5.50	4.31	5.56
10.	Harvest index (%)	42.46	39.75	32.00	45.33	37.25	44.17
11.	Oil content (%)	38.70	39.33	36.73	40.77	38.46	40.64
12.	Seed yield / plant (g)	31.01	33.66	26.67	36.00	31.25	37.42

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