

VARIETAL PERFORMANCE OF MUSTARD (*BRASSICA JUNCEA. L*) IN PRAYAGRAJ AGRO-CLIMATIC CONDITIONS

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Abstract—Among the seven edible oilseed cultivated in India, rapeseed-mustard (*Brassica spp.*) contributes 28.6% to the total production of oilseeds. In India, it is the second most important edible oilseed after groundnut sharing 27.8% in the India's oilseed economy. The annual requirement of edible oil is more. Therefore, there is a great opportunity to increase the yield of mustard by introducing high yielding varieties. Current experiment conducted to evaluate the performance under eastern plain zones of up region of 12 mustard varieties collected from various locations. Present study was done on the field experimentation center, Department of Genetics and Plant Breeding, Naini Agricultural Institute, SHUATS, Prayagraj. The experimental materials comprising of were grown under randomized block design (RBD) with three replications. The cultivars were sown at 30 cm × 10 cm spacing during winter of 2020–21. Experiments were conducted with the objectives of evaluating the Indian mustard varieties for Growth, Seed yield, and yield attributing traits to recommend promising mustard variety for commercial cultivation in Prayagraj region. Varieties were used in experiment designated as V1 to V12, Pusa Mustard-26, Pusa Mustard-21, Pusa Mustard-24, Pusa Mustard-30, RGN-145, Pitamabari, NRCDR 601, NRCHB 101, CS 56, Shatabdi (ACN9), Vaibhav, and Vardan. Observations were recorded for each variety on five randomly selected plants in each replication on characters are growth, yield and yield attributes. The results obtained indicated that the variety Vaibhav (V11), Vardan (V₁₂) had performed well with respect to growth and yield under agro-climatic conditions of Prayagraj region.

INTRODUCTION

Mustards belong to the family Cruciferae or Brassicaceae. The genus Brassica contains 150 species of annual or biennial herbs, most of which are grown as oilseed crops or as vegetable or fodder. 21 % of the world's area and 15 % of world's production, India is the fourth largest oilseed producing country in the world, next to the USA, China and Brazil. Oilseeds in India account for the second largest agricultural commodities after cereals, sharing 13 % of the country's gross cropped area, nearly 5 % of gross national product and 10 per cent of the value of all agricultural products (Hedge *et al.*, 2012).

Mustard requires some cool and dry climate for tropical and subtropical cropping, satisfactory growth, and development. Mustard is grown in drier regions because of the better seed quality

obtained under these conditions. It prefers well-aerated soils that do not become waterlogged and are drought tolerant. Poor aeration in the root zone permanently stunts their growth. Mustard performs best with a neutral pH in the soil but tolerates alkaline and slightly saline soils. High temperature during the flowering stage reduces seed yield because it can lead to pollen infertility (Singh *et al.*, 2014). Although mustard is a long day plant that requires 16 hours of light duration in a 24-hour cycle, it can flower if given 8 hours of light duration with a short duration of 4 hours. Mustard can flower in about 50 days in a 16/8 h light / dark period (Aziz *et al.*, 2011).

Prayagraj is situated in the South-Eastern part of the State Uttar Pradesh. It lies between the parallels of 24° 77' and 25° 47' north latitudes and 81° 19' and 82° 21' east longitudes. Prayagraj Agro Climatic has such tropical climate that the average maximum

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temperature ranges between 43 °C - 47 °C which may go as high as 48 °C during peak summers (Devesh and Satyendra, 2018). The minimum average temperature is 2- 4 °C which may fall as low as 1.5 °C during peak winter months (Dec.-Jan.) The average rainfall of the district is 960 mm and the monsoon season is spread between July-September (Thammineni *et al.*, 2021). In the Prayagraj climatic region mainly cultivated crop is Paddy has the largest share followed by Bajra during the Kharif season After paddy harvest, it is possible to harvest short-term crops such as mustard using residual soil moisture. Soil structure varies from sandy loam to clay loam (Firoz and Uddin, 2001).

Mustard is cultivated in winter. It is a thermo sensitive and photosensitive crop. In the state of Uttar Pradesh, the area sown under the rabi oilseed crop 2019-20 was 2.71 million hectares and production is 956.72 Tons (NHB 2019-20), while the world production of rapeseed oil reached nearly 27.3 million metric tons. The annual requirement of edible oil is more. Exploiting the genetic diversity of a species can improve the economic significance of mandatory crops with the intervention of plant breeders to benefit farmers and consumers. Yield is one of the most important economic characteristics and is the product of the multiplicative interactions that the characters provide. Therefore, there is a great opportunity to increase the yield of mustard by introducing high yielding varieties in these non-traditional areas. In these areas, farmers usually grow local mustard with low yield potential. With this in mind, the present study was undertaken to identify suitable varieties of mustard and thereby increase crop intensity. Variety selection is the most important decision to achieve high crop yield by improving fertilizer use efficiency and water use efficiency. Therefore, it is wise for growers to select high yielding varieties with better farming characteristics to adapt to the ever-changing pressures of field conditions. It is also a fact that the specified genotypes do not exhibit the same phenotypic characteristics in all environmental conditions. Therefore, better variety selection is an important tool to improve productivity.

The present study entitled "Varietal performance of mustard (*Brassica juncea* L.) in Prayagraj agro-climatic conditions" is carried out with the following objective To characterize the Indian mustard varieties for growth, seed yield, and yield attributing traits for recommend promising mustard variety for commercial cultivation in Prayagraj

region.

MATERIALS AND METHOD

The current experiment conducted to evaluate the performance Mustard (*Brassica Juncea* L) varieties under eastern plain zones of up region, 13 mustard varieties collected from various locations. Present study has obtained from the field experimentation center, Department of Genetics and Plant Breeding, Naini Agricultural Institute, SHUATS, Prayagraj. The experimental materials comprising of were grown under randomized block design (RBD) with three replications. The cultivars were sown at 30 cm × 10 cm spacing during winter of 2020'21. The soil was sandy loam in texture with moderate water holding capacity having pH 7.0 to 8.0. the experiment were conducted with the objectives of evaluating the Indian mustard varieties for Growth, Seed yield, and yield attributing traits to recommend promising mustard variety for commercial cultivation in Prayagraj region. Varieties were used in experiment designated as V0 to V12 viz., Mustard 5222, Pusa Mustard-26, Pusa Mustard-21, Pusa Mustard-24, Pusa Mustard-30, RGN-145, Pitamabari, NRCDR 601, NRCHB 101, CS 56, Shatabdi (ACN9), Vaibhav, and Vardan. Observations were recorded for each variety on five randomly selected plants in each replication on characters viz., field emergence, plant height, days to 50% flowering, number of primary branches per plant, number of secondary branches per plant, number of siliquae per plant, number of seeds per siliquae, seed yield per plant, seed yield per plot, test weight, days to maturity, biological yield, harvest index. Field experiment mean data analysis of variance was be carried out according to the procedure of Randomized Block Design (RBD) for each character.

RESULTS AND DISCUSSION

Physiological Traits

Among all the varieties (Table 1), the variety V₁ (Pusa mustard-26) took a minimum of 56.33 days for at least half of the plant population to attain 50 % flowering and variety V₀ (BK-1008) took maximum of 64.67 days to attain the same. Variety V₁₁ (Vaibhav) took minimum of 94.00 days to attain harvestable maturity from all the varieties whereas 132.67 days of maximum maturity period was recorded with V₀ (BK 1008). The difference can be

attributed to weather conditions. Mustard prefers moderate temperatures between 18 and 25 C, with a maximum of 20 C and a moderate rainfall of about 25-40 cm during the growing season. Sensitive periods for mustard crop growth indicate emergence, flowering, silica formation, silica filling, and physical maturity Saroj *et al.*, (2021).

Morphological Traits

Among all the varieties (Table 1), the variety V₄ (Pusa mustard-30) recorded the maximum height of 30.83 cm, 56.79 cm and 132.89 cm at 30, 60 and 90 DAS. The minimum plant height of 23.36 cm, 47.52 cm and 105.99 cm was recorded with the variety V₇ (NRCDR 601) respectively. The maximum number of primary and secondary branches of 7.11 and 12.90 respectively was recorded with the variety V₁₂ (Vardan), while the variety V₇ (NRCDR 601) recorded minimum of 5.66 and 9.26 of primary and secondary branches among all the varieties that were considered for the present experiment, Nitrogen can increase shoot height due to nitrogen, which stimulates cell division and multiplication, strengthens sink capacity, and is conducive to greater photosynthesis. The reason for the high variance in the present study may be due to the development of selected genotypes in different breeding programs representing different agro-climatic conditions in the country.

Yield and Yield Attributes

For yield and yield attributes (Table 2), all the twelve varieties varied significantly. Maximum siliquae of 342.76 per plant, 16.04 seeds in each siliquae and with 6.16 g of 1000 seed weight was recorded with the variety V₁₁ (Vaibhav). The minimum siliquae of 182.38 per plant, 12.01 seeds in each siliqua and 5.36 g of 1000 seed weight were recorded with the variety V₆ (Pitamabari). The maximum number of siliquae of 14.53 g of seed yield from each plant, 222.89 g of seed yield from each plot and 38.23 % of harvest index respectively was recorded with the variety V₁₁ (Vaibhav). The minimum seed yield of 5.95 g per plant, 122.51 g of seed yield per plot, 24.15 g of biological yield and lowest harvest index of 24.91 % among all the varieties was recorded with the variety V₆ (Pitamabari) respectively. The high rate of nitrogen fertilizer increased the number of silica per plant, number of seeds per siliquae is directly proportional to the increase of nitrogenous fertilizers. These results are alien with the findings of Shagata *et al.*, (2020); Suman Yadav *et al.*, (2018)

CONCLUSION

The overall performance of mustard varieties, results indicated that the variety V₁₁ (Vaibhav) performed well with respect to growth, yield and yield attribute parameters under agro-climatic

Table 1. Mean performance of Mustard (*Brassica juncea* L.) for growth parameters.

Sl. No.	Varieties	Field Emergence (%)	Days to 50% flowering	Days to maturity	Plant Height 30 DAS	Plant Height 60 DAS	Plant Height 90 DAS	No. of Primary Branches Plant ⁻¹	No. of Secondary Branches Plant ⁻¹
01	V ₀	78.33	64.67	132.67	26.68	50.67	115.70	6.60	10.23
02	V ₁	76.67	56.33	115.00	26.07	52.48	125.50	6.33	10.00
03	V ₂	77.00	62.00	136.33	29.00	54.14	121.94	6.40	11.02
04	V ₃	77.33	56.67	104.00	25.60	50.14	133.60	6.12	11.44
05	V ₄	79.00	59.33	133.33	30.83	56.79	132.89	5.99	10.47
06	V ₅	78.67	60.00	116.67	25.60	52.41	123.24	5.79	11.29
07	V ₆	78.33	60.33	120.33	28.77	55.12	118.77	6.28	12.23
08	V ₇	76.33	60.67	134.33	23.63	47.52	105.99	5.66	9.26
09	V ₈	80.33	60.00	106.67	25.23	49.67	125.37	6.14	10.02
10	V ₉	80.00	61.67	130.33	25.40	50.43	121.05	6.05	10.22
11	V ₁₀	82.33	60.00	120.33	22.93	52.82	120.53	5.92	9.92
12	V ₁₁	89.33	58.67	94.00	25.20	55.67	131.37	6.88	12.64
13	V ₁₂	90.67	59.33	96.33	25.60	53.65	128.43	7.11	12.90
14	G Mean	80.33	59.97	118.49	26.20	52.42	123.42	6.25	10.89
15	F test	S	NS	S	NS	NS	S	S	S
16	SE (M)	1.81	1.81	3.58	2.66	2.39	4.04	0.17	0.31
17	CD at 5%	5.31	4.90	6.87	7.66	7.9	7.87	2.21	2.44
18	CV	3.92	4.85	4.32	7.79	6.9	5.68	0.41	1.45

Table 2. Mean performance of Mustard (*Brassica juncea* L.) for yield and yield attributes

No. of Seeds per Siliquae ⁻¹	No. of Siliquae per plant ⁻¹	Seed Yield per Plant ⁻¹	Seed Yield per Plot ⁻¹	Test weight (g)	Biological Yield per plant ⁻¹	Harvest Index (%)
13.07	227.54	11.57	173.46	5.60	35.59	32.72
13.39	233.70	10.03	198.58	5.65	35.99	28.15
12.55	246.44	9.78	167.32	5.77	38.03	25.89
13.48	230.92	8.86	184.50	5.80	33.99	26.12
13.40	250.17	8.79	175.46	5.45	29.57	29.87
14.28	229.94	10.47	164.45	5.59	34.15	30.88
12.01	182.38	5.95	122.51	5.36	24.15	24.91
13.86	295.33	13.76	206.41	5.94	39.11	35.29
14.30	223.06	10.79	183.65	5.21	32.83	32.99
13.50	257.40	9.78	165.85	5.17	32.65	30.21
12.90	287.02	13.80	207.24	5.97	41.65	33.19
16.04	342.76	14.53	228.89	6.16	38.11	38.23
15.93	333.57	14.06	215.30	6.06	39.23	36.76
13.75	256.94	10.01	184.12	5.67	35.00	31.17
S	S	S	S	S	S	S
1.21	3.34	1.11	2.58	0.56	2.13	1.99
0.86	4.65	0.78	5.94	0.87	10.55	4.01
1.02	7.42	0.99	2.43	0.38	6.22	2.11

conditions of Prayagraj region. Hence, the varieties V₁₁ (Vaibhav) can recommended for commercial cultivation in Prayagraj region.

FUTURE LINE OF WORK

These findings are based on one-year experimental study, further research needs to be conducted in field and laboratory experiments for the confirmation of promising varieties for agro-climatic conditions of Prayagraj region.

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