

Original Research Article

Agronomic evaluation of mustard (*brassica juncea* L.) hybrids under agro-climatic conditions of prayagraj (u.p)

Comment [NSN1]: Corrected

ABSTRACT

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A field experiment was conducted at the Crop Research Farm, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during Rabi season 2022 on Mustard crop. The experiment was laid out in randomized block design with ten treatments and three replications. The soil of experimental plot was sandy loam in texture, nearly neutral in soil reaction (pH 7.1), low in organic carbon (0.36%), available N (171.48 kg/ha), available P (15.2 kg/ha) and available K (232.5 kg/ha). The maximum plant height (175.97 cm), primary branches (8.85), secondary branches (18.85/plant), plant dry weight (40.97 g/plant) at 100 DAS in hybrid M-155 was recorded. Maximum Crop growth rate (CGR) recorded at 60-80 DAS (10.24 g/m² /day), number of siliqua/plant (466.27), number of seeds/siliqua (13.63), test weight (5.40 g) and seed yield (2.40 t/ha) were observed in hybrid M-155. In terms of economics, highest gross returns (Rs 130905.7/ha), net returns (Rs 81592.73/ha) and B:C ratio (1.65) were observed in hybrid M-155.

Comment [NSN3]: Corrected

Keywords: Agronomic evaluation, Economics, Growth, Mustard hybrids, Yield.

1. INTRODUCTION

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Mustard (*Brassica juncea* L.) is important oilseed crop of family Cruciferae and occupies a prominent place among oilseed crops being next to groundnut in important. Nine oilseeds currently have an area, production, and yield in India of about 26.48 m/ha, 30.94 mt, and 1168 kg/ha, respectively. Rapeseed mustard has an area of 6.36 m/ha and a production in India of 8.03 mt. According to the **(Directorate of Economics and Statistics, Department of Agriculture and Cooperation, 2012–13)**. India's average productivity for rapeseed mustard is 1262 kg/ha. In order to ensure that India is self-sufficient in edible oil, the average productivity of rapeseed-mustard in the country must be increased to 2562 kg/ha by 2030. Currently, it is only 1145 kg/ha. The country shares about 23% of the world production of rapeseed and mustard. These crops are of particular significance of Rajasthan and Uttar Pradesh, which shares about 80% of area and production of entire country.

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The simple fact that these crops are grown in 28 states across the nation in a variety of agro-ecological conditions across an area of 6.51 million hectares and yield 8.18 million tonnes of vegetable oil attests to their significance in the national vegetable oil market. Rapeseed-mustard output made for 20–22% of the nation's total oilseed production, although Haryana accounted for 10.2% of that total. It is grown on 6.70 million hectares in India, with a productivity of 1188 kg/ha and a production of 7.96 mt in 2013–14. Haryana is one of the top states for rapeseed and mustard production, and in 2013–14, the crop produced 8.8 lakh tonnes on 5.4 lakh ha, with an average yield of 1639 kg/ha (**Pattam et al., 2017**).

Following a conventional package of practises, growing rapeseed-mustard as a second crop in a rice-based system could result in an increased net revenue of Rs. 23,127/- per hectare per year (**Singh et al., 2010**). Because mustard thrives in a dry, chilly atmosphere and is grown in a subtropical region, it is typically planted during the rabi season. It is raised in regions with annual rainfall ranging from 625 to 1000 mm. This crop needs a clear sky and no frost because it cannot survive frost. It may be cultivated in many different types of soil, including light and thick loamy soils. The optimum soils

for growing mustard are medium to deep and well-drained. For mustard, the optimal soil pH range is 6.0 to 7.5.

Despite the high quality of oil and meal and also its wide adaptability for varied agro-climatic conditions, the area, production and yield of rapeseed –mustard in India have been fluctuating due to various biotic and abiotic stresses coupled with India's domestic price support program. Nevertheless, the crop has potential to ensure nutritional security and contribute to livelihood security. In Uttar Pradesh rapeseed and mustard is one of the major grown crop occupying 0.56 million ha of area with production and productivity of 0.699 million tons and 1,248 kg/ha, respectively. The seed and oil of mustard have a peculiar pungency due to presence of glucosinolate and its hydrolysis products such as Allyl Isothiocyanate (0.30-0.35%). The productivity of the crop in the state (1,066 kg/ha) is quite lower than developed countries mainly due to cultivation of age-old varieties having low yield potential. Keeping above facts in view, the present experiment entitled "Agronomic Evaluation of Mustard (*Brassica juncea* L.) Hybrids Under Agro-climatic Conditions of Prayagraj (U.P)".

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2. MATERIALS AND METHODS

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During the *Rabi* season of 2022, a field experiment was conducted in alluvial soil at the Crop Research Farm of the Department of Agronomy, SHUATS, Prayagraj, U.P. The soil of experimental plot was sandy loam, having a nearly neutral soil reaction (pH 7.1), electrical conductivity (0.365 ds/m), medium in available Nitrogen (173.4 kg/ha) and available potassium (213.9 kg/ha), and low in available phosphorous (11.63 kg/ha). The crop was sown on November 5th 2022 using hybrids. The experiment was conducted in a Randomized Block Design consisting of 14 treatment combinations and 3 replications viz. T1 (M10), T2 (M30), T3 (M45), T4 (M85), T5 (M101), T6 (M105), T7 (M110), T8 (M155), T9 (M170), T10 (M210), T11 (M307), T12 (M320), T13 (M360), T14 (M414). The nutrient sources were Urea, Single Super Phosphate (SSP) and Muriate of Potash (MOP), applied as per the recommended dose of 60-30-30 kg NPK/ha. Plant growth parameters, such as plant height (cm), dry weight (g/plant) were measured at regular intervals from germination till harvest and yield

and yield attributes, such as Days to 50% flowering, Number of primary branches/plant, No. of secondary branches/plant, Siliqua/plant, Seeds/Siliqua, seed index (g), seed yield (t/ha), stover yield (t/ha), harvest index(%) and oil content(%) were measured at harvest. The observed data were statistically analysed using analysis of variance (ANOVA) as applicable to randomized block design (Gomez and Gomez, 1984).

3. RESULTS AND DISCUSSIONS

3.1 Growth parameter

The data pertaining to growth attributes presented in Table 1. At 100 DAS, maximum plant height was recorded in hybrid M 155 (175.97 cm). Hybrids M 45 (172.97 cm), M-210 (172.50 cm) and M-360 (170.17 cm) were statistically at par with hybrid M 155. The hybrid attained maximum plant height at all the stages of crop growth and tallest plant of hybrid was mainly due to the varietal characteristics. The above findings are supported by **Kumari et al., 2009**. At 100 DAS, significantly maximum dry matter was recorded in hybrid M- 155 (40.97 g/plant). Hybrid M 30 (38.49 g/plant) and M 360 (39.30 g/plant) were found to be statistically at par with M 155. At maturity total dry matter per plant was significant which may be due to the longer duration of crop growth and higher LAI during later stages of its growth which was true indicative of photosynthates production. At 40-60 DAS, significantly maximum crop growth rate was recorded in hybrid M-110 (22.37 g/m² /day). However, M-85 (21.63 g/m² /day), M-101 (20.04 g/m² /day) and M 155 (22.13 g/m² /day) were found to be statistically at par with M-110. At maturity the crop growth rate was higher due to higher dry matter production at respective stages of crop growth due to difference in dry matter accumulation. The physiological growth parameters like CGR and RGR differ significantly. These findings are supported by **Singh 1989 and Raquibullah et.al 2006**. The number of branches/plants recorded at maturity. The data shows that there was a significant effect of different hybrids on the number of branches/plant. Among variety, M 155 (8.85/plant) produced significantly highest number of primary branches per plant. However, M 170 recorded 7.65 which was statistically at par with M-

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155. The highest number of secondary branches (18.85/plant) in hybrid M 155. Hybrid M 30 (17.90/plant), M 110 (18.12/plant) and M 360 (18.60/plant) were found to be statistically at par with hybrid M 155. The higher number primary and secondary of branches during maturity was primarily because of higher LAI which increases the total energy available for formation of branches there by higher dry matter accumulation. These findings are supported by **Singh 1989 and Raquiballah et al., 2006**. The significantly lower fifty percent of flowering was achieved (43.33 DAS) by the hybrid M-307. However, M 45 (42.66 DAS), M-320 (42.33 DAS) and M 105 (41.66 DAS) were statistically at par with M 307. Different varieties of mustard had significant influence on flowering characters at productive part flowering development stages which might be due to different crop growth maturity pattern in complete life cycle growth period. These findings are supported by **Kumar et al., 2017**.

3.2 Yield attributes

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The data of yield attributes and yield Table 2 showed that the amount of siliqua/plant of mustard maximum number of siliqua/plant was recorded significantly higher in hybrid M-155 (466.27/plant). However, M 10 (449.80 siliqua/plant), M-307 (451.80 siliqua/plant) and M 414 (432.17 siliqua/plant) were statistically at par with M 155. The length of the siliqua of was recorded significantly higher in hybrid M-105 (5.91 cm). However, M 45 (5.84 cm), M-155 (4.93 cm), M-307 (5.46 cm) and M 210 (5.02 cm) were statistically at par with M 105. The number of seeds/siliquas of mustard was significantly maximum in hybrid M 155 (13.63). However, hybrid M-101 (12.62 seeds/siliqua), M 210 (12.79 seeds/siliqua) and M 307 (12.99 seeds/siliqua) were found to be statistically at par with M 155. Larger the siliqua more the grains per siliqua and higher test weight were recorded in main shoot followed by primary and secondary branches. The maximum test weight of mustard was recorded in hybrid M-155 (5.40 g). The highest test weight was recorded in hybrid which was primarily due to higher number of branches and siliqua per plant. The varietal differences of yield attributes has also been reported by **Singh et al., 2007 and Razzaque et al., 2007**. The maximum seed yield of mustard was recorded in hybrid M-155 (2.40 t/ha). However, M

10 (2.25 t/ha), M-170 (2.38 t/ha), M-307 (2.14 t/ha) and M 360 (2.09 t/ha). The hybrid which recorded significantly highest seed yield might be due to higher number of branches, siliqua and highest seed weight per plant. The significantly maximum stover yield of mustard was recorded in hybrid M-360 (5.14 t/ha). However, M-10 (4.52 t/ha), M 155 (5.09 t/ha), M-170 (4.70 t/ha) and M 307 (4.78 t/ha) were statistically at par with M-85. The stover yield was highest due to higher dry matter accumulation in that hybrid. The maximum harvest index of mustard was recorded in hybrid M-170 (39.09%). However, M 10 (37.06 %), M-155 (37.60 %) and M-307 (36.18 %) were statistically at par with M-170. The varietal differences in yield has also been reported by **Razzaque et al., 2007 and Dehghani et al., 2008.**

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3.3 Economics

The data pertaining to the economics of different treatments presented in Table 3 showed that the maximum gross return (130905.7 INR/ha), net return (87347.93 INR/ha), and benefit-cost ratio (1.65) were recorded in M155, and the minimum gross return (97286.32 INR/ha), net return (47973.32 INR/ha), and lowest benefit-cost ratio (0.97) were recorded in M110.

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4. CONCLUSION

From the results of the experiment, the results were concluded that the hybrid M-155 performs positively and has higher growth and yield parameters in mustard.

Comment [NSN13]: Corrected

COMPETING INTERESTS

Authors have declared that no competing interest exist

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Table 1. Growth parameter of different mustard hybrids

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Hybrids	Plant height (cm) 100 DAS	Dry weight (g/plant) 100DAS	Crop Growth Rate (g/cm ² /day) During 40-60 DAS	Primary Branches	Secondary Branches	50% Flowering
M-10	132.37	37.27	17.51	6.2	16.2	35.33
M-30	147.97	38.49	19.55	5.9	17.9	38.33
M-45	172.97	37.33	18.03	5.8	15.8	42.66
M-85	130.23	35.60	21.63	8.2	16.4	38.66
M-101	144.73	36.33	20.04	7.4	17.4	38.33
M-105	159.23	35.83	17.1	6.8	16.8	41.66
M-110	151.29	34.37	22.37	8.12	18.12	35.33
M-155	175.97	40.97	22.13	8.85	18.85	36.33
M-170	156.37	35.97	15.54	7.65	17.65	37.66
M-210	172.50	37.77	18.55	7.19	17.19	38.33
M-307	167.25	34.15	17.74	5.82	15.82	43.33
M-320	137.33	37.25	18.75	6.88	16.88	42.33
M-360	170.17	39.3	16.66	6.4	18.6	37.66
M-414	154.47	34.92	15.64	6.46	16.46	38.33
F-test	S	S	S	S	S	S
SEm(±)	2.14	0.97	0.75	0.39	0.32	0.70
CD (P=0.05)	6.43	2.95	2.33	1.2	1.02	2.13

Table 2. Yield and yield attributes parameter of different mustard hybrids

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Yield and Yield attributes							
Hybrids	Number of siliqua/plant	Length of siliqua/plant (cm)	Number of seeds/siliqua	Test weight (g)	Seed yield (t/ha)	Stover Yield (t/ha)	Harvest Index (%)
M-10	449.80	4.46	10.99	4.93	2.25	4.52	37.06
M-30	360.59	4.43	12.32	5.13	1.92	3.80	33.53
M-45	393.47	5.84	10.92	5.10	2.02	3.53	35.09
M-85	403.76	4.48	9.39	4.83	2.01	3.82	34.47
M-101	355.13	4.82	12.62	4.96	1.98	3.70	34.80
M-105	305.76	5.91	12.26	4.53	1.80	3.80	32.22
M-110	314.89	4.42	11.19	4.23	1.79	3.60	33.15
M-155	466.27	4.93	13.63	5.40	2.40	5.09	37.60
M-170	355.13	4.35	10.62	5.27	2.38	4.70	39.09
M-210	361.27	4.21	12.79	4.53	1.85	3.75	33.01
M-307	451.80	5.46	12.99	4.54	2.14	4.78	36.18
M-320	354.59	4.70	12.56	5.02	1.87	3.77	33.13
M-360	383.47	5.02	10.87	5.34	2.09	5.14	35.21
M-414	432.17	4.90	9.49	4.76	1.90	4.10	33.31
F-test	S	S	S	NS	S	S	S
SEm±	15.22	0.31	0.30	0.89	0.11	0.22	1.20
CD(P=0.05)	45.73	1.01	1.03	-	0.35	0.75	3.63

Table 3. Economics of mustard hybrid

Comment [NSN17]: Corrected

Hybrids	Economic		
	Grossreturns (INR/ha)	Net returns (INR/ha)	B:C
M-10	122683.3	73370.32	1.49
M-30	116869.8	67556.8	1.37
M-45	109984.8	60671.82	1.23
M-85	109421.3	60108.29	1.22
M-101	107641.3	58328.32	1.18
M-105	98339.8	49026.8	0.99
M-110	97286.32	47973.32	0.97
M-155	130905.7	81592.73	1.65
M-170	129441.3	80128.32	1.62
M-210	100701.3	51388.29	1.04
M-307	104490.1	55177.13	1.12
M-320	101656.1	52343.13	1.06
M-360	103323.8	54010.83	1.10
M-414	113776.9	64463.93	1.31