To Study the Effect of Varieties on Growth, Yield and Quality of Late Sowing Mustard in Chindwara District (*Brassica juncea* Linn Czern & Coss) Under Irrigated Condition

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Abstract-A field experiment was conducted during *rabi,* 2023-24 on clayey soil at the Agronomy Farm, Department of Agronomy, School of Agricultural sciences, G.H. Raisoni University, Saikheda, Chhindwara (M. P.), to study the effect of varieties on growth, yield and quality of late sowing mustard in Chindwara district (*brassica juncea* linn czern & coss) under irrigated condition. The experiment laid out in RBD design with three replications consisted seven treatments. Among the varieties tested, T3-Pusa agrani recorded significantly higher growth parameters, yield attributes, yield of mustard, and economics compared to other combinations. Significantly higher plant height (157.30 cm), number of branches per plant (7.30), plant dry weight (23.23 g/plant), siliquae per plant (292.32), grains per siliquae (15.56). However, higher grain yield (2122 kg/ha) and stover yield (6800 kg/ha) were obtained with significantly higher gross returns (Rs. 62275/ha), net return (Rs. 35275/ha), benefit cost ratio (2.18) and also oil content (38.41%) and oil yield (694.05 kg ha^{-1}) compared to other treatments.

Key words: Mustard, Oil content, Varieties, Growth, Yield

INTRODUCTION

One of the most significant oilseed crops of the rabi season is mustard (*Brassica juncea* L.), a member of the crucifereae (Brassicaceae) family. With a chromosomal number of 2n=36 and a Chinese origin, Indian mustard is a naturally occurring amphidiploid. Despite being a crop that self-pollinates, its seeds go by several names across the globe. Rapeseed is referred to as white sarson and toria, while mustard is referred to as rai, raya, or laha.

The flavor of mustard seeds is nutty, sweeter, and slightly spicy. They are spherical and average in size. These seeds consist of 12–18% carbohydrates, 23–30% protein, and 29–40% oil. While the entire mustard seed is flavorless, it can have a strong scent that changes depending on the variety. The spicier varieties of mustard seeds are black. Compared to white or yellow mustard, brown mustard seeds have a stronger flavor. Mustard seeds offer antioxidant and preservation qualities in addition to color and flavor. Depending on the variety of mustard seeds, the qualities of the leaves, seeds, and oil differ (Sharma, 2006).

After groundnut, which accounts for almost 30% of all oilseed output in India, mustard and rapeseed are the second most important oilseed crops. With a yield of 31.1 million tons, oilseeds are grown on 26.82 million hectares in India (2022–2023). In India, the average output of an oil seed crop is 1159 kg/ha. Madhya Pradesh is the state with the highest production and acreage in India. Other states that grow linseed extensively include Uttar Pradesh, Maharashtra, Bihar, Rajasthan, Karnataka, and West Bengal. Together, Madhya Pradesh and Uttar Pradesh account for over 70% of the country's linseed production. An average yield of 1745 kg ha-1 is produced by growing

13 million tonnes of linseed on 7.50 m ha of land in Madhya Pradesh (Anonymous, 2021).

With a view to be self-sufficient in fodder and oilseed production, the productivity in the net sown area has to be increased by growing fodder crops along with the oilseed crops (Barik *et al.,* 1998). To augment the fodder resources, intercropping of the same should be emphasized especially during the lean periods when fodder is not available in sufficient quantities.

Panda et al. (2004) has also reported that the yield potential of different mustard varieties may differ under different agro-climatic conditions because of their inherent capacity. It is also a fact that specified genotypes does not exhibit the same phenotypic characteristics in all environmental conditions. Improved cultivar is an important tool, which have geared production of mustard in many countries of the world. In addition to many other factors responsible for achieving higher yields, cultivars with higher yield potential and a wide range of adaptability to adaphic and climatic conditions is essential for increasing yield per unit area, ultimately boosting up total production.

A field experiment was carried out during the *rabi* season in the student research field of the agronomy department at the school of agricultural sciences of G. H. Raisoni University in Saikheda, Sausar, Chhindwara, Madhya Pradesh, with the following objectives in mind.

MATERIAL AND METHODS

The field experiment was conducted during *rabi* 2023-2024 at at the Agronomy Farm, Department of Agronomy, School of Agricultural sciences, G.H. Raisoni University, Saikheda, Chhindwara (M. P.). The experiment laid out in RBD design with three replications consisted seven treatments. The treatment varieties consisted of T1- PM 25, T2- Kranti, T3- Pusa Agrani, T4-PM 26, T5- PM 30, T6- PDZM 31 and T7- Navgold. Yield attributes were recorded from the five plants sample collected at the time of harvest. The crop harvested from net plot area was threshed after 4-5 days of sun drying and the seed yield of net plot was then converted into kg ha^{-1}. Before threshing of the crop harvested from net plot, the sun dried whole plant samples (biological yield) were weighed and straw yield was obtained by subtracting seed yield from biological yield. The seed oil content of all samples was determined by nuclear magnetic resonance spectrometer (NMR) (Robertson and Morrison, 1979).

RESULT AND DISCUSSION

Growth attributes

Growth attributes like plant height, number of branches and dry matter production plant-1 recorded significantly higher in the variety Pusa Agrani (T3). The data found on plant height recorded and analyzed is presented in Table 1. The varieties had no significant influence on plant height at 30 DAS which might be due to similar growth pattern at initial growth period whereas at 60, 90 DAS and at harvest the variety Pusa Agrani (T3) recorded significantly higher plant height at height (157.30 cm) at harvesting stage, but it at par with (T2) Kranti, (T7) Navgold, (T5) PM 30 and (T4) PM 26, varieties 155.0 cm, 152.68 cm, 150.25 cm and 143.84 cm respectively. This might be due to their own genetic characteristics and similar findings were reported by (Singh, 1989; Kurmi, 2002 and Singh and Singh, 2002).

The data on number of branches per plant were recorded and presented in Table 1. At harvest time, variety Pusa Agrani (T3) produces the highest number of branches plant-1 (7.30) at harvesting stage, but it at par with (T2) Kranti, (T7) Navgold, and (T4) PM 26, varieties 7.0, 6.65, and 6.24 respectively.

Table 1: Growth attributes of sesame influenced by various treatments

	Treatments	Plant height (cm)	No. of branches $plant^{-1}$	Dry matter production $plant^{-1}$
T1	PM 25	137.14	5.05	17.64
T2	Kranti	155.00	7.00	23.00
T3	Pusa Agrani	157.30	7.30	23.23
T4	PM 26	150.25	6.24	20.89
T5	PM 30	143.84	5.23	18.91
T6	PDZM 31	137.00	4.12	15.08
T7	Navgold	152.68	6.65	21.78
	SE (m) ±	4.56	0.43	4.22
	CD at 5%	15.77	1.30	12.54
	GM	147.60	5.94	20.07

The data found on dry matter production plant^{-1} recorded and analyzed is presented in Table 1. Among the varieties, Pusa Agrani (T3) recorded significantly higher dry matter accumulation at 60, 90 DAS and at harvest as compared to other varieties Pusa Agrani (T3) produced greatest plant dry matter output (23.23 g) at harvesting stage, followed by (T2) Kranti (23.0 g), (T7) Navgold (21.78 g), (T5) PM 30 (18.91 g) and (T4) PM 26 (20.89 g) and its probable reason might be attributed to genetic characters of Varuna which has higher capacity to utilized the photosynthates more efficiently for maximum leaf area index, number of branches plant-1 and ultimately the dry matter production. Similar findings have been reported by (Kumar et al., 2000 and Chaplot et al., 2012)

Yield attributes

Yield attributes *viz.*, number of siliquae plant^{-1} and grain yield kg ha^{-1} and straw yield kg ha^{-1} and also oil content was recorded significantly higher in Pusa Agrani (T3) (Table 2).

Among different varieties, Pusa Agrani (T3) (292.32 plant^{-1}) produced significantly more number of siliquae (in mustard crop, followed by (T2) Kranti 286.0, (T7) Navgold 274.71 g, PM 30 (T5) 245.33 and PM 26 (T4) 261.42. The varietal differences in yield attributes among different varieties of Brassica species had also been reported by Kumar et al. (2008).

Among different varieties, Pusa Agrani (T3) produced significantly higher seed yield (2122 kg ha^{-1}) and straw yield (6800 kg ha^{-1}) followed by (T2) Kranti (2068 kg ha^{-1}), (T7) Navgold (1974 kg ha^{-1}), PM 30 (T5) (1811 kg ha^{-1}), and PM 26 (T4) (1845 kg ha^{-1}) respectively. The higher seed yield in cv. Pusa Agrani was ascribed due to improved yield attributes viz., more number of siliqua plant-1 , more number of seeds (siliqua-1) and 1000- seeds weight. The varietal differences in seed yield had also been reported by Adak et al. (2011) and Kumari et al. (2012).

Among different varieties, Pusa Agrani (T3) recorded higher oil content (38.41%) followed by (T2) Kranti (38.12%), (T7) Navgold (37.86%), PM 30 (T5) (37.52%), and PM 26 (T4) (37.72%). The differences in oil content among different varieties could be attributed to their genetic constitution (Fasi et al., 2012).

Table 2: Yield attributes and oil content of mustard influenced various treatments

	Treatments	Number of siliquae plant^{-1}	Grain yield ha^{-1} (kg)	Straw yield ha^{-1} (kg)	Oil content %
T1	PM 25	60.5	1745	37.46	37.46
T2	Kranti	58.48	2068	38.12	38.12
T3	Pusa Agrani	55.61	2122	38.41	38.41
T4	PM 26	45.12	1845	37.72	37.72
T5	PM 30	53.12	1811	37.52	37.52
T6	PDZM 31	49.25	1625	37.11	37.11
T7	Navgold	40.75	1974	37.86	37.86
	SE (m) ±	0.67	55	0.46	0.46
	CD at 5%	1.88	192	NS	NS
	GM	51.83	1884	37.74	37.74

CONCLUSION

Among varieties, Pusa Agrani was found to be most suitable for agro-climatic condition of Chindwara district and also recorded higher the growth attributes *viz.*, plant height, number of branches plant^{-1} and dry matter accumulation plant^{-1} of sesame and yield attributes of sesame *viz.*, number of capsules plant^{-1}, grain yield kg ha^{-1} and straw yield kg ha^{-1} over all other varieties.

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