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The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(2): 875-877

www.thepharmajournal.com
Received: 06-11-2021
Accepted: 16-12-2021

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Performance of different mustard (*Brassica* sp.) varieties in Barmer district of Rajasthan

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Abstract
An experiment of three different varieties of mustard was conducted at the field of Krishi Vigyan Kendra Gudamalani Barmer-II farm during the *Rabi* season 2020-2021 to identify the suitable short duration variety high yielding suitable saline-alkaline soil and saline-alkaline water for western arid zone IA of Rajasthan. Results indicated that growth, as well as yield and yield attributes of different mustard verities, were significantly different. The varieties DRMRIJ- 31 and CS-60 were best suitable to arid saline-alkaline soil and saline water and they produced the highest seed yield and their growth parameters were also highly significant and a positive correlation was observed in seed yield/plant with siliquae per plant, length of silique, seed/silique, 1000 seed weight, and harvest index. So, DRMRIJ-31 and CS-60 are suitable for cultivation in the Barmer Districts of Rajasthan.

Keywords: Mustard, varieties, saline akline soil, growth, yield, correlation

Introduction
Rapeseed-mustard belongs to the family of Cruciferaceae under the genus *Brassica.* They are the most important oilseed crops, source of vegetable oil and widely grown oilseed crops in India, occupying 72.9 lakh hectares of land in 2020–2021. It is now third among oilseed crops in India and the second-largest oilseed crop in the world after soybean. Domestic production of edible oil in India mainly comes from mustard, groundnut, soybean, and sesame.
Besides, it offers higher return with low cost of production and low water requirement. Being a major rabi (winter season) oilseed crop and having an advantage of soil moisture conserved during monsoon, it has greater potential to increase the availability of edible oil from the domestic production. 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 programme. India has been facing an acute shortage of edible oil for the last several decades. Our internal production can meet only about 20.9% of our consumption. The remaining 79.1% is met by imports. Mustard oil is used for cooking and its cakes are used for feeding animals and as organic manure in the country. Increased oilseed production is needed not only to meet the demand of the increasing population but also to reduce the import of edible oil to save foreign currencies. Rajasthan's major mustard-growing districts include Bharatpur, Alwar, Sriganganagar, Hanumangargh, Barmer and Jalore among others.

Materials and methods
During the Rabi season of 2020–2021, the experiment was carried out at the Krishi Vigyan Kendra farm of Agriculture University Jodhpur in the Western arid zone IA of Rajasthan. The experimental field is located at an elevation of 40 meters above sea level at latitudes of 24° 58′ to 26° 32′ N and longitudes of 70° 05′ to 72° 52′ E. The soil belongs to the sandy soil series, having low to moderate organic matter. The experiment was laid out in three blocks of equal size. Three varieties, namely DRMRIJ-31 (Giriraj), CS-58, and CS-60, were tested in this experiment. Seeds were collected from ICAR-DRMR Sevar, Bharatpur and ICAR-CSSRI Karnal, Haryana. The experimental plots were fertilized according to package of practices of western arid zone IA at the rates of 60 kg of nitrogen, 40 kg of phosphorus, and 250 kg of gypsum per hectare. During final land preparation, half of the urea and the total amount of all other fertilizers were applied and incorporated into the soil and the rest of the urea was top-dressed at 25 days after sowing (DAS). The sowing was done on October 25, 2020.

Seeds were sown in line with a spacing of 30 cm x 10 cm row to row and plant to plant, respectively. Two-handed weeding was done at 20-25DAS and 45–50 DAS manually. Light irrigations were given, one at 25 DAS and another at 40 DAS. The crop was sprayed with Monocrotophos 36SL at 7-10 DAS to control painted bugs and sawflies and another spray was done at the *siliquae* formation stage with imidacloprid 17.8 SL to control aphids and jassid.

Plant height, number of primary branches per plant, days to 85 percent maturity, number of siliquae per plant, length of siliquae, seeds per siliquae, biological yield per plant, seed yield per plant, harvesting index, and weight of 1000 seeds were all recorded in above three varieties. The parameters like plant height, number of primary branches per plant, number of siliquae per plant, length of siliquae, and seeds per siliquae are recorded at days to 85 percent maturity by randomly selected five plants and the parameters like biological yield per plant and seed yield per pant are recorded on a 5 x 5-meter plot basis. The data was analyzed using the mean differences were determined using the least significant difference (LSD) test at a 5% level of significance. The correlation coefficients were calculated between the seed yield sand yield attributes at harvest according to Al Jibouri *et al*. The significance of correlation coefficients was tested against the "r" values given by Fisher and Yates.

Results and discussion

Growth characteristics of different mustard

Days of 85 percent maturity (days): The crop maturity duration of mustard varieties are significantly differed among the varieties. Variety CS-58 matures in a minimum of 122 days, variety CS-60 in 126 days, and variety DRMRIJ-31 in a maximum of 135 days. Generally, short-duration varieties are more preferable to the farmers of India as they can be fitted into any cropping pattern.

Plant height (cm): The DRMRIJ-31 (187.4 CM) had the highest plant height at 85 percent maturity, while the CS-58 (173.3 CM) had the lowest. that after 85 percent maturity of varieties, the final plant height reflected crop growth behavior.

Number of Primary branches/plant: The number of primary branches per plant varied significantly between varieties at 85 percent maturity. The Varieties CS-60 and DRMRIJ-31 produce the most primary branches per plant at 85 percent maturity, with 6.10 and 5.21, respectively. At 85 percent maturity, the minimum number of branches per plant produced by variety CS-58 is 4.57 primary branches per plant. The yield contributing characteristics like the primary number of branches per plant is an important trait which helps to produce more leaves and pods and ultimately assists in photosynthesis, which reflects the present study.

Siliquae/plant: Significant variation was found in the number of siliquae/plant among the varieties. The variety DRMRIJ-31 (590) produced the most siliquae per plant, followed by CS-60 (575) and CS-58 (570 Siliquae/plant).

Length of Siliquae: Significant variation was found in the number of Length of Siliquae among the varieties. The variety DRMRIJ-31 (6.3cm) produced the most Length of Siliquae followed by CS-60 (5.2cm), and CS-58 (4.9cm).

Seeds/siliquae: Significant variations were observed in terms of the number of seeds/siliquae among all the varieties. The maximum number of seeds per siliquae (22) was produced by the DRMRIJ-31 and 18.5 seeds per siliquae were produced by the CS-60. The minimum number of seeds/siliquae was produced by the variety CS-58 (16.11).

1000 seed weight (g): In the case of 1000 seed weight, significant variations were observed among all the varieties. The highest 1000 seed weight (6.12 g) was recorded in the variety CS-60, while a moderate seed weight was found in DRMRIJ-31 (5.72 g). The variety is CS-58 (5.57g).

Seed yield per plant (gm): Production of a higher yield by different varieties might be due to the contribution of cumulative favourable effects of the crop characteristics, *viz*., number of branches per plant, siliquae per plant, and seeds per siliquae. The seed yield of mustard varieties/lines differed significantly. Variety DRMRIJ-31 produced the highest seed yield per plant (67.50gm) due to the highest number of primary branches/plant (6.10), siliquae/plant (590), and seeds/siliquae (22) followed by CS-60 (61.20gm) and CS-58 (52.35gm).

Biological yield per plant (gm): In the case of biological yield, there were significant variations observed in different varieties. The maximum biological yield per plant (gm) was obtained by the variety DRMRIJ-31 (225.12gm), followed by varieties CS-60 (228.25gm) and CS-58 (219.15gm) after five to ten days of sun drying of randomly selected five plants of each variety.

Harvest index (%): There was significant variation in respect of harvest index among all the tested varieties, with the maximum (29.98%) harvest index found in the variety DRMRIJ-31, followed by varieties CS-60 (26.81%) and CS-58 (23.88%) of randomly selected five plants of each variety.

Table 1: Yield Attributes & Yield

S. No.	Yield Attributes & Yield	Varieties		
		DRMRIJ-31	CS-58	CS-60
1.	Days of 85% maturity (days)	135	122	126
2.	Plant height (cm)	187.4	173.3	177.6
3.	Number of Primary branches/plant	5.21	4.57	6.10
4.	Siliquae/plant	590	570	575
5.	Length of Siliquae	6.3	4.9	5.2
6.	Seeds/siliquae	22	16.11	18.5
7.	1000 seed weight (g)	5.72	5.57	6.12
8.	Seed yield per plant (gm)	67.50	61.20	52.35
9.	Biological yield per plant (gm)	225.12	219.15	228.25
10.	Harvest index (%)	29.98	23.88	26.81

Conclusion

Considering the growth parameters as well as yield and yield attributes, it was indicated that the variety DRMRIJ-31 produced the highest yield and was on par with CS-60 followed byCS-58. These varieties showed moderate seed size, a higher number of siliquae/plant and a number of seeds/siliquae. Side by-side growth parameters also showed that these varieties are dwarf and semi-dwarf in plant height, with a comparatively higher number of branches per plant. On the other hand, correlation studies with seed yield versus yield-attributing characters also indicate a similar trend. So,

these varieties could be suitable for the north-west part of India.

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