Journal of AgriSearch, 9 (1): 109-112
An Open Access International Peer Reviewed Quarterly

ISSN : 2348-8808 (Print), 2348-8867 (Online)
https://doi.org/10.21921/jas.v9i01.9904

On Farm Assessments of Mustard Varieties at Farmers' Fields in Humid South-Eastern Plain Zone of Rajasthan

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ABSTRACT
On farm trials were conducted during Rabi 2016-17 and 2017-18, to study the comparative performance of Mustard Varieties at Farmers Fields in Humid South-Eastern Plain Zone (V) of Rajasthan. Treatment comprising four newly released mustard varieties i.e. RH 749 (T_1), NRCHB 101 (T_2), DRMRIJ 31 (T_3) and NRCDR 2 (T_4) compared with local check Bio 902 (T_5). During both the year of study, mustard variety DRMRIJ 31 (T_3) revealed significantly higher yield attributing characters (number of primary branches, number of secondary branches and number of siliqua per plant), seed yield, gross return, net return and benefit cost ratio over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4) and Bio 902 (T_5) but at par with NRCHB 101 (T_2) and NRCDR 2 (T_4) in respect to seed yield, gross return, net return and benefit cost ratio during 2017-18. On mean basis, mustard variety DRMRIJ 31 (T_3) gave 19.46, 9.27, 14.07 and 22.39 per cent higher seed yield over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4), and BIO 902 (T_5), respectively. Variety RH 749 (T_1) recorded significantly higher test weight over rest of the treatments but at par with DRMRIJ 31 (T_3) and NRCHB 101 (T_2) during 2016-17 and with DRMRIJ 31 (T_3) during 2017-18.

KEYWORDS
Mustard, varieties, yield, yield attributes economics

ARTICLE INFO

Received on	:	04.01.2022
Accepted on	:	04.03.2022
Published online	:	16.03.2022

INTRODUCTION

The oilseed crops play a very significant role in the agricultural economy of our country. India is the largest producer of oilseeds in the world and contributes seven percent of the global vegetable oils production with a fourteen percent share in the area. Total oilseeds area and production in the country is about 27.0 million hectares and 33.4 million tonnes, respectively with an average yield of 1236 kg per hectare (Anonymous, 2020). Rapeseed mustard is the second most important oilseed crop in the country after soybean. It is cultivated on an area of about 6.8 million hectares with a production of about 9.1 million tonnes. The contribution of rapeseed-mustard to the total oilseed acreage and production of India is 25.19% and 27.25%, respectively. The major rapeseed-mustard growing states in India are Rajasthan, Haryana, and Uttar Pradesh (Anonymous, 2020). Rapeseed-mustard is a major oilseed crop of Rajasthan. The state ranks first both in the area (2.7 million hectares) and production (4.3 million tonnes) of rapeseed mustard in India. Rajasthan contributes 39.70% in area and 47.25% in the production of rapeseed-mustard of the country Anonymous (2020). Mustard contains 36-42% oil, 17-25% protein, 8-10% fiber, 6-10% moisture and 10-12% extractable substances. Its seed being used as condiment, or they are pressed for mustard oil extraction. Mustard oil is considered to be the healthiest and nutritious cooking medium. It is an important source of protein meal. Mustard oil possess one of the best fatty acids profile [low saturated fatty acids (8%), high mono unsaturated fatty acids (70%) and alpha linolenic acid (10%)] among the various vegetable oils, which reduces the risk of coronary heart diseases by almost 70%. The oil cake forms important cattle feed and furthermore utilized as natural compost. Mustard oil is utilized in India for cooking and frying purposes and also utilized in readiness of hair oil and medicines. Delicate leaves of young plants are used as green vegetable and are acceptable wellspring of sulphur and different minerals in diet. The causes of lower yields of rapeseed and mustard are mainly due to poor management practices and the use of non-recommended varieties (Rashid *et al*, 2010). Therefore, there is a scope to increase the yield level by using HYV and adopting proper management practices such as spacing, seed rate, irrigation, fertilizer application and other cultural operations. High yield potential of a variety is the prerequisite for increasing the production of crop. Genotype play an important role in crop production and the potential yield of a genotype within the genetic limit is determined by its environment (Iraddi, 2008). The release of high yielding varieties has contributed a great deal towards the improvement of mustard yields and the yield potential of these high yielding varieties can be further exploited through better agronomic practices (Sharif *et al*, 2016). Keeping in view of these facts, present investigation was carried out On Farm Assessments of Mustard Varieties at Farmers Fields in Humid South-Eastern Plain Zone (V) of Rajasthan.

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MATERIALS AND METHODS

The study was conducted in Bundi district of Rajasthan to find the comparative performance of Mustard Varieties at Farmers Fields in Humid South-Eastern Plain Zone (V) of Rajasthan. The On Farm Trial (OFT) was conducted at farmer's fields at four different locations during Rabi, 2016-17 and 2017-18. The soils of experiment locations were sandy loam to loam in texture, normal in soil reaction (pH 7.45-8.10) and electrical conductivity (0.129-0.321dSm^{-1}), medium in organic carbon (0.453-0.481%), available phosphorus (11.6-22.45 kg/ha) and available potassium (118-163.7 kg/ha). The experiment (OFT) was laid out using Randomized Block Design (RBD) with plot size of 40 m and 50 m and 45 cm row spacing. Treatment consisting four newly released mustard varieties i.e. RH 749 (T_1), NRCHB 101 (T_2), DRMRIJ 31(Giriraj) (T_3) and NRCDR 2 (T_4) compared with check Bio 902 (T_5). Filed was prepared with pre-sowing irrigation just after harvest of Kharif crops. Full dose of phosphorus, potash and sulphur were applied at basal, nitrogen was applied in two split doses, first 1/2 at basal and remaining 1/2 at first irrigation (30-35 days after sowing). Sowing of crop was done in between 14-15 and 18-19 October during Rabi 2016-17 and 2017-18, respectively. All other practices during crop growth period were as per the package of practices of the zone for Rabi crops Anonymous (2021). Five random plants were selected from each plot to take observations on numbers of primary and secondary branches. The yield attributes i.e. number of siliqua per plant, test weight was recorded at plot basis. The crop was harvested and threshed manually and further the seed yield was computed at 8 per cent moisture content. Data on crop yield attributes and seed yield were recorded at the time of crop harvest. Economics of the crop was calculated treatment wise to draw valid conclusions. Randomized block design (RBD) was employed to test the significant of the differences in different parameters as described by Cocharan and Cox (1967).

RESULTS AND DISCUSSION

Yield attributes

An assessment of data in Table 1 indicates that during both the years of study, mustard variety DRMRIJ 31 (T_3) tended to increase number of primary branches per plant significantly over rest of the treatments but at par with NRCHB 101 (T_2) and NRCDR 2 (T_4)during 2016-17 and with NRCHB 101 (T_2) during 2017-18. DRMRIJ 31 (T_3) recorded 21.31, 3.49, 11.27 and 29.82 per cent number of primary branches per plant over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4)and Bio 902 (T_5), respectively. Similarly, numbers of secondary branches per plant were also significantly higher in variety DRMRIJ 31 (T_3) over RH 749 (T_1), (NRCDR 2) T_4 and Bio 902 (T_5) but statistically at par with NRCHB 101 (T_2) during both the years of study. Mean data revealed that variety DRMRIJ 31 (T_3) recorded 32.92, 2.19, 14.73 and 28.23 per cent higher numbers of secondary branches per plant over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4), and Bio 902 (T_5), respectively.

Table 1: Comparative performance of different mustard varieties in respect to yield attributing characters

Treatments		No. of Primary branches			No. of secondary branches			No. of siliqua/plant			Test weight (g)		
		2016-17	**2017-18**	**Mean**	**2016-17**	**2017-18**	**Mean**	**2016-17**	**2017-18**	**Mean**	**2016-17**	**2017-18**	**Mean**
T_1	RH 749	6.3	5.9	6.1	12.4	12.2	12.30	281	276	278	5.7	5.6	5.65
T_2	NRCHB 101	7.1	7.2	7.15	15.8	16.2	16.00	318	325	321	5.0	4.9	4.95
T_3	DRMRIJ 31	7.2	7.6	7.4	16.4	16.3	16.35	371	365	368	5.4	5.2	5.3
T_4	NRCDR 2	6.7	6.6	6.65	14.5	14.0	14.25	342	331	336	4.7	4.6	4.65
T_5	Bio 902 (Check)	5.8	5.6	5.7	12.8	12.7	12.75	277	272	274	4.6	4.5	4.55
	CD (0.05)	**0.76**	**0.65**		**1.68**	**1.99**		**31.33**	**31.28**		**0.57**	**0.43**	
	CV (%)	7.51	6.43		7.61	9.06		6.39	6.46		7.28	5.67	

Over the years of investigation, significantly increased in number of siliqua per plant was observed in variety DRMRIJ 31 (T_3) over rest of the treatments. On mean basis, DRMRIJ 31 (T_3) recorded 32.37, 14.64, 9.52 and 34.30 per cent higher number of siliqua per plant over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4)and Bio 902 (T_5), respectively. An insight of data (Table 1) of both the years indicates that variety RH 749 (T_1) resulted in significantly higher test weight over rest

of the treatments but at par with DRMRIJ 31 (T_3) and NRCHB 101 (T_2) during 2016-17 and with DRMRIJ 31 (T_3) during 2017-18. Based on mean value, increase in test weight with the variety RH 749 (T_1) over NRCHB 101 (T_2), DRMRIJ 31 (T_3), NRCDR 2 (T_4)and Bio 902 (T_5) were 14.14, 6.60, 21.51 and 24.18 per cent, respectively. It was attributed due to genetic characters which truly indicated of total photosynthates production, have been reported by several other workers (Chaplot *et al*, 2012). Variation in yield attributing character in different genotypes was because of their genetic makeup which were reported by different worker (Gawariya et al., 2015, Singh et al., (2016) Singh *et al* (2016), Solanki and Mundra (2015) in mustard crop.

Yield

The seed yield of mustard was significantly influenced under different varietal treatments (Table 2). During both the years of experimentations, the seed yield of mustard recorded significantly higher under T_3 treatment (DRMRIJ 31) but at par with NRCHB 101 (T_2) during 2016-17 and NRCHB 101 (T_2) and T_4 (NRCDR 2) during rabi 2017-18. Mustard variety DRMR IJ 31 (T_3) resulted in 22.12, 12.91, 18.30 and 26.55 per cent yield increment over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4)and Bio 902 (T_5), respectively in the year of 2016-17. While the corresponding increase in 2017-18 was 16.90, 5.69, 9.97 and 18.39 per cent, respectively. Variety DRMRIJ 31 (T_3) exhibited 19.46, 9.27, 14.07 and 22.39 per cent higher seed yield over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4), and Bio 902 (T_5), respectively. This is because of variation in different genotypes in their genetic makeup which was also reported by Solanki and Mundra (2015), Gawariya *et al* (2015), Singh *et al* (2016), Kumar *et al* (2018) and Pradhan *et al* (2014) in mustard crop

Table 2: Comparative performance of different mustard varieties in respect to seed yield

Treatments		Seed yield (q/ha)			Per cent increase in yield over check on mean basis
		2016-17	2017-18	Mean	
T_1	RH 749	17.68	17.45	17.57	2.45
T_2	NRCHB 101	19.12	19.30	19.21	12.01
T_3	DRMRIJ 31 (Girriraj)	21.59	20.40	20.99	22.39
T_4	NRCDR 2	18.25	18.55	18.40	7.29
T_5	Bio 902 (Check)	17.06	17.23	17.15	-
	CD (0.05)	**2.65**	**2.31**		
	CV (%)	9.18	8.05		

Economics

Cost of cultivation of various treatments was estimated on the basis of approved market rates for inputs by taking into account the cost of seed, fertilizer, herbicides, pesticides, hiring charges of human labour and machines for different field operations. Gross returns were calculated on the basis of market rates at which produce was sold. The data (Table 3) revealed that during both the year of study, significantly higher gross return was recorded in DRMRIJ 31 (T_3) treatment over rest of the treatments but at par with NRCHB 101 (T_2) and NRCDR 2 (T_4), during 2017-18. On mean basis, DRMRIJ 31 (T_3) registered 19.30, 8.99, 13.78 and 22.14 per cent higher gross return over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4)and Bio 902 (T_5), respectively. It is evident from results that variety DRMRIJ 31 (T_3) gave significantly higher net returns over rest of the treatments during both the years of study but at par with NRCHB 101 (T_2) and NRCDR 2 (T_4), during 2017-18. DRMR IJ 31 (T_3) recorded 31.29, 13.84, 21.71 and 36.43 per cent higher net returns over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4), and Bio 902 (T_5), respectively. Similarly, B C ratio was also significantly higher with DRMRIJ 31 variety (T_3) treatment over rest of the treatments during both the year of study but statistically at par with NRCHB 101 (T_2) and NRCDR 2 (T_4), during 2017-18. Mean data revealed that variety DRMRIJ 31 (T_3) recorded 19.47, 9.44, 14.23 and 22.27 per cent higher B C ratio over RH 749 (T_1), NRCHB 101 (T_2), NRCDR 2 (T_4), and Bio 902 (T_5), respectively. These results are in conformity to the work of Singh *et al* (2016), Kumar *et al* (2018) in mustard crops.

CONCLUSION

From the above findings, it may concluded that the mustard variety DRMRIJ 31 performed better in respect to yield attributing characters, seed yield, return and B C ration in Humid South-Eastern Plain zone (V) of Rajasthan.

Table 3: Comparative economic performance of different mustard varieties in on farm trials

Treatments		Gross return (Rs/ha)			Net return (Rs/ha)			B C Ratio		
		2016-17	**2017-18**	**Mean**	**2016-17**	**2017-18**	**Mean**	**2016-17**	**2017-18**	**Mean**
T_1	RH 749	60120	69800	64960	37733	42420	40076	2.68	2.55	2.62
T_2	NRCHB101	65008	77200	71104	42621	49820	46220	2.90	2.82	2.86
T_3	DRMRIJ 31 (Girriraj)	73406	81600	77503	51019	54220	52619	3.28	2.98	3.13
T_4	NRCDR 2	62033	74200	68116	39646	46820	43233	2.77	2.71	2.74
T_5	Bio 902 (Check)	58004	68900	63452	35617	41520	38568	2.59	2.52	2.56
	CD (0.05)	**6393**	**8534**		**5443**	**7807**		**0.24**	**0.31**	
	CV (%)	6.51	7.45		8.55	10.79		5.39	7.44	

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Citation:
Bairwa RK, Meena PKP and Mahajani K. 2022. On Farm Assessments of Mustard Varieties at Farmers' Fields in Humid South-Eastern Plain Zone of Rajasthan. *Journal of AgriSearch* **9**(1): 109-112