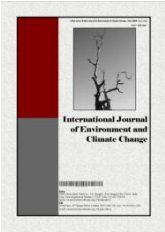

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Yield of Mustard as Influenced by Date of Sowing and Varieties in Western Rajasthan, India

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

An experiment was conducted at agricultural research station, SKRAU, Bikaner during *rabi* season of 2017-18 to evaluate yield of mustard as influenced by date of sowing and varieties in western Rajasthan. The treatment consisted of three dates of sowings viz., 10th October, 25th October and 9th November were kept in main plot and five varieties viz. RH-119, NRCHB-101, RGN-48, RH-749 and Laxmi was kept as sub plot replicated thrice in split plot design. Crop sown on 25th October recorded significantly higher seed yield as compared to 9th November sowing. In case of stover yield of mustard maximum was recorded under 25th October as compared to 10th October and 9th November. Days taken for emergence were no significant difference in varieties. RH-749 taken maximum days for 50 per cent flowering as compared to all varieties and for Siliqua appearance maximum days also taken by RH-749 as compared to NRCHB-101 and it statistically at par with RH-119, RGN-48 and Laxmi. RH-119 days to maturity and no. of branches/plant were minimum as compared to all varieties and these were remained statistically at par with each other. Maximum number of siliqua /plants was recorded under RGN-48 which was superior over rest of varieties and statistically at par with NRCHB-101. Highest grain/siliqua was recorded under NRCHB-101 over RH-119, RGN-48 and RH-749.

Keywords: Mustard; date of sowing; varieties and yield.

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1. INTRODUCTION

India is one of the world's most important producers of oil seeds. After cereals, oilseeds are the second most important agricultural commodity. After groundnut, mustard is India's second most important edible oil seed crop. It has a significant impact on the country's oil seed industry. In India, the rapeseed and mustard crop produced around 9.34 million tonnes from an area of 6.13 million hectares in 2018-19, with an average productivity of 1499 kg ha^{-1}(GOI, 2018-19). However, in Rajasthan it is grown in 2.79 mha with production of 4.30 million tonnes. The average productivity of Rajasthan is 1586 kg ha^{-1}(GOR, 2019-20). Weather variability is one of the most important elements influencing inter-annual crop development and yield in all ecosystems, but it is especially critical in rainfed situations. Adverse agro-meteorological occurrences such as excessive hot and cold temperatures, fewer brighter sunny days, and irregular and unequal rain distributions are key factors in reducing field crop development and yields, particularly in rainfed environments. Rainfalls are important, but the growth phases of any variety of crops are mostly regulated by the growing season, which is governed by the ambient temperature and solar radiation (Sastry et al., 2000).

2. MATERIALS AND METHODS

A field experiment was conducted at College of Agriculture, Bikaner (28.01 ^{0}N latitude and 73.22 ^{0}E longitude at an altitude of 234.7 M above mean sea level). The soil was loamy sand, low in organic carbon (0.08%) and available N (78 kg/ha) and medium in available phosphorus (22 kg P/ha) and available K (210 kg/ha) with pH 8.3. The experiment was laid-out in split plot design with three replications having fifteen treatment combinations of three dates of sowings viz., 10th October, 25th October and 9th November (in main plot) and five varieties viz. RH-119, NRCHB-101, RGN-48, RH-749 and Laxmi (in sub plot) were used to evaluate their effect on productivity of different varieties. The data related to growth, yield attributes and yield of mustard were recorded and statistically analyzed as per guidelines of Fischer [1].

3. RESULTS AND DISCUSSION

3.1 Effect of Irrigation Scheduling

Thermo and photosensitivity of oil seed crop limits the sowing period. Very early sowing causes the mortality of tender seedling due to high temperature. However, delayed sowing reduces production due to poor crop performance as a result of a shorter growing time, which delays maturity and, as a result, reduces yield. Furthermore, westerly hot winds hasten maturation and thus limit yield. As a result, seeding at the right time and in a conducive environment is critical to harvesting a productive crop. Thinning was used to keep the crop's initial plant population under check. Because soil moisture in the seedling zone was not a limiting factor for crop seed germination, pre-sowing irrigation was used on all three sowing dates. The dates of sowing brought significant variation on different agronomical parameters recorded at successive stages of Indian mustard, viz. Day to emergence, Plant height, days taken to 50% flowering, Days to Siliqua appearance, Number of branches/plant, and Days to maturity. Early sown crop (10 October) taken minimum days to emergence and had significant variation to normal sowing (25th October) and late sowing (09 November). Dates of sowing had significant influence on 50 per cent flowering of mustard. Due to higher number of branches/plant recorded at harvest as shown in (Table 1). This could be ascribed due to prolonged vegetative growth period because of congenial environmental conditions, especially atmospheric temperature which formed a basis for rapid cell division in the meristematic tissues of the experimental crop which led to better growth attributes under normal sowing (25th October). The early sown crop experienced sub-optimal temperature regime, especially first fortnight of October which retarded their growth as compared to those sown either normal date 25th October or 09th November. Shorter plant under delayed sowing of mustard crop in India have also been reported by Singh and Singh [2] and Kumar et al. [3], Yield attributes like number of siliqua /plant, number of seeds/Siliqua and 1000 seed weight were successively decreased with early sowing of the crop (Table 1). However, the difference between in number of seeds/Siliqua between on 25th October and 15th October sowing were non-significant. Early and late sowing restricted the crop growth duration and also induced early flowering. It is also reduced pod initiation and seed setting to a great extant as compared to 25th October. This could be attributed to low temperatures in September, which not only hampered crop growth but also resulted in decreased pollination, flower abortion, and shedding in early-sown mustard crops [4,2,5] also found similar results. Because of the

differing sowing dates, mustard seed and stover yields were severely influenced (Table 2). Crop sown on 25th October recorded significantly higher seed yield as compared to 9th November sowing mainly due to better translocation of photosynthates from source to sink. In case of stover yield of mustard maximum yield were recorded under 25 October as compared to 10th October and 9th November; this might be due to poor growth and better translocation of photosynthates from source to sink. When sowing on early dates, all of the growth and yield parameters that impacted the seed and stover yield of the mustard crop were adversely affected. Significant reduction in seed and stover yield of mustard in early have also been reported by several other workers Singh et al., [4], Sihag et al., [6], Panda et al., [5].

3.2 Effect of Varieties

Days taken for emergence were no significant difference in varieties. RH-749 taken maximum days for 50 per cent flowering as compared to all varieties and for Siliqua appearance maximum days also taken by RH-749 as compared to NRCHB-101 and it statistically at par with RH-119, RGN-48 and Laxmi. The probable reason may be attributed to genetic characters of Coral-437 which has higher capacity to utilized the photosynthates more efficiently through maximum leaf area index, number of branches/plant and ultimately the dry matter production, the similar findings have been reported by Kumar et al., [3], Shukla et al., [7] and Chaplot et al., [8]. RH-119 taken minimum days to maturity and number of branches/plant as compared to all varieties and these remained varieties were statistically on par with each other. Maximum number of siliqua/plant was recorded with RGN-48 which was superior over rest of varieties and statistically at par with NRCHB-101. Highest grain/siliqua was recorded under NRCHB-101 superior to RH-119, RGN-48 and RH-749. It was attributed due to genetic characters which truly indicated of total photosynthates production, have been reported by several other workers: Kumar et al., [3], Shukla et al., [7] and Chaplot et al., [8]. NRCHB-101 recorded highest grain yield over RH-119, RGN-48 and RH-749 and statistically at par with Laxmi. NRCHB-101 given 13.28 per cent higher seed yield over RH-119. Stover yield and harvest index were not influenced by varieties. Varieties have significantly variation in test weight and maximum recorded under Laxmi varieties of mustard which statistically at par with RH-119 and NRCHB-101. The similar resulted also recorded by Shukla et al., [7].

Table 1. Effect of date of sowing and varieties on phenophases of mustard

Treatments	Day to emergence	Days to 50% Flowering	Days to Siliqua appearance	Days to maturity	No. of Branches/plant
Date of sowing					
10th October	5.2	50.1	66.7	139.7	11.1
25th October	6.1	55.4	74.4	134.9	11.6
09th November	6.4	62.9	82.0	126.5	8.8
S. Em.±	0.1	0.4	0.4	0.5	0.3
CD (p=0.05)	0.4	1.1	1.0	1.4	0.9
Varieties					
RH-119	5.9	56.2	74.2	130.8	8.8
NRCHB-101	6.1	52.9	71.9	134.4	11.2
RGN-48	5.8	56.6	75.6	134.9	11.1
RH-749	5.7	59.2	76.0	134.3	10.1
LAXMI	6.0	55.7	74.2	134.1	11.4
S. Em.±	0.2	0.5	0.5	0.6	0.4
CD (p=0.05)	NS	1.5	1.3	1.8	1.2

Table 2. Effect of date of sowing and varieties on yield attributes, yield and harvest index of mustard

Treatments	No. of siliqua /plant	No. of grain/siliqua	Grain Yield (Kg/ha)	Straw Yield (Kg/ha)	HI (%)	TW (g)
Date of sowing						
10 October	211.6	15.7	4018.9	16073.3	25.2	6.3
25 October	236.1	15.9	4106.7	18182.6	22.7	6.3
09 November	194.9	16.8	2693.7	10226.3	26.8	6.4
S. Em.±	2.8	0.2	113.7	633.6	0.5	0.0
CD (p=0.05)	8.1	0.6	331.9	1849.5	1.4	0.1
Varieties						
RH-119	209.7	15.9	3267.3	13226.5	25.2	6.5
NRCHB-101	213.5	17.8	3767.9	15102.3	25.7	6.4
RGN-48	224.1	14.2	3669.8	15365.6	24.3	6.1
RH-749	207.6	16.0	3614.8	14939.2	24.7	6.0
LAXMI	216.0	16.7	3712.3	15503.3	24.5	6.6
S. Em.±	3.6	0.3	146.8	818.0	0.6	0.1
CD (p=0.05)	10.4	0.8	428.5	2387.7	1.8	0.2

4. CONCLUSION

Based on the findings of the present study, it may be concluded that the sowing of wheat cultivar Raj 4079 on 15th November with irrigation scheduling at 1.2 ETc was found better with respect to yield attributes and yield in relation to economics as compared to other cultivars. This remained at par with irrigation scheduling at 1.0 ETc under 15th November sown crop. However, under late sowing (15th December) the cultivar Raj 4238 produced higher grain yield as compared to all other cultivars. This study helps to the farmers in gaining an accurate knowledge of the optimum sowing window and efficient irrigation scheduling approach to achieve crops productive potential and higher yield.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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