RESEARCH ARTICLE Indian Journal of Agricultural Research, Volume 57 Issue 1: 56-59 (February 2023)

Effect of Date of Sowing on Growth, Seed Yield and Economics of Indian Mustard (*Brassica juncea*) Varieties under Rainfed Conditions

S.K. Sharma[1], Amit Kumar[2]

10.18805/IJARe.A-5947

ABSTRACT

Background: Indian mustard (*Brassica juncea*) is an important *rabi* crop raised under rainfed areas of Haryana. Optimum time of sowing plays an important role in augmenting the productivity of Indian mustard. There is a need to find out the optimum time of sowing of Indian mustard to overcome the yield gap under present scenario of climatic conditions. Different cultivars may respond differently to different sowing time. The current study aimed to study the effect of date of sowing on growth, seed yield and economics of Indian mustard varieties under rainfed conditions.

Methods: In this field experiments were conducted during *rabi* 2018-19 and 2019-20 at Dryland Agriculture Research Farm, CCS Haryana Agricultural University, Hisar. The experiment comprising of 3 dates of sowing (16 October, 23 October and 30 October) and 4 varieties of Indian mustard (RH 30, RH 406, RH 725 and RH 761) was laid out in split plot design with three replications.

Result: Crop sown on 23th October produced significantly taller plants over 30th October sowing. However, yield attributes *viz*., number of siliquae per plant, number of seeds per siliqua and test weight was successively decreased with delayed sowing of the crop. Seed yield was highest (2499 kg/ha) when sown on 16th October as compared to 23th October and 30th October sowing. Highest net returns (` 92674/-) and BC ratio (5.23) was recorded in 16$^{th}$ October sowing over other dates of sowing. Among varieties, RH 725 produced significantly higher seed (2583 kg/ha) and stover yield (7415 kg/ha) over RH 30, RH 406 and RH 761. Variety RH 725 also recorded higher net returns of ` 95940/- and B:C ratio of 5.38 compared to other varieties.

Key words: B:C ratio, Date of sowing, Economics, Rainfed conditions, Seed yield, Varieties, Yield attributes.

INTRODUCTION

Indian mustard (*Brassica juncea*) is the second most important oilseed crop in India after groundnut sharing 27.8% in the India's oilseed production. The crop occupies an area of 8.74 m ha, with the production of 10.95 m tons and average productivity of 1270 kg/ha in the country (Anonymous, 2022). Haryana state also contributes 10.2% to the total rapeseed-mustard production in the country. Indian mustard is an important *rabi* crop raised under rainfed areas of Haryana but also in adjoining Rajasthan. High probability of irregular monsoon not only jeopardizes the *kharif* production but *rabi* crops also due to inadequate moisture storage in the soil profile. In the last decade, against the normal precipitation of 54.9 mm rainfall during *rabi* season, the values differed every year due to change in climatic conditions. Indian mustard also suffers from frost at maturity phase and yields are drastically affected in winter season. Adoption of improved varieties and their timely sowing are important factors for improving their productivity. Different cultivars may respond differently to different sowing time (Rajput *et al.,* 1991).

Time of sowing is very important for crop production as different sowing dates provide variable environmental conditions within the same location for growth and development of crop. Growth and yield of Brassica species largely depends upon change in environment during crop growth and this change in environment can occur through many practices including sowing dates and water availability. For getting higher yields, sowing time of crop needs to be adjusted with suitable agro climatic environment (Saha and Khan, 2008). Pradhan *et al.* (2014) reported that there was significant interaction between date of sowing and cultivars with respect to seed yield of mustard. Indian mustard is much sensitive to climatic variables. Hence climate change could have significant effect on its production. Planting window and mustard cultivars is the most important element realizing potential yield of crop. Generally, the time of planting varies depending on the climatic condition of the region and the variety to be grown. Different varieties of mustard are sensitive to change in environmental conditions

[1]Department of Soil Science, CCS Haryana Agricultural University, Hisar-125 004, Haryana, India.
[2]Regional Research Station, Kaul-136 021, Haryana, India.

Corresponding Author: S.K. Sharma, Department of Soil Science, CCS Haryana Agricultural University, Hisar-125 004, Haryana, India. Email: sksharma67@rediffmail.com

How to cite this article: Sharma, S.K. and Kumar, A. (2023). Effect of Date of Sowing on Growth, Seed Yield and Economics of Indian Mustard (*Brassica juncea*) Varieties under Rainfed Conditions. Indian Journal of Agricultural Research. 57(1): 56-59. doi: 10.18805/IJARe.A-5947.

Submitted: 23-11-2021 **Accepted:** 16-07-2022 **Online:** 28-09-2022

where the crop is being grown. Delayed sowing owing to change in biotic and abiotic environmental conditions may have adverse affect on crop performance. Sowing time is also one of the most important non-monetary input which influences to a great extent on both the productivity of seed and oil of Indian mustard under rainfed conditions (Shekhawat *et al.,* 2012). On the other hand, sowing time of Indian mustard was determined long back but therefore, the fertility status, varieties and other inputs have inadequate a considerable change, so there is a need to give fresh look for time of sowing of Indian mustard in the light of introduction of new varieties. Hence, keeping in view the importance of Indian mustard as a major oilseed crop of the state, the present study was investigated to find out the best time of sowing and suitable variety for mustard under rainfed conditions.

MATERIALS AND METHODS

Field experiments were conducted at Dryland Agriculture Research Farm, Chaudhary Charan Singh Haryana Agricultural University, Hisar during 2018-19 and 2019-20 (20°-10′N, 75°-46′E and 215.2 m above mean sea level). The sandy loam soil of the experimental field was low in organic carbon (0.27%), available nitrogen (120 kg/ha), medium in available phosphorus (12.4 kg/ha) and available potash (262 kg/ha) with 7.3 pH. The experiment comprising of 3 dates of sowing (16 October, 23 October and 30 October) and 4 varieties of Indian mustard (RH 725, RH 761, RH 406 and RH 30) was laid out in split plot design. The sowing dates were allocated in the main plots and varieties in the sub-plots and were replicated thrice. A basal dose of 40 kg N + 20 P_2O_5/ha was applied at the time of sowing. The row spacing was 45 cm keeping 5 kg seed rate/ha. The other agronomic practices were followed as per production recommendations during the crop growth period. Rainfall (October-March) and other climatic data were recorded during the course of experimentation.

The observations on plant height and number of branches per plant were recorded manually on five randomly selected representative plants from each plot of each replication separately as well as yield and yield attributing characters were recorded as per the standard method. Yield attributes were also recorded at physiological maturity stage. The economics of the treatments was worked out considering the prevailing cost of inputs and outputs (` 4312/qtl for mustard seed and ` 75/qtl for mustard stover/stalk). All the results were then analyzed statistically for drawing conclusion using Analysis of variance (ANOVA) procedure. Since similar trends were noticed during both the years, the data pertaining to both years were pooled.

RESULTS AND DISCUSSION

Weather and climate

The data on rainfall was recorded by the rainguage located at the experimental site (Table 1). The total rainfall received during the crop growth period was 46.2 and 167.5 mm while during *rabi* season (Oct-Mar) it was 46.2 and 173.0 mm during 2018-19 and 2019-20, respectively with average value of 109.6 mm, which was 100 per cent higher over the mean normal rainfall (54.6). Month wise it was 171, 79 and 385% higher in November, January and March and 70, 37 and 17% deficit in October, December and February over the mean monthly normal rainfall, respectively. More or less variations among the rest of the climatic data compared to long term average were also observed (Fig 1). During both the seasons, the mean maximum and minimum temperature ranged from 24.8-25.9 and 10.9-15.5°C, respectively. The relative humidity varied from 49 to 53% in the evening to 89 to 91% in the morning. The average wind speed ranged from 3.3 to 3.7 km/hr. The bright sun shine hours ranged between 5.1 on a cloudy day to 5.5 on a clear day. Evaporation from open pan evaporimeter ranged between 2.2 to 2.3 mm/day.

Effect of date of sowing

Date of sowing brought significant variation on growth, yield attributing parameters, seed and stover yield of Indian mustard (Table 2). Crop sown on 23th October produced significantly taller plants being at par with sowing on 16th October over 30th October sowing. Higher number of branches per plant and test weight was recorded when planting was done on 16th October compared to 23th October and 30th October sowing. However, difference between 16th October and 23th October sowing was found to be at par. Yield attributes *viz*., number of siliquae per plant and number of seeds per siliqua was significantly increased when mustard was sown on 16th October compared to 23th October and 30th October sowing. Similar results were also observed by Singh *et al.* (2017). Seed and stover yields showed significant difference among sowing dates. The highest seed yield in 16th October sown crop was also due to significantly improved yield attributes as compared to crop sown on other dates. Maximum seed yield was recorded in 16th October (2499 kg/ha) as compared to 23th October (2277 kg/ha) and 30th October (2032 kg/ha). The reduction in yield by delay in sowing by successive week after 16th October was 8.9 and 18.7%. The highest yield may also be due to the prevalence of most favourable temperature at sowing time (16th October) and longer optimum period for crop growth (Fig 1). The late

Table 1: Rainfall (mm) recorded at experimental site.

Month	Actual rainfall (mm)		Mean	Normal rainfall (mm)
	2018-19	2019-20		
October	0.0	5.5	2.7	8.9
November	0.0	17.5	8.7	3.2
December	0.0	6.0	3.0	4.4
January	28.0	12.9	20.4	11.4
February	11.5	11.5	11.5	14.0
March	6.7	119.6	63.1	13.0
Rabi (Oct-Mar)	46.2	173.0	109.6	54.9

Table 2: Effect of treatments on yield, yield attributing parameters and economics of Indian mustard.

Treatments	Plant height (cm)	Number of branches per plant	Number of siliquae per plant	Number of seeds per siliqua	Test wt (g)	Seed yield (kg/ha)	Stover/ stalk yield (kg/ha)	Harvest index	Net returns (`/ha)	BC: ratio	RWUE (kg/ha-mm)
Date of sowing											
16 October	176.9	13.6	334.5	13.3	5.3	2499	7608	24.7	92674	5.23	39.88
23 October	180.4	13.4	319.8	12.2	5.1	2277	7363	23.6	82651	4.78	36.32
30 October	171.4	12.6	291.3	10.7	4.6	2032	6177	24.6	70911	4.24	32.99
CD (P=0.05)	4.6	0.6	12.8	0.5	0.4	216	670				
Varieties											
RH- 725	180.5	13.5	332.9	13.0	5.1	2583	7415	25.8	95940	5.38	40.84
RH- 761	177.9	12.9	311.3	12.2	4.9	2230	7192	23.6	80445	4.68	35.96
RH- 406	175.6	13.1	301.7	11.0	4.8	2005	6512	23.5	70109	4.18	32.58
RH- 30	171.0	13.2	314.9	12.0	5.3	2242	6851	24.6	80634	4.67	36.20
CD (P=0.05)	3.8	NS	11.4	0.4	0.2	135	215				

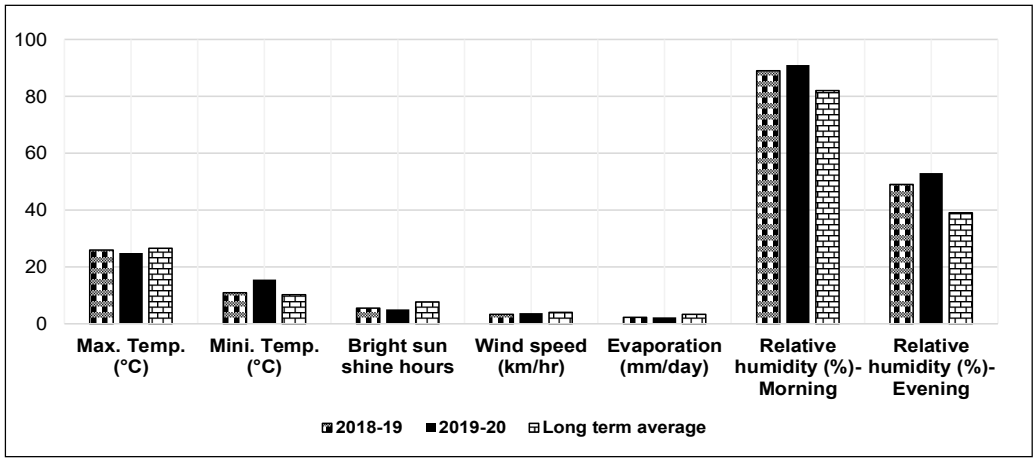

Fig 1: Average climatic data during crop season.

planted crop is subjected to relatively lesser time span available for plant growth and development. Further monthly rainfall distribution pattern during the crop seasons of 16th October sown crop showed that comparatively higher rainfall was received during November and January commentating vegetative and flowering stage of the crop, however normal rainfall was received during the month of February commentating siliqua formation stage of the crop which helped in terms of increased seed and stover yield. These findings are in close conformity with those of Kumar *et al.* (2017) and Tripathi *et al.* (2021). The 16th October (24.7) sown crop recorded highest harvest index as compared to 23th October (23.6) and 30th October (24.6). Rain water use efficiency was found highest in 16th October (39.88 kg/ha-mm) sowing compared to other dates of sowing.

Effect of varieties

All the varieties tested under different dates of sowing differed in respect of growth, yield and yield parameters (Table 2). The maximum plant height (180.5 cm) was recorded for RH 725 which was significantly superior to other varieties except RH 761. Number of siliquae per plant and seeds per siliqua were found to be significantly higher with variety RH 725 compared to other varieties. Mustard variety RH 30 recorded higher test weight compared to other varieties and was at par with RH 725. This is because of variation in different genotypes in their genetic makeup. The seed yield of mustard mainly depends on the number of siliquae per plant, number of seeds per siliqua and test weight as these characters have high degree of positive correlation with seed yield. The variety with RH 725 produced higher value of seed and stover yield which was significantly higher to RH 30, RH 406 and RH 761. Such varietal differences with respect to yield have been reported by Ranabhat *et al.* (2021) and Panwar *et al.* (2000). Harvest index and rain water use efficiency was found highest in RH 725 compared to other varieties of mustard. Interaction of sowing date and varieties was not significant.

Economics

The crop sown on 16th October provided higher net returns (` 92674/ha) as well as B:C ratio (5.23) and it was 12.1 and 30.7% higher over 23th October and 30th October sowing, respectively. This is because of higher seed and stover yield

in 16th October sowing compared to other dates of sowing. Indian mustard variety RH 725 proved its superiority with 19.2, 36.8 and 18.9% higher net returns over RH 761, RH 406 and RH 30, respectively. This is again because of higher seed and stover yield for RH 725 variety compared to other varieties. These results are in agreement with the results of Singh *et al.* (2018) and Bikshapathi (2021).

CONCLUSION

Based on two years performance it can be concluded that Indian mustard can be sown by October 16 for higher yields and RH 725 variety proved to be highest yielder under rainfed conditions of sandy loam soils in arid/semi arid regions.

Conflict of interest: None.

REFERENCES

Anonymous (2022). Accessed from agricoop.nic.in. Department of Agriculture Cooperation and Farmer Welfare.

Bikshapathi, M., Singh, R., Singh, E. and Chhetri, P. (2021). Effect of sowing dates on yield and economics of Indian mustard (*Brassica juncea*) varieties under late sown conditions. International Journal of Current Microbiology Applied Science. 10(02): 2711-2716.

Kumar, Y., Singh, R., Kumar, A. and Dhaka, A.K. (2017). Effect of growth and yield parameters on Indian mustard genotypes under varying environmental conditions in Western Haryana. Journal of Applied and Natural Science. 9(4): 2093-2100.

Panwar, K.S., Sharma, S.K. and Nainwal, R.K. (2000). Influence of sowing time on the yield of different mustard cultivars (*Brassica* spp.) under conserved soil moisture condition. Indian Journal of Agricultural Science. 70(6): 398-399.

Pradhan, S., Sehgal, V.K., Das, D.K., Jain, A.K., Bandyo-padhyay, K.K., Singh, R. and Sharma, P.K. (2014). Effect of weather on seed yield and radiation and water use efficiency of mustard cultivars in a semi-arid environment. Agricultural Water Management. 139: 43-52.

Rajput, R.L., Sharma, M.M., Verma, O.P. and Chauhan, D.V.S. (1991). Response of rapeseed and mustard varieties to date of sowing. Indian Journal of Agronomy. 36: 153-155.

Ranabhat, G., Tiwari, P., Dhakal, A., Oli, P., Chapagain, A. and Neupane, S. (2021). Effect of sowing dates on different rapeseed varieties under rainfed condition. Journal of Agriculture and Natural Resources. 4(1): 176-190.

Saha, G. and Khan, S.A. (2008). Predicting yield and yield attributes of yellow sarson with agrometeorological parameters. Journal of Agrometeorology (Special issue-Part 1): 115-119.

Shekhawat, K., Rathore, S.S., Premi, O.P., Kandpal, B.K. and Chauhan J.S. (2012). Advances in agronomic management of Indian mustard (*Brassica juncea* L.): An overview. International Journal of Agronomy. doi: 10.1155/2012/408284.

Singh, A.K., Singh, B., Thakral, S.K. and Irfan, M. (2018). Effect of sowing dates and varieties for higher productivity of Indian mustard (*Brassica juncea* L.)- A review. Advances in Bioresearch. 9(4): 01-08.

Singh, A.K., Singh, H., Rai, O.P., Singh, G., Singh, V.P., Singh, N.P. and Singh, R. (2017). Effect of sowing dates and varieties for higher productivity of Indian mustard (*Brassica juncea* L.). Journal of Applied and Natural Science. 9(2): 883-887.

Tripathi, K.B.M., Gaur, T., Pandey, L., Singh, A., Tiwari, A., Prakash, V., Rathore, U.S. and Singh, R.K. (2021). Effect of sowing dates on growth and yield of Indian mustard (*Brassica juncea* L.). International Journal of Current Microbiology and Applied Science. 10(01): 3046-3057.