www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2023; 12(6): 2638-2640
© 2023 TPI
www.thepharmajournal.com
Received: 20-03-2023
Accepted: 26-04-2023

Effect of date of sowing and planting geometry on growth and yield of Indian mustard (*Brassica juncea* L.)

Praveen Kumar, Divya Singh, Atish Yadav, Shubhendu Singh, Abhishek Mishra and Dr. Anil Kumar Singh

Praveen Kumar
Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Uttar Pradesh, India

Divya Singh
Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Uttar Pradesh, India

Atish Yadav
Department of Agronomy, Institute of Agriculture Sciences, BHU, Uttar Pradesh, India

Shubhendu Singh
Department of Agronomy, Institute of Agriculture Sciences, BHU, Uttar Pradesh, India

Abhishek Mishra
Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Uttar Pradesh, India

Dr. Anil Kumar Singh
Department of Agronomy, Acharya Narendra Deva University of Agriculture and Technology, Uttar Pradesh, India

Corresponding Author:
Atish Yadav
Department of Agronomy, Institute of Agriculture Sciences, BHU, Uttar Pradesh, India

Abstract
A field experiment was conducted during *Rabi* season of 2021-22 at the Agronomy Research Farm of the Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) India to study the "Effect of date of sowing and planting geometry on growth and yield of Indian mustard (*Brassica juncea* L.)". The experiment included two factors, *viz.* Date of sowing (25 October, 04 November, 14 November) and Planting geometry(40 x 15, 40 x 20, 40 x 25). The overall 9 treatment combinations were accommodated in Split Plot Design and replicated three times. From the results sowing during the 25 October recorded Significantly higher crop yield attributing characters *viz.* number and weight of siliqua per plant and ultimately seed yield (19.8 q/ha) with better growth and higher dry matter accumulation in yield components compared to 04 November and 14 November. Crop geometry of 40 x 15 cm recorded significantly higher seed yield (20.5 q/ha) with better utilization of space, nutrients, water and sunshine resulting in higher dry matter accumulation as compared to 40 x 20, 40 x 25 cm crop geometry.

Keywords: Dry matter, space, geometry and sowing date

Introduction
Mustard (*Brassica juncea*) locally known as "ray" or "laha" belongs to the family Cruciferae. Mustard is Latin term 'must' 'mustun' denotes expressed juice of grapes and 'ardens' means hot and burning (Ahlawat, 2008) [12]. Rapeseed-mustard is the third important oilseed crop in the world after soybean (*Glycine max*) and palm (*Elaeis guineensis* Jacq.) oil. Among the seven edible oil seed cultivated in India, Rapeseed mustard is the second-most important oilseed crop in India, next only to soybean, with almost one-fourth share in both area and production (Jat *et al*. 2019) [4]. Dry matter accumulation is the important parameter for obtaining better growth and yield attributes and yields in the crop which can be mostly done by the adopting changing management *viz.*, sowing dates and planting geometry under changing climate. Indian mustard is highly sensitive to climate change and soil fertility. Sowing time is a nonmonetary input for optimizing the maximum dry matter accumulation and to provide most congenial conditions for maximum light interception and the best utilization of moisture and nutrients to the better plant growth and seed yield (Yadav, 2018) [10]. Among the agronomic factors which are known for augmenting the mustard production are crop spacing and planting geometry which plays a very important role in enhancing the production. Spacing is a non-monetary input but it plays a vital role by changing the magnitude of competition. The competitive ability of rapeseed-mustard plant depends upon the density of plants per unit area and soil fertility status (Shekhawat *et al*. 2012) [13]. Thus optimum row spacing is very necessary for sunlight interception at each strata of leaves. This will result in the enhancement of the rate of photosynthesis which will consequently enhance dry matter production which will finally lead to increase in the crop yield. Establishment of optimum plant population by maintaining proper row spacing is one of the important factors to secure a better translocation of photosynthesis which render better yield of crop (Alam, 2018) [6]. Another most important agronomic factor is the optimum sowing time, which is a non-monetary input playing an important role in fully exploiting the genetic potential of a variety as it provides optimum growth conditions such as temperature, light, humidity and rainfall (Kumar, *et al* 2008) [12]. Rapeseed-Mustard is considerably sensitive to weather as evidenced from the variable response to different dates of sowing (Kumar *et al.*, 2008) [12]. Planting time is the single most important variable affecting the seed yield of Indian mustard to a great extent.

Since the rate of development of oil in seed is greatly influenced by the variation in atmospheric temperature, humidity, and other biotic factors, sowing either too early or too late have been reported to be harmful. Delay in planting reduces the yield on account of its depressing effect on the plant growth, flowering duration, seed formation and seed size.

Material and Methods

The experiment was carried out at the Agronomy Research Farm of the Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya (U.P.) to study the "Effect of date of sowing and planting geometry on growth and yield of Indian mustard (*Brassica juncea* L.)" The experiment included two factors, *viz*. Date of sowing (25 October, 04 November, 14 November) and Planting geometry(40 x 15, 40 x 20, 40 x 25). The overall 9 treatment combinations were accommodated in Split Plot Design and replicated three times. The soil of experiment site was medium in organic carbon and nitrogen, high in phosphorus, medium in potassium and slightly alkaline in reaction. The various growth and yield attributes as well as quality parameters as per standard procedure.

Result and Discussion

Effect of sowing date

The effect of dates of sowing on yield attributes are presented in the table 1. Crop sowing on 25 October recorded significantly higher growth and yield attributes. Sowing of crop at 25 October recorded significantly higher plant height (179.2 cm), Leaf area index (3.3 cm^2), no. of branches per plant (21.7), Dry matter accumulation (44.9 g/cm^2), Siliqua per plant (325.0), siliqua length(8.1 cm) and No. of seed per siliqua (13.0) as compare to late of mustard at 04 November and 14 November. The late sowing of mustard at 14 November recorded significantly lower growth and yield attributes due to unfavorable climate condition, particularly the temperature (Alam *et al*., 2015) [1]. The favorable climatic condition available to the crop when sown on 25th October which accelerated vegetative growth in terms of taller plants and more number of secondary branches per plant also contributed towards remarkable increase in number of siliquae per plant. The results are closely related with the findings of Alam *et al*. (2015) [1] and Kumar *et al*. (2018) [5]. Similarly higher leaf area per plant can be ascribed due to comparatively longer duration of vegetative growth period because of congenial environmental conditions, especially atmospheric temperature which formed a basis for rapid cell division in the meristematic tissues. These results are in conformity with the findings of Singh *et al*. (2017) [9].

Early sowing of crop at 25th October also recorded the significantly higher seed yield (19.8 q/ha) and stover yield (62.1 q/ha) while the late sown mustard at dated 14th November recorded significantly lowest seed and stover yield. The drastic increase in seed yield might also be due to the fact that sowing of mustard on 25th October enjoyed higher amount of moisture and nutrients as well as higher total leaf area per plant which intercepted more sunlight and improvement in the rate of photosynthesis resulted in production of more photosynthates and better translocation of photosynthates from source to sink lead to remarkable increase in seed and straw yields of mustard. Singh *et al*. (2017) [9] also noted that higher seed and stover yield with sowing of mustard on 30th October. Significantly higher oil yield (7.8 q/ha) was noticed with 25th October sowing date over rest of the dates of sowing. The present results are in close agreement with the results of Jat *et al*. (2019) [4]. The percentage oil content of the crop is not significantly affected by the Dates of sowing. Early sowing of crop at 25th October having the highest Net return (₹54429/ha) with highest BC ratio of 3.14. The results are in full agreement with those of Singh and Singh (2017) [9].

Effect of Crop Geometry

The data presented in the table indicated that the Crop geometry Significantly influenced the crop growth and yield attributes. Plant height at harvesting was recorded significantly higher (180.2 cm) with closer crop spacing at 40x15 cm as compare to wider spacing. The increasing in plant height in narrow spacing might be due to stiff competition for mainly light which facilitated vertical growth by producing weak, lanky and taller plants. The results are in agreement with the findings of Begum *et al*. (2005) [2] in mustard. While wider spacing (40x25 cm) recorded significantly higher, Leaf area index (3.3 cm^2), no. of branches per plant (22.1), Dry matter accumulation (43.9 g/cm^2), Siliqua per plant (334.8.0), siliqua length(8.3 cm) and No. of seeds per siliqua (14.0) as compare to closer spacing. It may be ascribed to the better growth of plant under border spacing because it resulted in better vegetative growth owing to less plant density and computation for nutrients, moisture and light resulted in more horizontal growth in term of secondary branches per plant and plant canopy area i.e. leaf area per plant than those under narrow spacing. So, the branch bearing capacity was increased, as also reported by Begum *et al*. (2005) [2] and leaf area per plant by Yadav *et al*. in mustard. The effect of different crop geometry was found insignificant in term of harvest index and percentage oil contents. The mustard seed, oil and straw yield was significantly affected by the crop geometry. Narrow crop geometry (40 x 15 cm) recorded significantly higher seed yield (20.5 q/ha), straw yield (64.9 q/ha) and oil yield (8.0 q/ha) as compare to wider spacing of crop. The main reason was dense plant population under closer spacing treatments, which accelerated the competition within crop plant for space, light, nutrients and moisture as well as adequate interception of sunlight by crop capony consequently enhanced rated of photosynthesis which ultimately produced higher seed and straw yield of mustard. These result are in conformity with the results reported by Jat *et al*. It is evident from the data presented in table 2 showed that the crop spacing G1 (40 x 15 cm) secured maximum net return (₹ 56496/ha) and benefit cost ratio (3.21) followed by the G2 (40 x 20 cm). The increase in net returns was mainly due to higher seed yield in the treatments (Chaniyara *et al*., 2002) [3].

Table 1: Effect of Sowing dates and cropping Geometry on growth and yield attributes of Indian mustard

Treatments	Plant height At harvest	LAI	No. of branches per plant	Dry matter accumulation	No. of Siliqa/Plant	Siliquae Length (cm)	No. of seeds per siliquae	1000 seeds Wt. (gm)
Date of sowing								
D1:25 October	179.2	3.3	21.7	44.9	325.0	8.1	13.0	4.9
D2:04 November	168.3	3.1	19.1	41.4	301.6	7.4	13.0	4.9
D3:14 November	155.6	2.9	18.9	38.4	283.6	7.1	11.9	4.9
SEm+-	3.1	0.06	0.43	1.14	6.89	0.20	0.27	0.09
CD 5%	9.01	0.19	1.21	3.50	19.06	0.68	1.09	NS
Planting geometry								
G1:40 cm x 15 cm	180.2	3.0	17.8	39.7	279.6	7.0	11.7	4.8
G2:40 cm x 20 cm	164.9	3.1	20.8	42.1	303.3	7.6	12.8	4.9
G3:40 cm x 25 cm	159.9	3.3	22.1	43.9	334.3	8.3	14.0	4.9
SEm+-	3.80	0.06	0.42	0.98	7.98	0.16	0.27	0.12
CD 5%	11.71	0.20	1.30	3.04	24.59	0.51	0.82	NS

Table 2: Effect of sowing dates and cropping Geometry on yield and economics of Indian mustard

Treatments	Seed Yield (q/ha)	Stover Yield (q/ha)	Harvest index (%)	Oil content (%)	Oil Yield (q/ha)	Cost of cultivation Rs. ha^{-1}	Gross Return Rs.ha^{-1}	Net return Rs. ha^{-1}	B:C ratio
Date of sowing									
D1:25 October	19.8	62.1	24.1	39.5	7.8	25469	79898	54429	3.14
D2:04 November	17.6	56.3	24.2	39.4	7.3	25469	78294	52825	3.07
D3:14 November	16.1	51.9	23.8	39.4	6.7	25469	78209	52740	3.07
SEm+-	0.46	1.30	0.59	0.46	0.12	-	-	-	-
CD 5%	1.82	5.12	NS	NS	0.48	-	-	-	-
Planting geometry									
G1:40 cm x 15 cm	20.5	64.9	24.0	39.4	8.0	25589	82085	56496	3.21
G2:40 cm x 20 cm	18.5	58.2	24.1	39.5	7.3	25489	80780	55291	3.17
G3:40 cm x 25 cm	16.6	52.3	24.0	39.5	6.5	25689	74014	48325	2.88
SEm+-	0.43	1.21	0.52	1.11	0.19	-	-	-	-
CD 5%	1.34	3.73	NS	NS	0.60	-	-	-	-

References

1. Alam, Ahmed KS, Mollah MRA, Alam J. Effect of planting dates on the yield of mustard (*Brassica napus* L.) seed. International Journal of Applied Science and Biotechnology. 2015;3(4):651-654.
2. Begum F, Rahman M, Islam N. Effect of seed rate and row spacing on the yield and yield components of mustard (*Brassica napus* L.). Thesis submitted to Bangladesh Agricultural University, Mymensingh; c2005 May.
3. Chaniyara NJ, Solanki RM, Bhalu VB. Effect of inter and intra row spacings on yield of mustard. Agricultural Science Digest. 2002;22(1):48-50.
4. Jat A, Desai AG, Rathore BS. Effect of different sowing schedule and crop geometry on productivity and profitability of Indian mustard (*Brassica juncea* L.). Journal of Oilseeds Research. 2019;36(1):17-18.
5. Kumar A, Lal M, Mohan N, Kumar M, Kumar N. Effect of different sowing dates on yield and yield attributes of Indian mustard (*Brassica juncea* L.). International Journal of Pure and Applied Bioscience. 2018;6(2):848-853.
6. Lakra RK, Alam P, Nayar A. Effect of sowing time and crop geometry on productivity of mustard (*Brassica juncea* L.) under irrigated condition of Jharkhand. International Journal of Microbiology and Applied Science. 2018;7:777-781.
7. Ozer H. Effect of plant population densities on growth, yield and yield components of two spring rapeseed cultivars. Plant Soil Environment. 2003 Sep 1;49(9):422-426.
8. Singh AK, Singh H, Singh G, Singh VP, Singh NV, Singh R. Effect of sowing dates and varieties for higher productivity of Indian mustard (*Brassica juncea* L.). Journal of Applied and Natural Science. 2017a Jun 1;9(2):883-887.
9. Singh RK, Singh CV. Studies on response of mustard (*Brassica napus* L.) varieties to different sowing dates under alluvial soils of Indo-Gangetic plains. International Journal of Applied and Natural Sciences. 2017;6(3):9-14.
10. Yadav A, Singh AK, Chaudhry R, Mishra SR. Effect of planting geometry on growth and yield of mustard varieties. Journal of Pharmacognosy and Phytochemistry. 2018;7(3):2624-2627.
11. Ray I, Chakraborty S, Chowdhury A, Majumdar S, Prakash A, Pyare R, Sen A. Room temperature synthesis of γ-Fe2O3 by son chemical route and its response towards butane. Sensors and Actuators B: Chemical. 2008 Mar 28;130(2):882-888.
12. Shivay YS, Kumar D, Prasad R, Ahlawat IP. Relative yield and zinc uptake by rice from zinc sulphate and zinc oxide coatings onto urea. Nutrient Cycling in Agroecosystems. 2008 Feb;80:181-188.
13. Shekhawat K, Rathore SS, Premi OP, Kandpal BK, Chauhan JS. Advances in agronomic management of Indian mustard (*Brassica juncea* (L.) Czernj. Cosson): an overview. International journal of Agronomy. 2012 Oct;2012.