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Marni Anuroop
M.Sc. Scholar, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Joy Dawson
Head of the Department, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Victor Debbarma
Assistant Professor, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author:
Marni Anuroop
M.Sc. Scholar, Department of Agronomy, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Influence of dates of sowing and crop geometry on growth and yield parameters of yellow mustard (*Sinapis alba*)

Marni Anuroop, Joy Dawson and Victor Debbarma

Abstract
A field experiment was carried out at Crop Research Farm, Department of Agronomy, Naini Agriculture Institute, SHUATS, Prayagraj (U.P) in *Rabi* 2020-2021 to determine the effect of different dates of Sowing and Spacing on growth and yield of yellow mustard. The treatments which are T1: Control, T2: 15th November + 30 ×15 cm, T3: 15th November + 45 ×15 cm, T4: 15th November + 60 ×15 cm, T5: 25th November + 30 ×15 cm, T6: 25th November + 45 × 15 cm, T7: 25th November + 60 ×15 cm, T8: 5th December + 30 ×15 cm, T9: 5th December + 45 ×15 cm, T10 5th December + 60 ×15 cm used. The results showed that plants sown on different dates with various Spacings showed significant variation for growth parameters. Among all the treatments, plants sown on 15th November with 60 cm row spacing recorded maximum plant height (133.93 cm), dry weight (19.76 g), Leaves/plant (29.47), crop growth rate (4.74 g/m2 /day), relative growth rate (0.02 g/g/day). Among all the treatments, plants sown on 15th November with 60 cm row spacing recorded siliquae/plant (137.80), seeds/siliquae (33.97), and test weight (3.83 g) whereas plants sown on 15th November with 30 cm row spacing recorded seed yield (15.38 q/ha), stover yield (57.42 q/ha), B:C ratio (2.01).

Keywords: Mustard, dates of sowing, spacing, growth parameters, yield parameters, economics

Introduction
India is the 4th largest oil seed producing economy in the world after USA, China and Brazil, which contributes about 10% of the world oilseeds production, 6 -7% of the global production of vegetable oil, and nearly 7% of protein meal. Although India has 20.8% of the world's area under oilseed crops, it accounts for about 10% of global production. This is because of low productivity of oilseed crops and year to year fluctuations in production in India. Currently, India accounts for about 13% of world's oilseeds area, 7% of world's oilseeds output and 10% of world's edible oil consumption. Among the seven edible oilseeds cultivated in India, rapeseed-mustard contributes 28.6% in the total oilseeds production and rank second after groundnut sharing 27.8% in the India's oilseed economy. In India, area, production and yield of rapeseed-mustard was 6.8 million hectare, 9.1 million tonnes and 13.31 q/ha, respectively (Anonymous, 2019). In Uttar Pradesh, rapeseed and mustard is grown on 6.94 lakh ha area with production of 0.89 mt and productivity of 1290 kg/ha (Anonymous, 2019).
A total twelve important constraints *viz*. unavailability of quality seed, weed problem, unavailability of quality fertilizers, technological problem, irrigation problems, disease and pest attack, shortage of labour in peak time, low price of output, high price of input, small holding of seed growers, non-availability of credit and inadequate storage facility for output were identified. Among twelve constraints, the disease pest attack, low price of output, weed infestation, availability of credit and high price of inputs were the major five constraints, hindering the adoption and expansion of seed production at farmer's level. The prevailing high humid condition and mostly acidic soil might be reason of diseases and pest attack as well as high weed infestation. The impediments need to be addressed by technological breakthrough. The study of Sunita *et al*. (2016) also reported that lack of market and support price of output are one the major constraints in mustard cultivation. (Layek *et al.*, 2021) [9]
Keeping all this in view for better growth of yellow mustard, The present investigation was undertaken to study the "Influence of dates of sowing & crop geometry on growth parameters on yellow mustard (Sinapis alba)".

Materials and Methods: The present experiment was carried out during Rabi 2020 at

Crop Research Farm, Department of Agronomy, SHUATS, Prayagraj, UP, which is located at 25.28ºN latitude, 81.54ºE longitude and 98 m altitude above the mean sea level. Pithambari variety used for sowing yellow mustard. The experiment laid out in Randomized Block Design which consisting of ten treatments with T1: Control, T2: 15th November + 30 ×15 cm, T3: 15th November + 45 ×15 cm, T4: 15th November + 60 ×15 cm, T5: 25th November + 30 ×15 cm, T6: 25th November + 45 ×15 cm, T7: 25th November + 60 ×15 cm, T8: 5th December + 30 ×15 cm, T9: 5th December + 45 ×15 cm, T10 5th December + 60 ×15 cm used.

The experimental site was uniform in topography and sandy loam in texture, nearly neutral in soil reaction (PH 7.1), low in Organic carbon (0.38%), medium available N (225 kg/ ha), higher available P (19.50 kg /ha) and medium available K (213.7 kg/ ha). Nutrient sources were Urea, DAP, MOP to fulfill the necessity of Nitrogen, phosphorous and potassium. The application of fertilizers is done as basal at the time of sowing. In the period from germination to harvest several plant growth parameters were recorded at frequent intervals after harvest, those parameters are growth parameters, plant height, leaves per plant, and plant dry weight are recorded in Variety - Pithambari. Statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez K.A. and Gomez A.A. 1984). In the period from germination to harvest several plant yield parameters were recorded at frequent intervals after harvest several yield parameters were recorded. The yield parameters like siliquae per plant, seeds per siliquae, test weight, seed yield (kg/ha) and stover yield (kg/ha) and harvest index (%) were recorded and statistically analyzed using analysis of variance (ANOVA) as applicable to Randomized Block Design (Gomez K.A. and Gomez A.A. 1984).

Results and Discussion

Growth attributes Plant height

Data in Table 1, tabulated that treatment T4 (15th November + 60 ×15 cm) recorded significantly higher plant height (133.93 cm). However, plant height in treatment T3 (15th November + 45 ×15 cm) and treatment T7 (25th November + 60 ×15 cm) were statistically at par with T4 compared to other treatments.

The probability in increase in plant height due to widest plant spacing might be due to the fact that the increased spacing between plants resulted in, sun-light, nutrients and soil moisture for increased photosynthesis, metabolic activities, growth and development (Sondhiya *et al.,* 2019) [12]

Leaves/Plant

T4 which is 15th November + 60 ×15 cm recorded significantly higher number of leaves/plant (29.47). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November + 60 ×15 cm) which are statistically at par to the T4 which is 15th November + 60 ×15 cm.

The results of present study were also supported by the results of Khaton (2004) in mustard. Among the five planting dates the highest number of leaves/plant (27.08) was obtained from the planting date 30 October. It was significantly different from the all-other planting dates. The lowest number of leaves plant-1 (16.70) was recorded from 15th November (Alam *et al.,* 2015) [1].

Plant dry weight (g/plant)

T4 (15th November + 60 ×15 cm) recorded significantly higher dry weight(19.76 g). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November+ 60 ×15 cm) were statistically at par with T4 (15th November + 60 ×15 cm).

The probable reasons for better growth might be due to relatively competition free environments prevail, hence more availability of nutrients, greater light interception, efficient utilization of soil moisture and space under lower degree of inter-plant competition ultimately leads to increased synthesis of carbohydrate and production of more dry matter plant-1 (Jangir *et al.,* 2017) [5]

Crop Growth Rate (g /m^2 /day)

Maximum crop growth rate (4.74 g/m2 /day) was observed in treatment T4 (15thNovember + 60 ×15 cm). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November + 60 ×15 cm) were at par with the T4 (15th November + 60×15 cm).

The probability in increase in crop growth rate was due to the reason that the high temperature at 15thNovember sown crop might have accelerated the plant growth rate which might have resulting into increased plant growth rate and might be due to temperature gradient i.e., low temperature at vegetative phase and high temperature at reproductive phase in 21st November sown crop might have resulted into decreased plant growth rate (Alam *et al.,* 2014) [2]

Relative growth rate (g/g/day)

The highest relative growth rate (0.02 g/g/day) was recorded in treatments T3 (15th November + 45 ×15 cm), T4 (15th November + 60 ×15 cm), T7 (25th November + 60 ×15 cm).

Yield attributes and Yield Siliquae/plant

Treatment T4 (15th November + 60 ×15 cm) recorded significantly higher No. of siliquae/plant (137.80). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November + 60 ×15 cm) which were statistically at par with T4 (15th November + 60 ×15 cm).

The number of siliquae/plant were highest in crop sown on 15th November and lowest number of siliquae/plant were found in 25th November sowing. This might be due to the reason that on 16 October sowing the prevailing temperature at the time of harvesting was optimum for mustard crop as 16 October was the normal sown condition for mustard that might have resulted into maximum number of primary and secondary branches on stem that might have resulted into a greater number of siliquae/plant (Khan *et al.,* 2006) [6].

Seeds/Siliquae

Treatment T4 (15th November + 60 ×15 cm) recorded significantly higher No. of seeds/siliquae (34.50). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November + 60 ×15 cm) which were statistically at par with T4 (15th November + 60 ×15 cm).

The present study result revealed that early sown crop produced more number of seeds/siliquae Due to translocation of more photosynthates from source to sink, suitable temperature and longer reproductive phase are the major reasons behind the more numbers of siliqua/plant in the earliest sowing than later dates of sowing (Gouraw *et al.,* 2020).

Test weight (g)

Treatment T4 (15th November + 60 ×15 cm) recorded significantly higher test weight (3.83 g). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T7 (25th November + 60 ×15 cm) which were statistically at par with T4 (15th November + 60 ×15 cm).

This indicated the synergistic effects of increase in test weight due to earlier sown crop (November 15 and 25) faced favorable soil moisture condition and relatively warmer temperature during vegetative phase and conducive temperature during 50% flowering and pod formation stage and might be maintained better plant relations like leaf water potential (LWP) and higher turgor potential which led to higher rate of photosynthesis due to more opening of stomata for longer period of time (Kumar *et al.*, 2013) [7].

Seed yield (q/ha)

Significantly higher seed yield (15.38 q/ha) recorded in the treatment T2 which is (15th November +30 ×15 cm). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T5 (25th November + 30 ×15 cm) which were statistically at par with T2 (15th November + 30 ×15 cm).

The higher seed yield obtained in early sowing is due to longer reproductive phase where as shorter growth and shorter span of reproductive phase are the reason behind the reduced seed yield (Gourav *et al.*, 2020). The increase in grain yield was mainly due to increase in the plant population per unit area due to closer spacing between plants. Although wider spacings rows the yield attributes where the plants received increased space, light, nutrients and moisture (Sondhiya *et al.*,2019) [12].

Stover yield (q/ha)

Significantly higher stover yield (57.42 q/ha) was recorded in the treatment T2 which is (15th November + 30 ×15 cm). However, in treatment T3 (15th November + 45 ×15 cm) and in treatment T5 (25thNovember + 30 ×15 cm) which were statistically at par with T2 (15th November + 30 ×15 cm).

This might be due to the reason that on 15th November sowing the prevailing temperature at the time of harvesting was optimum for mustard crop as 15th November was the normal sown condition for mustard that might have resulted into maximum number of primary, secondary branches and siliqua/plant that might have resulting into increased test weight, biological yield (Ram *et al*.,2015) [11].

Harvest index (%)

Significantly higher Harvest index (21.12%) was recorded in the treatment T2 which is (15th November + 30 ×15 cm). However, in treatment T3 (15th November + 45 ×15 cm) and treatment T5 (25thNovember + 30 ×15 cm) which were statistically at par with T2 (15 th November + 30 ×15 cm).

Table 1: Effect of Sowing dates and Spacing on growth attributes of Yellow mustard

Treatments	Plant height (cm)	Plant Dry weight (g)	Leaves/plant	Crop growth rate (g/m2 /day)	Relative growth rate (g/g/day)
1. Control	129.85	16.93	27.43	0.93	0.01
2. 15th November + 30 ×15 cm	132.75	18.57	28.83	3.09	0.01
3. 15th November + 45 ×15 cm	133.34	19.29	29.27	3.98	0.02
4. 15th November + 60 ×15 cm	133.93	19.76	29.47	4.74	0.02
5. 25th November + 30 ×15 cm	131.76	17.79	28.20	1.48	0.01
6. 25th November + 45 ×15 cm	132.24	18.29	28.63	2.54	0.01
7. 25th November + 60 ×15 cm	133.12	18.83	29.17	3.81	0.02
8. 5th December + 30 ×15 cm	130.48	17.17	27.73	0.99	0.01
9. 5th December + 45 ×15 cm	131.27	17.56	28.00	1.37	0.01
10. 5th December + 60 ×15 cm	131.97	17.98	28.37	2.00	0.01
F- test	S	S	S	S	NS
S. EM (±)	0.28	0.32	0.10	0.33	0.0008
C.D. (P=0.05)	0.84	0.96	0.33	1.01	-

Table 2: Effect of Sowing dates and Spacing on Yield attributes and Yield of Yellow mustard

Treatments	Siliquae/plant	Seeds/Siliquae	Test weight (g)	Seed yield (q/ha)	Stover yield (q/ha)	Harvest index (%)
1. Control	127.07	29.77	3.42	12.24	53.53	18.60
2. 15th November + 30 ×15 cm	136.30	33.07	3.72	15.38	54.42	21.12
3. 15th November + 45 ×15 cm	137.30	33.97	3.78	14.94	56.93	20.78
4. 15th November + 60 ×15 cm	137.80	34.50	3.83	14.27	56.17	20.25
5. 25th November + 30 ×15 cm	134.80	31.90	3.59	14.82	56.74	20.70
6. 25th November + 45 ×15 cm	1357.47	32.37	3.65	13.92	55.67	20.66
7. 25th November + 60 ×15 cm	136.90	33.57	3.77	13.35	54.90	19.55
8. 5th December + 30 ×15 cm	129.47	30.70	3.48	13.58	55.31	19.71
9. 5th December + 45 ×15 cm	130.33	30.97	3.54	12.92	54.68	19.11
10. 5th December + 60 ×15 cm	131.07	32.10	3.61	12.65	54.15	18.93
F- test	S	S	S	S	S	S
S. EM (±)	0.41	0.31	.039	0.02	0.19	0.22
C.D. (P=0.05)	1.24	0.93	1.17	0.08	0.57	0.68

Table 3: Effect of Dates of sowing and Spacing on economics of Yellow Mustard

Treatments	Cost of cultivation (INR/ha)	Gross return	Net Return (INR/ha)	B:C ratio
1. Control	24609.00	73440.00	48831.00	1.98
2. 15th November + 30 ×15 cm	25409.00	92280.00	66871.00	2.63
3. 15th November + 45 ×15 cm	25209.00	89640.00	64431.00	2.55
4. 15th November + 60 ×15 cm	24959.00	85620.00	60661.00	2.43
5. 25th November + 30 ×15 cm	25409.00	88920.00	63511.00	2.49
6. 25th November + 45 ×15 cm	25209.00	83520.00	58311.00	2.31
7. 25th November + 60 ×15 cm	24959.00	80100.00	55141.00	2.20
8. 5th December + 30 ×15 cm	25409.00	81480.00	56071.00	2.20
9. 5th December + 45 ×15 cm	25209.00	77520.00	52311.00	2.07
10. 5th December + 60 ×15 cm	24959.00	75900.00	50941.00	2.04

Conclusion

On the basis of one season of experiment it may be concluded that better growth parameters were obtained with treatment T4 (sowing on 15th November + 60 ×15 cm spacing). Higher yield parameters were obtained with treatment T2 (15th November + 30×15 cm spacing) recorded Maximum seed yield (15.38 q/ha), as well as with greater B:C ratio (1.93). Since, the findings were based on the research done in one season under agro- ecological conditions of Prayagraj it may be repeated for confirmation and farmer recommendations.

References

1. Alam MJ, Ahmed KS, Mollah MRA, Tareq MZ, Alam J. Effect of planting dates on the yield of mustard seed. International Journal of Applied Sciences and Biotechnology. 2015;3(4):651-654.
2. Alam Mahbubul, Md Ferdousi Begum, Priyanka Roy. Yield and yield attributes of rapeseed – mustard (brassica) genotypes grown under late sown condition. Bangladesh Journal of Agricultural Research. 2014;39(2):311-336.
3. Das A, Manabendra Ray, Kanu Murmu. Yield and Yield Attributes of Hybrid Mustard as Affected by Crop Geometry and Varieties. International Journal of Current Microbiology and Applied Science. 2019;8(4):2160-2166.
4. Gaurav Ranabhat, Pramod Tiwari, Ashmita Dhakal, Pramod Oli, Amira Chapagain, Susmita Neupane. Effect of sowing dates on different rapeseed varieties under rain fed condition. Journal of Agriculture and Natural Resources. 2020;4(1):176-190.
5. Jangir Arvadia LK, Sunil Kumar. Growth and Yield of Mustard (*Brassica juncea* L.), Dry Weight of Weeds and Weed Control Efficiency Influence by Different Planting Methods and Weed Management. International Journal of Current Microbiology and Applied Sciences. 2017;6(7):2586-2593.
6. Khan FA, Ali S, Shakeel A, Saeed A, Abbas G. Correlation analysis of some quantitative characters in *Brassica napus* L. Journal of Agriculture Research. 2006;44:7-14.
7. Kumar A, Manohar Lal, Narender Mohan, Mahesh Kumar, Neeraj Kumar. Effect of Different Sowing Dates on Yield and Yield Attributes of Indian Mustard (*Brassica juncea* L.) Genotypes. International Journal of Pure and Applied Bioscience. 2017;6(2):848- 853.
8. Kumar S, Sairam RK, Prabhu KV. Physiological traits for high temperature stress tolerance in Brassica Juncea. Indian Journal of Plant Physiology. 2013;18(1):89-93.
9. Layek Nityananda, Gobinda Mula, Ashutosh Sarkar, Bidhan Roy. Economics of Mustard Seed Production - An Analytical Study from Terai Zone of West Bengal. Indian Journal of Extension Education. 2021;57(04-06):78-85.
10. Patel A, Singh AK, Singh SV, Sharma A, Raghuvanshi N, Singh AK. Effect of Different Sowing Dates on Growth, Yield and Quality of Various Indian Mustard (*Brassica juncea* L.) Varieties. International Journal of Current Microbiology and Applied Sciences. 2017;(4):71-77.
11. Ram B, Singh VV, Singh BK, Priyamedha kumar A, Singh D. Comparative tolerance and sensitive response of Indian mustard (*Brassica juncea* L. czern and coss) genotypes to high temperature stress. SABRAO Journal of Breeding and Genetics. 2015;47(3):315-325.
12. Sondhiya, Rajshree Pandey, Namdeo KN. Effect of plant spacings on growth, yield and quality of mustard (Brassica juncea L.) genotypes. Annals of Plant and Soil Research. 2019;21(2):172-176.11..