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Comparative performance of normal and late sown mustard varieties through growth and growth characters under organic management

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Abstract
The field experiment was laid out at Organic Research Farm, Karguwa Ji of Bundelkhand University, Jhansi (U.P). This farm is situated behind the Bundelkhand University in foot hills of Kamashin Mata Temple. The field experiment laid out by split-Plot Design (SPD) consisting of two sowing date and eight varieties in 3 replications during *Rabi* season of 2017-18. The data recorded on growth and yield attributes, revealed that the vegetative growth in general was normal in normal sown but better in late sown. However, there attributes could not reflect their direct effect on yield attributes. The normal sowing (D1) in November 1st week was confirmed to be better than late sowing (D2). It is therefore, considering the yield as prime concern genotype Bayer-5222 for normal sown (on 4th November 2017) and KMH-721 for late condition would be better option.

Keywords: Growth, sowing date, yield

Introduction
Indian mustard (*Brassica juncea* L.) belongs to family Cruciferae. It is most important winter (Rabi) oil seed crop. India is one of the largest mustard growing country in the world, occupying the first position in area and third position in production after China and Canada. Rapeseed-Mustard is the third important oilseed crop in the world after soybean (*Glycine max* L.) and palm oil. Among the seven edible oilseed cultivation in India, rapeseed-mustard *(Brassica spp.*) contributes 28.6% in the production of oilseeds. The global production of rapeseed- mustard and its oil is around 38-42 and 12-14 million tonnes respectively. India contributes 8.3% and 19.8% of world acreage and production respectively. Mustard is the second most important edible oil seed crop after groundnut in India. It plays an important role in the oil seed economy of the country. In India, during 2016-17 the area of rapeseed-mustard was 6.5 million ha with the production of 5.70 million metric tonnes and productivity of 1000 kg/ha. However, in Uttar Pradesh during the year 2016-17 the area of rapeseed-mustard was 781 thousand ha with the production of 986 thousand tonnes and productivity of 1262 kg/ha. (Anonymous, 2016-17) [18] Sowing time is one of the major input factors affecting growth and yield of crops. It affects duration of vegetative, reproductive and maturity period of mustard. Optimum planting time of mustard may vary from one variety to another and from a region to another because of variation of agro-ecological conditions (Sarkar *et al.* 2004) [13]. The optimum time of sowing can provide congenial conditions to have maximum light interception, best utilization of moisture and nutrients from early growth stage to seed filling stage. Sowing time is very important for mustard production (Uzun *et al.* 2009) [17].

Materials and Methods
The field experiment was laid out at Organic Research Farm, Karguwa Ji of Bundelkhand University, Jhansi (U.P). This farm is situated behind the Bundelkhand University in foot hills of Kamashin Mata Temple. Geographically, the Organic Research Form, Karguwa Ji Farm Bundelkhand University, Jhansi is situated at a latitude: 25027’31” N. Longitude: 78034’47 E.

India. Soil of that particular field was Sandy loam, with pH 6.8, medium in organic carbon (0.60 %) and available nitrogen, low in available phosphorous(13.50Kgha^{-1}), rich in potassium (99.00 Kgha^{-1}) and slightly alkaline in reaction. Eight varieties viz. V1: Pusa Bold V2: RH-0749 V3: RVM-2 V4: Bayer- 5222 V5: Varuna V6: Super gold V7: JM-3 V8: KMH-721 were used to assess their performance fewer than two dates of sowing viz., 4th November 2017 (D1), 18th November 2017 (D2). The experiment was conducted under Split plot design with three replications in which date of sowing was taken as main plot treatments and varieties were allocated in sub plots. The amount of organic manures was calculated on the basis of their actual nitrogen content. The required quantity of organic manures, *viz*. vermicompost was applied in moist soil in the row before sowing of seed. Mustard seeds were sown in lines at the distance of 45 cm by manual. The seed rate was used 6 kg ha^{-1}. Two irrigations, First irrigation was done at rosette stage (25 DAS) and second irrigation was done at siliqua formation stage (55 DAS) of the crop along with manual intercultural operation at 45 DAS. Observations regarding growth like shoot length (cm), dry weight of shoot and primary and secondary branches were recorded at 90 DAS and while observations regarding number of siliqua, yield and harvest index were taken at after harvesting. The plant height was measured randomly three selected plant in cm with the help of meter scale from the base of the plant to top of the plant and mean value was computed at 90 DAS .Three plants were selected randomly from each plot and uproot plant from plot and dry shoot weight (g shoot^{-1}) , three selected uprooted plants were also used dry shoot weight study and chopped in to small pieces and placed for sun drying for two days and then in the oven at a temperature of 70 ± 1 °C till the constant weight attained. The average value was calculated and noted as dry matter in g plant^{-1}. The number of primary and secondary branches recorded from randomly selected three plant and count average value was calculated and noted as number of primary and secondary branches. The siliqua present on three randomly selected plants were separated and counted, and average value was recorded as number of siliqua plant^{-1}. Harvesting of individual plot was done at physiological maturity when siliquae turned brownish. Mainly mustard crop was harvested as soon as 75% pods turned yellowish brown and bundles of harvested plants were sun dried for few days at threshing floor after proper tagging. The bundle weight of net plot was recorded individually. From the individual plot, the crop of net plot area was harvested and dried. After sun drying, the produce was threshed and seeds were cleaned. The final seed weight was recorded in kg per plot and converted in to q ha^{-1}.

Results and Discussions

A. Growth Character

1. Shoot length (cm): The data pertaining to shoot length (cm) at various stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in table.1 The result at 90 days of after sowing are discussed here.

It is apparent from the data that shoot length (cm) increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 18th November sown crop exhibited statistically higher significant shoot length at stages of plant growth (90 DAS) as compared to the genotypes of Mustard sown on 4th November sowing date.

Among the different varieties, shoot length (cm) was found statistically significant at 90 DAS. Shoot length(cm) was significantly greater in *cv*. RH-749 (V2 = 199.88 cm) followed by *cv*. JM-3 (V7 = 197 cm), Pusa bold (V1 = 197.88 cm), Bayer-5222 (V4 = 190.55 cm), RVM-2 (V3 = 189.22 cm), Varuna (V5 = 182.22 cm), KMH-721 (V8 = 182.22 cm) and least length in at Super gold (V6 = 180 cm) at 90 days in late sowing schedule (LSS) done on 18th November 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS). The results obtained from the present experiment are near conformity with the finding of Akhter *et al.*, 2015, Singh *et al.*, 2010, Fathi *et al.* 2003 and Pandey *et al.*, 2015 [15, 6, 11].

2. Dry shoot weight plant^{-1} (g)

The data pertaining to dry shoot weight (g) at various stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in table 2. The results at 90 days of after sowing are discussed here.

It is apparent from the data that dry shoot weight (g) increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 18th November sown crop exhibited statistically higher significant dry shoot weight at all stages of plant growth 90 DAS as compared to the genotypes of Mustard sown on 4th November sowing date. Among the different varieties, dry shoot weight was found statistically significant at 90 DAS. Dry shoot weight was significantly greater in *cv*. KMH-721 (V8 = 104.97 g) followed by *cv*. JM-3 (V7 = 104.86 g), Pusa bold (V1 = 97.84 g), RH-0749 (V2 = 88.42 g), Bayer (V4 = 88.13 g), RVM-2 (V3 = 81.46 g), Super gold (V6 = 81.24 g) and least weight in Varuna (V5 = 78.26 g) at 90 days in late sowing schedule (LSS) done on 18th November 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS). The results obtained from the present experiment are near conformity with the finding of Alam, *et al.*, 2015, Devi *et al.*, 2017 and Patel *et al.*, 2017 [2, 4, 12].

3. Number of primary branches plant^{-1}

The data pertaining to number of primary branches (plant^{-1}) at various stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in table 3. The results at 90 days of after sowing are discussed here.

It is apparent from the data that number of primary branches (plant^{-1}) increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 4th November sown crop exhibited statistically non-significant at number of primary branches all stages of plant growth 90 DAS as compared to the genotypes of Mustard sown on 18th November sowing date.

Among the different varieties, number of primary branches was found statistically significant at 90 DAS. Number of primary branch were significantly greater in *cv*. KMH-721 (V8 = 7.89) followed by *cv*. JM-3 (V7 = 7.66), RH -749 (V2 = 6.33), Bayer -5222 (V4 = 6.00), RVM-2 (V3 = 5.78), Super gold (V6 = 5.66), Varuna (V5 = 5.55), and least number in Pusa bold (V1 = 32.55)at 90 days in late sowing schedule (LSS) done on 18thNovember 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS). The results obtained from the present experiment are near conformity with the finding of Singh *et al.* 2008, Singh *et al.* 2010, Fathi *et al.* 2003 and Patel *et al.* 2017 [16, 12, 15, 6].

4. Number of secondary branches plant^{-1}

The data pertaining to number of secondary branches (plant^{-1}) at various stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in table 4. The results at 90 days of after sowing are discussed here.

It is apparent from the data that number of secondary branches (plant^{-1}) increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 18th November sown crop exhibited statistically higher significant at number of secondary branch all stages of plant growth (30, 60 and 90 DAS) as compared to the genotypes of Mustard sown on 4th November sowing date. Among the different varieties, number of secondary branches was found statistically significant at 90 DAS. Number of secondary branches was significantly greater in *cv*. KMH-721 (V8 = 24.11) followed by *cv*. JM-3(V7 = 21.55), RVM-2.(V3 = 19.22), Bayer-5222 (V4 = 19.11), RH-749 (V2 = 17.99) Super gold (V6 = 15.44) and least number in Pusa bold (V1 = 15.33) at 90 days in late sowing schedule (LSS) done on 18th November 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS). The results obtained from the present experiment are near conformity with the finding of Singh *et al.* 2008, Alam**,** *et al.*, 2015, Devi *et al.*, 2017 and Patel *et al.*, 2017 [16, 2, 5, 12].

B. Yield Character

1. Number of siliqua plant-^{1}

The data pertaining to number of siliqua plant^{-1} at stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in table- 5. The results at maturity are discussed here.

It is apparent from the data that number of siliqua plant^{-1} increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 18th November sown crop exhibited statistically higher significant siliqua number at stages of plant maturity as compared to the genotypes of Mustard sown on 4th November sowing date.

Among the different varieties, number of siliqua plant^{-1} was found statistically high significant at maturity. Number of siliqua plant^{-1} was significantly greater in *cv*. KMH-721 (V8 = 448.97) followed by *cv*.Varuna (V5 = 425.66), Super gold (V6 = 418.77), JM- 3 (V7 = 418.33), Pusa bold (V1 = 372.99), RH-0749 (V2 = 361.55) and least number in RVM-2 (V3 = 348.55) at maturity in late sowing schedule (LSS) done on 18th November 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS).Interaction between sowing dates x varieties was found highly statistically significant on attribute taken on number of siliqua plant^{-1} of different genotypes of mustard at maturity. The results obtained from the present experiment are near conformity with the finding of Hocking *et al.* 2001, Singh *et al.*, 2010, Fathi *et al.*, 2003 and Meena *et al.*, 2017 [9, 15, 6, 10].

2. Biomass hectare^{-1} (quintal)

The data pertaining to biomass weight at stages of plant maturity as influenced by sowing dates and varieties are presented in Table-6. The results at 90 days of after sowing are discussed here.

It is apparent from the data that biomass weight increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 18th November sown crop exhibited statistically non-significant biomass weight at stages of plant maturity as compared to the genotypes of Mustard sown on 4th November sowing date.

Among the different varieties, biomass weight was found statistically significant at maturity. Biomass weight was significantly greater in *cv*. JM-3 (V7 = 108.97q) followed by *cv*.RH-0749 (V2 = 102.61q), RVM-2 (V3 = 101.93q), Pusa bold (V1 = 99.03q), Super gold (V6 = 97.73q), Varuna (V5 = 96.34q), Bayer-5222 (V4 = 94.26q) and least weight in KMH-721 (V2 = 89.35q) at maturity in late sowing schedule (LSS) done on 18th November 2017 as compared to the genotype of Mustard sown on 4th November 2017 as normal sowing schedule (NSS).The results obtained from the present experiment are near conformity with the finding of Hocking *et al.* 2001, Singh *et al.*, 2010, Fathi *et al.*, 2003 and Meena *et al.* 2017 [9, 15, 6, 10].

3. Grain yield hectare^{-1} (quintal)

The data pertaining to grain weight at stages of plant growth (DAS) as influenced by sowing dates and varieties are presented in Table-7. The results at 90 days of after sowing are discussed here.

It is apparent from the data that grain weight increased with the advancement in the age of the plant in two sowing dates. Between two different sowing dates, 4th November sown crop exhibited statistically higher significant grain weight at stages of plant maturity as compared to the genotypes of Mustard sown on 18th November sowing date.

Among the different varieties, grain weight plant^{-1} was found statistically high significant at maturity. Grain weight was significantly greater in *cv*. Bayer-5222 (V4 = 34.95q) followed by *cv*. Pusa bold (V1 = 34.58q), JM-3 (V7 = 33.89q), Super gold (V6 = 33.13q), Varuna (V5 = 32.64q), RVM-2 (V3 = 30.56q), RH-0749 (V2 = 29.99q) and least weight in KMH-721 (V8 = 28.93q) at maturity in normal sowing schedule (NSS) done on 4th November 2017 as compared to the genotype of mustard sown on 18th November 2017 as late sowing schedule (LSS). Interaction between sowing dates x varieties was found highly statistically significant on attribute taken on grain weight of different genotypes of mustard at maturity. The results obtained from the present experiment are near conformity with the finding of Singh *et al.* 2008, Singh *et al.* 2010, Fathi *et al.*, 2003 and Gul *et al.*, 2007 [16, 15, 6, 7].

Table 1: Effect of date of sowing and various varieties of mustard on shoot length of plant^{-1} at 90DAS

Shoot length (cm) at 90 DAS.									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	186.55	179.00	183.89	177.89	160.17	182.77	190.11	160.16	177.57
18th Nov 2017	197.88	199.88	189.22	190.55	182.33	180.00	197.99	182.22	190.01
Mean (V)	192.88	189.44	186.55	184.22	171.25	181.39	194.05	171.90	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	3.78		4.92		6.96		6.10		

Table 2: Effect of date of sowing and various varieties of mustard on dry weight of shoot plant^{-1} at 90 DAS

Dry weight (g) of shoot at 90 DAS									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	44.84	66.05	64.16	53.40	42.28	46.97	57.65	58.90	54.28
18th Nov 2017	75.62	86.02	60.78	82.62	73.82	77.15	84.77	101.89	80.33
Mean (V)	60.23	76.04	62.47	68.01	58.05	62.06	71.21	80.39	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	2.07		2.14		3.03		2.99		

Table 3: Effect of date of sowing and various varieties of mustard on number of primary branches plant^{-1} at 90 DAS

Number of primary branches at 90 DAS.									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	5.05	5.44	5.33	5.33	4.35	5.55	5.88	5.55	5.31
18th Nov 2017	5.22	6.33	5.78	6.00	5.55	5.66	7.66	7.89	6.26
Mean (V)	5.14	5.89	5.55	5.67	4.95	5.61	6.77	6.72	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	N.S.		0.89		N.S.		0.00		

Table 4: Effect of date of sowing and various varieties of mustard number of secondary branches plant^{-1} at 90 DAS

Number of secondary branch at 90 DAS.									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	10.66	13.11	10.55	11.77	8.66	11.22	13.77	11.99	11.47
18th Nov 2017	15.33	17.99	19.22	19.11	16.99	15.44	21.55	24.11	18.72
Mean (V)	12.99	15.55	14.88	15.44	12.83	13.33	17.67	18.05	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	1.48		0.94		1.33		1.68		

Table 5: Effect of date of sowing and various varieties of mustard number of siliqua plant^{-1} at maturity stage

Number of siliqua at maturity.									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	260.44	297.44	278.77	233.11	231.66	277.55	353.91	279.66	276.57
18th Nov 2017	372.99	361.55	348.55	388.77	425.66	418.77	418.33	448.97	397.95
Mean (V)	316.72	329.50	313.66	310.94	328.66	348.16	386.12	364.32	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	41.13		23.51		33.25		35.05		

Table 6: Effect of date of sowing and various varieties of Mustard on weight (quintal) of biomass hectare^{-1} at harvest

After harvesting (wt. of biomass per hectare in quintal)									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	97.31	104.86	95.05	105.51	85.00	99.67	115.37	76.34	97.39
18th Nov 2017	99.03	102.61	101.93	94.26	96.34	97.73	108.97	89.35	98.78
Mean (V)	98.17	103.74	98.49	99.88	90.67	98.70	112.17	82.85	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	N.S.		7.63		10.80		11.88		

Table 7: Effect of date of sowing and various varieties of Mustard on weight (quintal) of grain yield hectare^{-1} after harvest

After harvesting (wt. of grain yield per hectare in quintal)									
Treatment	**V1**	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**Mean (D)**
4th Nov 2017	34.58	29.99	30.56	34.95	32.64	33.13	33.89	28.93	32.33
18th Nov 2017	31.99	30.41	30.51	31.43	32.64	31.02	31.34	33.20	31.57
Mean (V)	33.29	30.21	30.53	33.19	32.64	32.07	32.61	31.07	
	Date		Variety		Date X Variety		Variety X Date		
CD (P = 0.05)	N.S.		1.05		1.48		1.87		

Conclusion

The comparative performance of mustard varieties under normal and late sown conditions revealed that the vegetative growth in general was normal in normal sown but better in late sown. However, there attributes could not reflect their direct effect on yield attributes.

The majority of yield attributers were better in normal sown. The yield attributers of variety Bayer 5222 were best in normal sown conditions.

In overall comparison variety Bayer 5222 for normal sown and variety KMH-721 for late sown condition was identified to be the best choice for growing in Organic Farming with respective yield of 34.9 q/ha and 33.2 q/ha. The normal sowing in November 1stweek was confirmed to be better than late sowing.

Reference

1. Akhter S, Singh L, Rasool R, Ramzan S. Effect of date of sowing and varieties on yield of Brown sarson (*Brassica rapa* L.) under temperate Kashmir. Int J Eng Sci Invention. 2015;4(3):2319–6734.
2. Alam MJ, Ahmed KS, Mollah MRA, Tareq MZ, Alam J. Effect of planting dates on the yield of mustard seed. Int J Appl Sci Biotechnol. 2015;3(4):651-654.
3. Baghdadi H, Taspinar S, Yousefi M, Hosseinpour A. Influence of different sowing dates on grain yield of canola (*Brassica napus* L.) cultivars in Qazvin area. Intl. J Agric Res Rev. 2012;2:1092±1096.
4. Devi M, Sharma HK. Effect of sowing date on flowering and seed set of mustard (*Brassica juncea* L.). J Entomol Zool Stud. 2017;5(5):1534-1537.
5. Devi YP, Chhetry GKN. Effect of traditional agronomic practices on fungal diseases of rapeseed/mustard under organic farming system in Manipur. J Adv Res. 2017;5(6).
6. Fathi G, Siadat SA, Hemaiaty SS. Effect of sowing date on yield and yield components of three oilseed rape varieties. Acta Agron Hung. 2003;51(3):249±255. https://doi.org/10.1556/AAgr.51.2003.3.2
7. Gul H, Ahmad R. Effect of different sowing dates on the

vegetative and reproductive growth of canola (*Brassica napus* L.) cultivars under different salinity levels. Pak J Bot. 2007;39(4):1161-1172.
8. Hamid RAY, Amir HSRG, Nourmohammadi BD, Koliai A, Mohsen T. Morphological traits of Indian mustard (*Brassica juncea* (L.)) as influenced by sowing date and manure fertilizers. Ann Biol Res. 2012;3(8):4039-4044.
9. Hocking PJ, Stapper M. Effects of sowing time and nitrogen fertiliser on canola and wheat, and nitrogen fertiliser on Indian mustard. I. Dry matter production, grain yield, and yield components. Aust J Agric Res. 2001;52(6):623. https://doi.org/10.1071/AR00113
10. Meena H, Meena PKP, Kumhar BL. Studies on Response of Mustard Varieties to Different Sowing Dates under Humid Southern Plain Zone of Rajasthan. Int J Pure App Biosci. 2017;5(3):385-391.
11. Pandey S, Kumar S, Singh G. Effect of planting geometry on growth and yield of mustard varieties. Int J Farm Sci. 2015;5:47-50.
12. 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. Int J Curr Microbiol Appl Sci. 2017;4:71-77.
13. Sarkar AR, Kabir H, Begum M, Salam A. Yield performance of mungbean as affected by planting date, variety and plant density. Ind J Agron. 2004;53:18-24.
14. Singh RK, Singh CV. Studies on response of mustard varieties to different sowing dates under alluvial soils of Indo-Gangetic plains. Int J Appl Nat Sci. 2017;6(3):2319-4022.
15. Singh RK, Singh Y, Singh AK, Kumar R, Singh VK. Productivity and economics of mustard (*Brassica juncea*) varieties as influenced by different fertility levels under late sown condition. Ind J Soil Cons. 2010;38:121-124.
16. Singh T, Minhas KS, Brar R. Effect of sowing dates and plant geometry on seed yield of canola (*Brassica napus* var Canola). Res Crop. 2008;9:36-38.
17. Uzun B, Zengin U, Furat S, Akdesir O. Sowing date effects on growth, flowering, seed yield and oil content of canola cultivars. Asian J Chem. 2009;21:1957±1965.
18. Anonymous. All India area, production and yield of total pulses 2016-17. Ministry of Agriculture, Gov. of India, 11349; c2016-17.