Effect of different sowing date and varieties on Mustard growth and yield in Prayagraj conditions

ABSTRACT

A field experiments was conducted during winter seasons of 2021-22 at Research farm of college of forestry Sam Higginbottom University of Agriculture Technology and Science Prayagraj (U. P) investigate the effect of different sowing date and varieties on Mustard growth and yield in Prayagraj conditions Keeping in this view experiment was conducted in Factorial RBD with three replications having two factors. First factor comprised of three dates of sowing 15Oct. 30Oct. and 15Nov. whereas second factor consist of three Indian mustard varieties viz; Maharaja Mustard, Md Rani Supergold, Kala Sona, Crop sown on 15th November was recorded statistically significant higher seed yield, stover yield, test weight, harvest index and at maturity best consumption of heat units like gdd, htu and ptu as compared to 30th October and 15 October sowing. In case of plant growth parameters of mustard maximum was recorded under 15th November as compared to 30th October and 15th October and in case of varieties maximum plant growth like plant height, no of leaves no of branches, no of silique, and optimum use of heat units was recorded with md rani super gold as compared to kala sona and maharaja. The treatment with date of sowing 15th November and md rani super gold variety proved the most remunerative and economically feasible for cultivation of Indian mustard under the agro climatic conditions of Prayagraj U.P.

Keywords: plant height, no of leaves, no of branches, heat units, yield, etc.

1 INTRODUCTION

Mustard (Brassica juncea L.) also known by the name of Indian Mustard, belongs to the plant family Brassiceae (Cruciferae) or the Mustard family .In the trade, it is commonly referred to as Rapeseed-Mustard along with four other closely related cultivated oilseed species viz. Brassica rapa ,Brassica napus ,Brassica carinata and Eruca sativa. Over the past couple of decades, these crops have become one of the most important sources of vegetable oil in the world. Continuous improvement in Rapeseed-Mustard has resulted in nutritionally superior

edible oil and meal as an important source of protein in Animal feed Mustard crops are commercially cultivated in more Then 60 countries and major producers include china Canada India Australia and Czech Republic .In the past the area under Rapeseed-Mustard globally increased from 6.3 million hectare in 1961 to 34.3 million hectare in 2012 with a mean increment of 0.56 million hectare per annum. Production in the same period increased from 3.68 to 65.1 million tones at mean increment of 3.68 m.t. per annum. Chaudhary *et al*., (2015) Mustard plays an important role in the oil seed economy of the country. Rajasthan is the largest mustard producing state in the country. Mustard seed production in the state is expected to increase upto 49.50 lakh tonne during rabi season of 2021-22 from 35 lakh tonnes in the previous year. In Uttar Pradesh, production is likely to increase from 613.5 lakh tonnes from 17 lakh tonnes. Mustard seed production in Madhya Pradesh is estimated to rise to 12.5 lakh tonnes from 8.5 lakh tonnes. In Punjab and Haryana, mustard seed production is expected 11.50 lakh tonnes, up from 9.5 lakh tonnes in the previous year.

Rapeseed and mustard are generally grown on marginal lands with poor fertility status. Hence, they also suffer from nutrient stress. Sowing time is one of the most important nonmonetary input which influences the productivity of seed and oil to a great extent (**Pavlista *et. al*. 2011**). Rapeseed and mustard are generally sown by first week of October to middle of November in north India. High diurnal temperature during early sown crops resulted in poor germination,Improper growth and development of plants. Besides, pests viz., pointed bug (Bagrada hilaris), cutworm (Agrotis sps.), sow fly (Athalialugens proxima). Late sown crop on the other hand, suffers from low temperature during its germination and early growth phases and damages due to aphids (Lipophis sps.) during flowering and pod development stage **(Bhuiyan *et al*., 2008; Aziz *et al*., 2011**). With the development of new varieties of crop and adoption of multiple cropping systems under irrigated conditions it has become essential to extend its sowing from October to mid-November or even later. Considering the above facts, field experiments were conducted to study the impact of different sowing dates on two commonly grown mustard varieties of mustard in north India

Justification

In India, shrinking land resources coupled with increased population exerts huge pressure on the farmers, researchers and agricultural policy makers to meet the food grain requirement of the nation. This enforces to search out for newer vistas. With optimum change in temperature and

rainfall the optimum time of sowing will also change and ultimately the crop growth will also be affected. The weather parameters which determined the optimum date of sowing are supposed to be altered to some extent with climate change occurring in that region. Keeping these aspects in view the present study on Effect of different sowing dates and varieties on mustard growth and yield in prayagraj condition was carried out with the following objectives

1 effect of sowing time and varieties on growth and yield of mustard

2. To evaluate agrometeorological indices for Indian mustard

2 MATERIAL AND METHODS

The experiment was conducted at field of collage of forestry Sam Higginbottom University of Agriculture Techonology and Science Prayagraj-2110007 (UP) it is located at 25.45°N 81.84°E in the southern part of the Uttar Pradesh at an elevation of 98 meters (322 ft5) and stands at the confluence of two, the Ganges and Yamuna. The region was known in antiquity as the Vats country. To its south and southeast is the Bundellkhand region; to its east is middle Ganges valley of North India,

Prayagraj features the typical version of a humid sub-tropical climate that is common to cities in north-central India. Prayagraj experiences three seasons: hot dry summer, cool dry winter and warm humid monsoon. The summer season lasts from April to June with the maximum temperatures ranging from 40 °C (104 °F) to 45 °C (113 °F). Monsoon begins in early July and lasts till September. The winter season lasts from December to February.

Brassica juncea cultivars namely md rani supergold, kala sona, and maharaja mustard were sown during rabi season at 15 days' intervals on three dates of sowing beginning 15st October 2021. The field experiment was conducted in a RBD in which three varieties and three sowing dates were replicated three times.

Date variety

1. 15 oct.2022
2. 30 oct.2022
3. 15 nov.2022

1. maharaja mustard
2. md rani super gold
3. kala sona mustard

T1 –D1V1 (15-oct.maharaja mustard)

T2- D1V2 (15-oct. md rani super gold)

T3- D1V3 (15-oct kala sona)

T4-D2V1 (30-oct maharaja mustard)

T5-D2V2 (30-oct.md rani super gold)

T6-D2V3 (30-oct kala sona)

T7-D3V1 (15- nov. maharaj mustard)

T8- D3V2 (15-nov..md rani super gold)

T9- D3V3 (15- nov. kala sona)

Fertilizers were applied as per recommended agronomic package of practices for the experiment i.e. nitrogen @ 120 kg/ha, P_2O_5 60 kg/ha and K_2O 40 kg/ha and 20 kg Sulphur. Seeds were sown at the rate of 5 kg seed per hectare in rows spaced 30 cm apart and 3-4 cm deep by a hand drawn drill. Weeding was carried out manually at about 40 days after seeding and thinning was done to maintain plant population of about 2,50,000 plants per hectare uniformly in all the plots

The crop was irrigated during the two most critical growth stages viz. flowering and pod formation stages, as per recommended irrigation package of practices for the crop under prayagraj conditions. Additional irrigations were also given whenever the gravimetric samples showed that the soil moisture had depleted to a value below 50 per cent of available water (on volume basis) in the 15 to 60 cm depth. The purpose of these additional irrigations was to ensure the maintenance of ‘not short of water’ conditions and to retain the soil moisture in the root zone fairly within the available water range.

2.1 observe growth, yield, and meteorological parameters

Growth parameters was recorded like- plant height,(at 30,60,90,DAS and at harvest), no of leaves (at 30,60,90,DAS and at harvest), no of branches (at 30,60,90,DAS and at harvest) and Yield & economical parameters was recorded like- no of silique, grain yield, harvest index and also meteorological indices (GDD,HTU,PTU) was recorded at different phenological stages of plant and at final maturity.

2.2 statistical analysis

Analysis of treatment for all the treatments in randomized block design was carried out. Testing the hypothesis, the following ANOVA table was used analysis of variance (ANOVA) as outlined where the 'F' test was significant for comparison of the treatment means, CD values were worked out at 5% probability level. C.D = S.E (d) ×'t' error d. f. at 5% level of significance

3 Results and discussion

3.1 growth attributes

May be observed that there is no significant relationship due to date of sowing on plant height was observed after 30 days of crop while after 30 days of sowing of mustard the plant height had significant effect because of date of sowing it was also entered from the table that

variety has significant effect on plant height from 30 DAS to 120 DAS. The no significant result were observed for interaction of date of sowing and variety on number of leaves **Singh *et al.*(2020)** also conducted. The maximum plant height at 30, 60, 90, 120, DAS is 20.6, 67.76, 135.3, 189.86 (cm) was found in T_8 (15nov-md rani super gold). However minimum plant height at 30, 60, 90, 120, DAS is 18.7, 61.7, 125.2, 159.5 (cm) was recorded in T_1 (15oct-maharaja).in (Table-1)

Table.1 Plant height as influenced by different date of sowing and varieties

Treatments	plant height (cm)			
	30 DAS	60 DAS	90 DAS	At harvest
Date of sowing				
15th Oct 2021	18.967	62.889	125.544	159.589
30th Oct 2021	19.133	64.522	129.211	177.522
15th Nov 2021	20.367	67.656	134.689	188.556
SEm±	0.104	0.561	0.316	0.399
CD (*p*=0.05)	0.314	1.2	0.956	1.205
Varieties				
Md rani super gold	18.96	65.61	129.94	175.61
Kala sona	18.8	64.84	129.82	175.24
Maharaja	18.7	64.61	129.67	174.81
SEm±	0.104	0.561	0.316	0.399
CD (*p*=0.05)	NS	1.2	0.956	1.205

From **table -2** may be observed that there is no significant relationship due to date of sowing on number of leaves observed after 30 days of crop while after 30 days of sowing of mustard the number of leaves had significant effect because of date of sowing it was also entered from the table that variety has significant effect on number of leaves from 30 DAS to 120 DAS. The no significant result were observed for interaction of date of sowing and variety on number of leaves (**Chaplot *et al.*, 2012**) also conducted. The maximum no. of leaves at 30, 60, 90, 120, DAS is 8.0, 42.8, 59.13, 49.8 (no.) was found in T_8 (15nov-mdrani super gold) However minimum no of leaves at 30, 60, 90, 120, DAS is 5.73, 32.43, 50.76, 44.05 (no.) was recorded in T_1 (15oct-maharaja). In (Table -2)

Table.2 No of leaves as influenced by different date of sowing and varieties

Treatments	plant leaves (no)			
	30 DAS	60 DAS	90 DAS	At harvest
Date of sowing				

15th Oct 2021	5.967	32.911	51.922	45.467
30th Oct 2021	6.9	37.756	58.211	48.6
15th Nov 2021	7.7	41.967	59.133	48.678
SEm±	0.253	0.49	0.603	0.417
CD (*p*=0.05)	0.766	1.48	1.82	1.26
Varieties				
Md rani super gold	6.94	37.42	56.83	48.13
Kala sona	6.91	37.82	56.25	47.44
Maharaja	6.71	37.38	56.17	47.16
SEm±	0.253	0.49	0.603	0.417
CD (*p*=0.05)	NS	1.48	1.82	1.26

From **table -3** may be observed that there is no significant relationship due to date of sowing on number of branches observed after 30 days of crop while after 30 days of sowing of mustard the number of branches had significant effect because of date of sowing it was also entered from the table that variety has significant effect on number of branches from 30 DAS to 120 DAS. The no significant result were observed for interaction of date of sowing and variety on number of leaves **Singh *et al.*(2020)** also conducted. The maximum no. of branches at 30, 60, 90, 120, DAS is 5.1, 15.0, 20.7, 20.4 (no.) was found in T_8 (15nov-mdrani super gold) However minimum no of branches at 30, 60, 90, 120, DAS is 3.0, 10.4, 16.1, 16 (no.) was recorded in T_1 (15oct-maharaja). (In Table-3)

Table.3 No of branches as influenced by different date of sowing and varieties

Treatments	Branches (no)			
	30 DAS	60 DAS	90 DAS	At harvest
Date of sowing				
15th Oct 2021	3.131	11.801	16.4	16.333
30th Oct 2021	4.033	13.578	18	17.944
15th Nov 2021	4.933	14.6	20.389	20.122
SEm±	0.097	0.116	0.142	0.19
CD (*p*=0.05)	0.92	0.352	0.429	0.576
Varieties				
Md rani super gold	4.11	14.05	18.61	18.45
Kala sona	4.10	13.32	18.33	18.17
Maharaja	3.87	12.60	17.84	17.76
SEm±	0.097	0.116	0.142	0.19
CD (*p*=0.05)	NS	0.352	0.429	0.576

3.2 growth attributes

From **table -4** may be observed that there is significant relationship due to date of sowing on number of siliqueit was also entered from the table that variety has significant effect on number of silique. The no significant result were observed for interaction of date of sowing and variety on number of silique. may be observed that there is significant relationship due to date of sowing on test weight it was also entered from the table that variety has significant effect on test weight. The no significant result were observed for interaction of date of sowing and variety on test weight also conducted. may be observed that there is significant relationship due to date of sowing on grain yield it was also entered from the table that variety has significant effect on grain yield The no significant result were observed for interaction of date of sowing and variety grain yield **Singh and Singh (2002)** also conducted. may be observed that there is significant relationship due to date of sowing on harvest index it was also entered from the table that variety has significant effect on harvest index. The no significant result were observed for interaction of date of sowing and variety on number of silique **(Singh *et al.*, 2001 and Panda *et al.*, 2004)** also conducted.

The maximum no. of silique (303.4) was found in T_8 (15nov-mdrani super gold)However minimum no of silique (164.5) was recorded in T_1 (15oct-maharaja).The maximum yield was recorded in T_8 (15nov.-md rani super gold) is 23.36 qtl/^{ha} and minimum yield was recorded in T_1 (15oct.-maharaha) is 15.04 qtl/^{hac} The maximum harvest index was found in T_8 (15-nov md rani super gold) is 38.38% and minimum harvest index was recorded in T_1 (15oct.-maharaja) 34.5%The maximum test weight was found in T_8 (15nov-md rani super gold is 5.4gm and Minimum test weight was recorded in T_1 (15oct-maharaja) is 3.16gm. in (Table-4)

Table.4 Yield parameters as influenced by different date of sowing and varieties

Treatments	Yield parameters			
	No of silique (no)	Grain yield(qtl/hac)	Harvest index (%)	Test weight (gm)
Date of sowing				
15th Oct 2021	165.789	15.876	37.042	3.189
30th Oct 2021	261.867	18.873	36.5	4.533
15th Nov 2021	293.245	22.79	38.299	5.133
SEm±	6.70	0.51	0.729	0.045
CD (*p*=0.05)	20.26	1.54	NS	0.135
Varieties				
Md rani super gold	246.81	19.77	38.04	4.46
Kala sona	239.62	19.32	37.27	4.31
Maharaja	234.46	18.44	36.52	4.07
SEm±	6.70	0.51	0.729	0.045
CD (*p*=0.05)	NS	1.54	NS	135

Table -5 The maximum heat units (GDD,HTU,PTU). Consumed by 15 oct.. growing crop and minimum GDD,HTU, PTU. Consumed by15 nov. growing crop and in case of varieties maximum consumed by maharaja mustard and minimum consumed by md rani super gold variety

may be observed that there is significant relationship due to date of sowing on heat unit consumption was also entered from the table that variety has significant effect on heat units consumption.

Table.4 Meteorological indices as influenced by different date of sowing and varieties

Treatment	**No. of days**	**GDD (0^c day)**	**HTU (0^c day)**	**PTU (0^C day/hr.)**
Date of sowing				
15/10/21	**146**	**1823.6**	**14132.3**	**19660.97**
30/10/21	**143**	**1812.7**	**14132**	**19039.97**
15/11/21	**132**	**1675.95**	**11342.2**	**17462.53**
Sem+_	**2.74**	**196.10**	**217.56**	**117.44**
CD(p=0.05)	**8.21**	**277.32**	**652.26**	**352.08**
Varieties				
Md rani super gold	**137**	**1740**	**10907.97**	**17859 12**
Kala sona	**138**	**1757**	**10553.64**	**16716.57**
Maharaja	**142**	**1776**	**10142.23**	**16660.17**
Sem+_	**2.74**	**196.105**	**217.56**	**117.44**
CD(p=0.05)	**8.21**	**277.32**	**652.26**	**352.08**

CONCLUSION

On the basis of findings present research work it can be concluded that November 2nd and 3rd week was most suitable time for mustard crop because that time sown crop are consume optimum heat units and change timely phenological stages. Heat units (GDD,HTU, PTU) are play most important role in plant growth and production. 3rd date of sowing (15th Nov. 2021) was found most suitable period for sowing mustard which resulted in maximum growth, and yield attributes. & in case of variety md rani super gold is most suitable variety for prayagraj region. Based on this study we can recommended farmers around prayagraj to prefer use of md rani super gold variety and sowing of mustard in the 2nd and 3rd week of November for better results and yield.

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