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Research Article

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Effect of Different Sowing Dates on Yield and Yield Attributes of Indian Mustard (*Brassica juncea* L.) Genotypes

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ABSTRACT

The experiment was conducted with 6 genotypes of Indian mustard (Brassica juncea L.) viz RH-0116, RH-725, RH-923, RH-1019, RH-1077, RH-1301 for three dates of sowing i.e 23 September, 16 October & 21 November in the field in randomized block design during rabi season of 2015-16 at Oil Seed Section, Chaudhary Charan Singh Haryana Agricultural University, Hisar to observe the effect of sowing dates on yield and yield attributes of Indian mustard genotypes. The values of yield and all yield attributes were highest on 16 October sowing while 21 November sowing dates showed lowest values of yield and yield attributing traits. Results showed that among sowing dates, 16 October sowing was the best for Indian mustard and genotypes RH-0116 performed better in terms of yield and yield attributes.

Key words: *Mustard, Rai, Protein, Yield, Genotypes*

INTRODUCTION

Rapeseed–mustard is the third most important source of edible oil next to soybean and groundnut in India, and is grown in certain tropical and subtropical regions as a cold-season crop[34]. Mustard seed in general, contains 30-33 % oil, 17-25 % proteins, 8-10 % fibers, 6-10 % moisture, and 10-12 % extractable substances[27]. Demand of edible oil has increased with increasing population and improvement in the living standard of the people, resulting thereby in short supply of edible oils which is being met with imports of edible oil worth 44,000 crores per annum. Thus, there is need to boost the oilseed production through area expansion and productivity enhancement. Indian mustard (*Brassica juncea* L. Czern) belongs to family Cruciferae, genus *Brassica* and species *juncea* popularly known as rai. Mustard is cultivated mostly under temperate climate. It is also cultivated in certain tropical and subtropical region as a cold weather crop. In India, rapeseed-mustard occupy 5.99 million ha area with production and productivity of 6.31 million tones and 1053 kg/ha respectively (India stat 2014-15). Indian mustard (*Brassica juncea* L.) is an important *rabi* crop of Haryana.

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In Haryana, rapeseed and mustard is one of the major growing crop occupying 0.56 million ha of area, with production and productivity of 0.699 million tones and 1248 kg/ha respectively (India stat 2014-15). Time of sowing is very important for mustard production[22,23,29]. Different sowing dates provide variable environmental conditions within the same location for growth &development of crop[25]. The late sowing of mustard decreased seed yield through synchronization of silique filling period with high temperatures, the decrease in assimilates production, drought stress occurrence, shortened silique filling period and acceleration of plant maturity[21] because it is a thermo sensitive as well as photosensitive crop[5].

Indian mustard is sown late due to delay in harvesting of rainy season crops like cluster bean, cotton and rice[18]. Under late sown condition, productivity declines primarily due to the shortening of vegetative and reproductive phase. Late sown Indian mustard is exposed to high temperature coupled with high evaporative demand of the atmosphere, during the reproductive phase which consequently results in forced maturity, increased senescence and low productivity[28]. Climate change has increased the intensity of heat stress and heat stress due to increased temperature is an agricultural problem in many areas in the world as well as in India[7].Heat stress affects plant growth throughout its ontogeny, though heat-threshold level varies considerably at different developmental stages. High temperature in *Brassica* enhanced plant development and caused flower abortion with appreciable loss in seed yield[3,19,30] . Kumar & Srivastava[17] reported that under late sown conditions there is reduced chlorophyll stability index, poor harvest index and consequently decreased seed yield. Appropriate sowing time is the most important non monetary input which contributes towards the greater yield in mustard crop as sowing time influences phenological development of crop plants through temperature and heat unit. Thus sowing at optimum time gives higher yields due to suitable environment that prevails at all the growth stages[34]. Optimum sowing time plays an important role to fully exploit the genetic potential of a variety as it provides optimum growth conditions such as temperature, light, humidity and rainfall[11].

MATERIAL AND METHODS

The experiment was conducted at research area of Oil Seed Section, in the Department of Genetics & Plant Breeding of Chaudhary Charan Singh Haryana Agricultural University, Hisar during *Rabi* 2015-16. The minimum temperature in this area reaches upto 0.5 ºC in December and January and the maximum temperature in the area reaches upto 48 ºC during May or June. The experimental soil having 57.93 % sand, 26.03 % silt and 16.04 % clay particles, EC = 0.20 dSm^{-1} at 25°C, pH = 8.0, Organic carbon = 0.30 %, Nitrogen = 143.4 kg ha^{-1}, Phosphorus = 17 kg ha^{-1}, Potassium = 172 kg ha^{-1}**.** The crop was planted in rows spaced 45cm with 30 cm plant to plant distance. The genotypes of mustard were RH-0116, RH-725, RH-923, RH-1019, RH-1077, RH-1301. The experimental treatments were 3 sowing dates viz. D1=23rd September, D2=16th October, D3= 21st November. The experimental design was Randomized Complete Block Design (RCBD) with three replications having plot size 1.5 m × 5.0 m. Data were collected on Number of primary and secondary branches on main stem, Number of siliquae per plant, Test weight or 1000 seed weight, Seed yield, Biological yield and Harvest index. All the collected data were statistically analyzed by the OPSTAT software at the Computer Centre, Department of Statistics, CCS HAU, Hisar.

RESULTS AND DISCUSSION

Among three dates of sowings the primary and secondary branches on stem were highest in crop sown on October 16 and lowest were found in November 21 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 more number of primary and secondary branches on stem while on 21November sowing the high temperature

was prevailing at the time of harvesting that might have resulted into less number of primary and secondary branches on stem. Similar results have also been reported earlier in the literature[16], Panda *et al*[25], Singh *et al*[35], Muhal and Solanki[36], Gawariya *et al*[8] in mustard crop. Among genotypes, more number of primary and secondary branches on stem were recorded in genotype RH-0116 and minimum were recorded in RH-1019. This is because of variation in different genotypes in their genetic makeup which is well reported in the literature[35], Gawariya *et al.*[8] in mustard crop. The number of siliqua per plant were highest in crop sown on October 16 and lowest number of siliqua per plant were found in November 21 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 more number of siliqua per plant while on 21November sowing the high temperature was prevailing at the time of harvesting that might have resulted into less number of primary and secondary branches on stem that might have resulted into less number of siliqua per plant. Similar results due to different sowing dates have also been reported earlier in the literature[24], Khan *et al.*[14], Akber *et al.*[2], Jeromela *et al.*[12], Muhal and Solanki[36], Alam *et al.*[3], Gawariya *et al.*[8] in mustard crop. Among genotypes, more number of siliqua per plant were recorded in genotype RH-0116 and minimum were recorded in RH-1019. This is because of variation in different genotypes in their genetic makeup which is well reported in the literature[36], Gawariya *et al*[8] in mustard crop. Among three dates of sowings the test weight, biological yield, seed yield and harvest index were highest in crop sown on October 16 and lowest were found in crop sown on 21 November. 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, secondary branches and siliqua per plant that might have resulting into increased test weight, biological yield, seed yield and harvest index while on 21 November sowing the high temperature was prevailing at the time of harvesting that might have resulted into less number of primary, secondary branches and siliqua per plant that might have resulting into decreased test weight, biological yield, seed yield and harvest index. Similar results due to different sowing dates have also been reported earlier in the literature[5], Kaur *et al.*[13], Ram *et al.*[31], Sharma *et al.*[33] Amrawat *et al.*[4], Azharudheen *et al.*[6], Sudhir *et al*.[37], Abdul *et al.*[1], Muhal and Solanki[36], Ram *et al.*[30], Alam *et al.*[3], Solanki and Mundra[36], Gawariya *et al.*[8], Khayat *et al.*[15], Ram *et al.*[32] in mustard crop. Among genotypes, highest test weight, biological yield, seed yield and harvest index were recorded in genotype RH-0116 and lowest were recorded in RH-1019. This is because of variation in different genotypes in their genetic makeup which is well reported in the literature[31], Sudhir *et al.*[37], Muhal and Solanki[36], Gawariya *et al.*[8] in mustard crop.

Table 1: Effect of sowing dates on yield and yield attributes of Indian mustard genotype

Treatments	No. of primary branches	No.of secondary branches	No. of siliqua/ plant	Test weight (g)	Seed yield (kg/ha)	Biological yield (kg/ha)	Harvest index (%)
Sowing dates							
23 September	4.8	14.5	633.8	4.65	1249.17	3651.05	34.1
16 October	5.1	15.9	697.3	4.77	2009.24	5243.76	38.2
21 November	3.2	10.7	329.5	4.18	929.16	2765.18	33.3
CD at 5 %	0.4	0.6	10.3	0.02	69.01	207.25	0.4
Genotypes							
RH-0116	5.1	15.2	596.8	5.24	1553.06	4163.94	37.2
RH-725	4.7	14.6	587.2	5.22	1508.63	4089.86	36.8
RH-923	4.1	13.2	535.8	4.29	1353.03	3826.30	34.6
RH-1019	4.0	12.7	524.8	3.98	1266.54	3667.01	34.1
RH-1077	4.1	13.2	537.7	4.23	1354.36	3778.61	34.8
RH-1301	4.3	13.2	538.8	4.24	1339.54	3794.27	34.9

CONCLUSION

From the results it may be concluded that under agroclimatic condition of Hisar maximum yield and yield attributes of *Brassica juncea* cultivars can be obtained if these cultivars were sown on October 16. The genotype RH-0116 proved to be best among all studied genotypes in terms of yield and yield attributes.

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