Effect of Sowing Dates on Growth and Yield of Toria under Rainfed Condition

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ABSTRACT: A study was conducted in *rabi*, 2020-21 on effect of sowing dates on growth and yield of rapeseed under rainfed condition. The treatments consisted of 3 dates of sowing viz., 30th October, 15th November and 1st December. The results revealed that sowing the crop on different dates had significant effect on most of the growth and yield attributes. There was significant increase in plant height, dry matter accumulation, number of leaves, leaf area, leaf area index (LAI), crop growth rate (CGR), relative growth rate (RGR) from 30 days after sowing (DAS) to harvest. However, there was no significant effect on RGR at 60 DAS-harvest. Dates of sowing did not show any significant effect on test weight. Among the different sowing dates, the crop sown on 15th November recorded highest seed yield and harvest index (8.93 q/ha and 44.30% respectively) which was significantly higher than the crop sown on 1st December.

Keywords: Rapeseed, sowing dates, growth, seed yield

Introduction

Rapeseed is one of the most important oilseed crops and provides more than 13% of the world's supply of vegetable oil. This group of crops is grown in more than 70 countries over an area of 36.12 m ha with production of 72.51 million metric tonnes of seed and productivity of 2.01 t /ha (Anonymous, 2021). It is a major *rabi* oilseed crop of India and covers an area of 8.20 million ha with a production of 8.50 million metric tonnes and productivity of 1.04 t/ha (Anonymous, 2021). India imports edible oil to bridge the gap between domestic availability and actual need of oil. To reduce the import of edible oil and increase self-sufficiency, there is a need to increase the productivity of oilseed crops. In Assam, due to climatic suitability, toria is a predominant oilseed crop. However, the productivity of toria is much lower than the national average, which may be due to various factors, viz., moisture stress, untimely sowing, poor crop management, etc. Optimum sowing time is a non-monetary practice to enhance productivity. It is a factor which plays a very important role in exploiting the full genetic potential of the crop. Formation of oil in rapeseed is influenced by a number of factors like soil moisture, time of sowing, temperature, etc. Therefore, optimum time of sowing is essential to synchronize the optimum environmental conditions with different phases of crop growth which is very essential for higher growth and yield.

Materials and Methods

The experiment was conducted at Biswanath College of Agriculture, Biswanath Chariali, Assam. The soil of the experimental area was acidic (pH 4.64), sandy loam in texture, medium in organic carbon (0.64%), low in available nitrogen (232.06 kg/ha), P_2O_5 (21.65 kg/ha) and K_2O (113.20 kg/ha), having bulk density of 1.42 (Mg m^{-3}). The experiment consisted of 3 sowing dates viz., 30th October (D1), 15th November (D2) and 1st December (D3). The experiment was laid out in randomized block design with 3 replications. The variety used in the study was TS-38, which is an improved variety of toria. Fertilizers and FYM were applied as per recommended package of practices for Assam @ 40:35:15 kg/ha of N, P_2O_5 and K_2O. The cultural operations were carried out as per state's recommended package of practices.

Results and Discussion

Effect of sowing dates on growth and yield attributes

The findings from the experiment revealed that differences in dates of sowing resulted in significant changes in the growth and yield attributes viz., emergence percentage, plant height, number of leaves per plant, leaf area per plant, number of primary branches per plant, total leaf chlorophyll content, seedling vigour index, days to 50% flowering, LAI, total plant dry weight, CGR, RGR, plant population, number of siliquae per plant, and number of seeds per siliqua. However, it did not show any significant effect on RGR at 60 DAS-harvest and test weight. (**Tables 1, 2, 3** and **4**). Crop performance parameters were better with D_2, which might be due to the higher rainfall received after sowing of the crop resulting in higher soil moisture. Such suitability provided the crop with optimum condition for growth and development. Further, early emergence of seedlings helped the crop to escape diseases and insect pests. Kumar *et al.* (2018) found that dry matter accumulation increased under 17th November sowing of Indian mustard, which might be due to optimum soil moisture condition and relatively suitable temperature during vegetative phase which help in sufficient photosynthesis to accumulate higher drymatter in crops. Ranabhat *et al.* (2021) reported that date of sowing had highly significant effect on plant growth and yield attributes such as plant height, branches per plant and siliquae per plant. They also concluded that rapeseed sown on 14th November showed optimum performance.

Table 1: Effect of sowing dates on emergence percentage, plant height, number of leaves per plant, leaf area per plant and number of primary branches per plant

Sowing dates (D)	Emergence percentage (%)	Plant height (cm)			Number of leaves per plant		Leaf area per plant (cm^2)		Number of primary branches per plant
		30 DAS	60 DAS	Harvest	30 DAS	60 DAS	30 DAS	60 DAS	
D_1: 30th Oct	62.30	35.42	75.94	96.31	5.01	10.75	38.38	104.45	3.69
D_2:15th Nov	67.34	59.49	80.68	100.32	9.66	11.65	83.94	113.27	3.75
D_3: 1st Dec	62.04	27.41	68.51	87.36	4.63	8.96	39.11	86.37	3.47
S Ed (±)	2.28	1.24	2.99	3.17	0.24	0.31	1.60	3.05	0.10
CD (P=0.05)	4.67	2.54	6.12	6.49	0.49	0.63	3.29	6.24	0.22

Table 2: Effect of sowing dates on total leaf chlorophyll content, seedling vigour index, days to 50% flowering, LAI and total dry weight

Sowing date (D)	Total leaf chlorophyll content (mg $plant^{-1}$)	Seedling vigour index	Days to 50% flowering	Leaf Area Index (LAI)		Total dry weight (g $plant^{-1}$)		
				30 DAS	60 DAS	30 DAS	60 DAS	Harvest
D_1: 30th Oct	1.29	546.86	50.93	0.12	0.51	0.74	3.24	4.61
D_2:15th Nov	1.30	566.44	50.40	0.26	0.54	1.10	3.25	5.07
D_3: 1st Dec	1.20	525.77	54.12	0.11	0.44	0.55	2.87	4.41
S Ed (±)	0.03	5.22	1.36	0.005	0.009	0.05	0.10	0.13
CD (P=0.05)	0.07	10.70	2.79	0.01	0.01	0.11	0.21	0.28

Table 3: Effect of sowing dates on CGR and RGR

Sowing date (D)	Crop growth rate (CGR) (g m^{-2} day^{-1})		Relative growth rate (RGR) (g g^{-1} day^{-1})	
	30 DAS - 60 DAS	60 DAS-Harvest	30 DAS - 60 DAS	60 DAS - Harvest
D_1: 30th Oct	1.73	2.15	0.040	0.010
D_2:15th Nov	2.20	2.49	0.050	0.010
D_3: 1st Dec	1.71	2.09	0.030	0.010
S Ed (±)	0.12	0.14	0.002	0.0008
CD (P=0.05)	0.24	0.30	0.006	NS

Table 4: Effect of sowing dates on plant population, number of siliquae per plant, number of seeds per siliqua and test weight

Sowing date (D)	Plant population (m^{-2})	Number of siliquae per plant	Number of seeds per siliqua	Test weight (g)
D1: 30th Oct	144.47	44.39	16.58	2.15
D2: 15th Nov	146.13	65.40	17.89	2.94
D3: 1st Dec	107.20	43.00	15.85	2.12
S Ed (±)	7.17	1.64	0.52	0.14
CD (P=0.05)	14.69	3.37	1.08	NS

Effect of sowing dates on yield

Significant variations on seed yield were recorded due to differences in dates of sowing. Rapeseed planted on 15th November (D_2) gave higher seed yield (8.93 q/ha), stover yield (11.15 q/ha) and HI (44.30) as compared to other sowing dates, i.e., 30th October (D_1) and 1st December (D_3). Sowing time is one of the most important factors in increasing productivity. Appropriate date would help in escaping yield reducing factors such as frost, pest attack and insufficient reproductive phase. Time of planting of rapeseed adversely affects the yield and yield components due to its effect on growth, because the different growth stages of rapeseed require enough time for their development. The reason for highest values in D_2 might be due to the longer reproductive phase, conducive climatic conditions, and better translocation of photosynthates from source to sink than other dates of sowing. Also, the seed yield of rapeseed mainly depends on the yield attributing characters, viz., number of siliquae per plant, number of seeds per siliqua, number of branches per plant, which were higher in crop sown on 15th November (D_2).

Table 5: Effect of sowing dates on seed yield per plant, seed yield, stover yield and harvest index

Sowing date (D)	Seed yield per plant (g plant^{-1})	Seed yield (q ha^{-1})	Stover yield (q ha^{-1})	Harvest Index (%)
D1: 30th Oct	1.58	8.38	10.55	43.60
D2: 15th Nov	2.07	8.93	11.15	44.30
D3: 1st Dec	1.47	8.08	10.36	40.92
S Ed (±)	0.13	0.31	0.30	0.98
CD (P=0.05)	0.27	0.64	0.62	2.01

Ranabhat *et al.* (2021) found that rapeseed sown on 14th November gave significantly higher seed yield and biological yield. Bhusan *et al.* (2021) reported that yield parameters were significantly influenced by date of sowing. They also reported that crop sown on 10th November recorded significantly higher seed yield over 15th October and 5th December sowings. However, 1000-seed weight was not influenced significantly by date of sowing.

Conclusion

From this study, it can be inferred that sowing of rapeseed on 15th November resulted in better performance of crop in growth and yield attributing characters. It can also be concluded that sowing on 15th November resulted in higher yield over other sowing dates.

References

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