

EFFECT OF SOWING DATE AND IRRIGATION ON THE PERFORMANCE OF MUSTARD (*Brassica spp.* L.)

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ABSTRACT

To observe the growth and yield attributes of mustard under different sowing date and irrigation frequency, a field experiment was conducted with mustard (*Brassica sp.*) var. "BARI Sarisha-14". The experiment was carried out at the research field of the Department of Crop Science and Technology, Rajshahi University, Rajshahi during the period from October, 2023 to March, 2024. The experiment consisted of three sowing date i.e. 31st October, 10th November and 20th November as well as three irrigation frequency viz. no irrigation, 2 times irrigation and 3 times irrigation. The results revealed that different treatments significantly affected the growth and yield attributes of BARI Sarisha-14. The combination of 20th November sowing date (S₃) and three times irrigation (I₂) produced the maximum plant height, no. leaves per plant, no. of branches per plant, minimum days required to 50% flowering and maturity, pod length, no. of pods per plant, no. of seeds per plant, 1000 seeds weight and seed yield. On the other hand, all the studied parameters except days to 50% flowering and maturity found to be lowest in 31st October sowing (S₁) date along with no irrigation (I₀). Hence, the study concluded that 20th November sowing date (S₃) and three times irrigation (I₂) can be used for getting the targeted yield as well as desired return from BARI Sarishal-14 cultivation in "High Ganges River Floodplain zones" of Bangladesh.

Key words: Sowing date, irrigation, growth and yield, mustard.

Introduction

Sowing time is very important in deciding the environmental conditions of crop, timing and rate of organ appearance while in crop growth analysis predicting of phenology is of prime importance. Since the temperature and solar radiation play a significant role in partitioning of biomass between various organs of plant which is related to and often governed by phonological phase of the plant and the way in which a crop develops can affect the yield and this therefore an aspect with which agronomists are much concerned. In Bangladesh context, mustard is popular edible oil in rural area and is considered important for improving the taste of a number of food items. It is mainly grown during the winter season (October-March). It covers about 80% of the total oilseed acreage and about 71% of the total production in Bangladesh (BBS, 2009). Last ten years have witnessed gradual decline in an area of 104 thousand hectare and production 68 thousand tons of mustard and rapeseed (Anonymous, 2006). Though the production of edible oil is being decreased, whereas, the demand is increasing day by day for increased population. Cultivation of low yielder local varieties, proper sowing date and proper water management are the major causes for poor yield of mustard in the country (Alam and Rahman, 2006). So, there is a great scope of increasing yield of mustard by selecting high yielding varieties and improving management practices. The growth yield attributes and yield of mustard increased significantly with the increase in number irrigation. Adequate supply of moisture in soil helps in proper utilization of plant nutrients, ensuring proper growth and yield of mustard. The frequency of irrigation and the amount of water required depend on cultivar, soil type, season, amount of rainfall and diseases; therefore, it is difficult to give definite recommendation. Over irrigation, as well as under irrigation may lower yields. Indeed, irrigation had significant effect on all the yield and yield contributing characters. A very few research have so far been done with combined application of sowing date and irrigation in mustard. Therefore, the present study is undertaken to assess the effect of sowing date and irrigation frequency on the growth and yield of mustard.

Materials and Methods

The experiment was carried out at the research field of Department of Crop Science and Technology, University of Rajshahi, Rajshahi, during the period from October, 2023 to March, 2024 with mustard (*Brassica sp.*) var. "BARI Sarisha-14". The study area is located at 24. 370⁰ N and 88.637⁰ E latitude and 200 cm from the sea level and was belonging to the Agro Ecological Zone (AEZ-11) "High Ganges River Floodplain". The soil was sandy loam in texture with pH 5.47. The experimental area is under the sub-tropical climate that is characterized by less rainfall associated with moderately low temperature during rabi season, (October-March) and high temperature, high humidity and heavy rainfall with occasional gusty winds during kharif season (April-September). The two factors Randomized Complete Block Design (RCBD) with three replications was followed to carry out the study. The study consisted of three sowing date (factor A) i.e. S₁=31st October, S₂=10th November and S₃=20th November as well as three irrigation frequency viz. I₀=no irrigation, I₁=2 times irrigation (at 20 and 50 DAS) and I₂=3 times irrigation (at 20, 40 and 50 DAS). The unit plot size was 3m X 2m. The seed of BARI Sarishal-14 was collected from the Bangladesh Agricultural Research Institute (BARI), Joydebpur, Gazipur Plant to plant distance was continuous and 2-3 cm depth furrow and row to row distance was 30cm. Fertilizers were applied following the guidelines of Rashid (1993). Intercultural operations were done as and when necessary. Data were recorded for desired parameters from the sample plants at 60 days after sowing (DAS) and at harvest. Ten (10) plants were randomly selected from each unit plot for the collection of data. The collected data were analyzed using computer package MSTAT and mean differences were adjudged by using Duncan's Multiple Range Test following Gomez and Gomez (1984).

Results and Discussion

Plant height

Significant variation of plant height was found due to combined effect of sowing time and irrigation (Table 1). The results revealed that at 60 DAS, the tallest plant (101.00 cm) was obtained from treatment S₃I₂ (20th November sowing date three times irrigation) significantly different from all other treatments whereas the shortest plant (73.00 cm) was obtained from treatment S₁I₀ (31th October sowing date with no irrigation) which was significantly different from all other treatments except S₂I₀. It might be due to the soil moisture availability for the plant was which sufficient before third time irrigation at 50 DAS. Similar result was reported by Latif, 2006 and Kibbria, 2013.

No. of leaves per plant and no. of branches per plant

The effect of sowing date interacts better with irrigation when sufficient moisture was supplied. Table 1 shows that treatment S₃I₂ produced the highest no. of leaves per plant (17.10) and no. of branches per plant (10.30) which were statistically identical with treatments S₂I₁, S₂I₀ and S₁I₂. The lowest no. of leaves per plant (13.30) was found in S₁I₀ which was statistically similar with S₁I₁ and the lowest no. of branches per plant (6.80) was also in S₁I₀ which was statistically identical with S₁I₂. This result is in conformity with the findings of Singh *et al.* (1993). They reported that two levels of irrigation resulted highest number of branches per plant.

Days to 50% flowering and maturity

Effect due to sowing date and irrigation on days required for 50% flowering and maturity were found significant (Table 1). The treatment combination S₁I₀ required maximum number of days for 50% flowering and maturity (43.00 and 84.00) which were statistically similar with S₁I₁, S₂I₀ and S₂I₁ whereas S₃I₂ required the minimum days (36.00 and 77.00) which were statistically different from all other treatments. Less number of days taken to 50% flowering and maturity with late sowing date and higher frequencies of irrigation might be due to early vegetative growth and hastening the initiation of reproduction phase. These results were in conformity with the findings of Jilani *et al.* (2009).

Table 1. Effects of sowing date and irrigation on vegetative growth of mustard

Treatments	Plant height (cm)	No. of leaves per plant	No. of branches per plant	Days to 50% flowering	Days to maturity
S ₁ I ₀	73.00 e	13.30 d	6.80 d	43.00 a	84.00 a
S ₁ I ₁	83.30 c	13.50 d	8.70 bc	42.00 ab	82.00 b
S ₁ I ₂	87.60 b	16.00 ab	7.50 d	37.00 bc	78.00 c
S ₂ I ₀	73.00 e	16.00 ab	9.50 a-c	42.50 d	83.00 ab
S ₂ I ₁	84.00 c	15.60 a-c	9.00 a-c	42.00bc	83.00 ab
S ₂ I ₂	87.60 b	15.00 b-d	8.70 bc	39.00 b	79.00 c
S ₃ I ₀	80.60 d	15.00 b-d	9.90 bc	40.00 d	82.00 b
S ₃ I ₁	86.00 b	16.90 cd	10.20 c	38.00 c	82.00 b
S ₃ I ₂	101.00 a	17.10 a	10.30 a	36.00 e	77.00 d
Level of significance	**	*	*	*	*
CV (%)	4.19	6.48	9.91	2.50	3.23

Table 2. Effects of sowing date and irrigation on yield attributes and yield of mustard

Treatments	Pod length (cm)	No. of pods/plant	No. of seeds/ pod	1000 seeds wt. (g)	Seed yield (t/ha)
S ₁ I ₀	4.50	60.00 f	15.00 c	2.50 d	0.91 e
S ₁ I ₁	5.00	80.00 d	30.00 b	2.85 b-d	0.95 e
S ₁ I ₂	5.30	87.00 a	31.60 a	3.10 ab	1.30 bc
S ₂ I ₀	4.60	75.00 e	20.00 b	2.60 cd	0.98 de
S ₂ I ₁	5.10	83.30 a	30.08 b	2.90 bc	1.10 c-e
S ₂ I ₂	5.50	86.00 b	32.30 a	3.00 bc	1.40 ab
S ₃ I ₀	4.80	78.00 d	21.00 b	2.80 bc	1.00 de
S ₃ I ₁	5.21	85.00 c	30.30 b	2.95 bc	1.25 b
S ₃ I ₂	5.64	88.33 a	34.00 a	3.40 a	1.5 a
Level of significance	NS	**	*	7.56	**
CV (%)	9.78	7.83	24.49	0.38	4.20

Means followed by the same letter(s) do not statistically differ at 5% level tested by DMRT.

Yield attributes and yield

All the recorded parameters regarding yield attributes and yield of mustard showed significant variations due to combined effect of sowing date and irrigation frequency (Table 2). The longest pod (5.64 cm) was found in treatment S₃I₂ whereas the shortest one (4.50 cm) was observed in S₁I₀ which were statistically non significant. No. of pods per plant and no. of seeds per pod were found highest (88.33 and 34.00) in treatment S₃I₂ which were statistically identical with S₁I₂ and S₂I₂ whereas the lowest (60.00 and 15.00) were observed in S₁I₀ which were statistically different from all other treatments. Results showed that the number of pods per plant increased with the increasing irrigation frequency. These results are in also conformity with Parsad and Ehsanullah (1988). Sowing date and Irrigation had significant influence on 1000 seeds weight. Results showed that the highest 1000 seed weight (3.40 g) was produced by S₃I₂ which was statistically similar with S₁I₂ whereas the lowest 1000 seeds weight (2.50 g) was found in S₁I₀ which was statistically identical with S₁I₁ and S₂I₀. This result is in agreement with Sharma and Kumar (1989). Similar results were also obtained by Gupta (1988).

Seed yield is the ultimate goal of mustard cultivation. Sowing date with irrigation had significant influence on the seed yield of mustard. The highest seed yield (1.50 t/ ha) was observed in S₃I₂ which was statistically identical with S₂I₂ and lowest one (0.91 t/ha) was obtained from S₁I₀ which was statistically identical with S₁I₁, S₂I₀, S₂I₁ and S₃I₀. The reason of the highest seed yield might be due to the highest value at all the yield contributing characters such as plant height, number of pods per plant, number of seeds per pod and 1000 seeds weight. Giri *et al.* (2003) found that different irrigation practices significantly increased the mustard yield over the control. Similar results were obtained by Khan and Muendel (2005).

Conclusion

The study concluded that mustard variety BARI Sarisha-14 cultivated on 20th November with three times irrigation may be recommended for getting the targeted yield as well as desired return in “High Ganges River Floodplain zones” of Bangladesh.

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