

## GROWTH AND YIELD ATTRIBUTES OF MUSTARD (*Brassica sp.*) UNDER INFLUENCE OF SOWING DATA AND FERTILIZER

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### ABSTRACT

To observe the growth and yield attributes of mustard under different sowing dates and fertilizer levels, a field experiment was carried out at the research field of the Department of Crop Science and Technology, Rajshahi University, Rajshahi during the period from October, 2018 to February, 2019 with mustard (*Brassica sp.*) var. "BARI Sarishal-14". The study consisted three different sowing dates i.e. 31<sup>st</sup> October, 10<sup>th</sup> November and 20<sup>th</sup> November as well as three levels of fertilizers viz. 80-20-30 kg/ha NPK (Farmers practice), 90-30-40-25-1.0 kg/ha NPKSB (MYG) and 100-40-50-35-1.5 kg/ha NPKSB (HYG). Different treatments showed significant effects on growth and yield attributes of mustard. The results revealed that the combination of sowing on 10<sup>th</sup> November and highest level of fertilizer (HYG) produced the highest plant height, no. leaves/ plant, no. of branches/plant, siliqua length, no. of siliqua/plant, no. of seeds/siliqua, 1000 seed weight, seed yield and minimum days to maturity. On the other hand the studied growth and yield attributes of mustard except days to maturity found to be the lowest due to sowing date of 20<sup>th</sup> November along with fertilizer as farmers practice. The study concluded that mustard seeds need to be sowed on 10<sup>th</sup> November and 100-40-50-35-1.5 kg/ha NPKSB is to be applied for getting the targeted yield as well as desired return from mustard cultivation in "High Ganges River Floodplain zones" of Bangladesh.

**Key words:** Sowing date, fertilizer, growth, yield, mustard.

### Introduction

Mustard (*Brassica sp.*) belongs to the family *Brassicaceae* (formally *Cruciferae*) is one of the most important oil crops originated in southern Europe from where it was introduced to Asia and Africa (Downey and Robblene, 1989). Among the mustard producing countries, Canada occupies the first position followed by Nepal, Ukraine and Burma (FAO, 2010). It is a cool, thermo sensitive as well as photosensitive crop (Ghosh and Chatterjee, 1988). Bangladesh is principally an agricultural country and produces a good number of oilseed crops like mustard, sesame, groundnut, linseed, safflower, sunflower, soybean, castor etc. The first three of these are considered as the major oil seed crops. Mustard and rapeseed are quietly significant in Bangladesh economy. It is an important and the top ranking oil seed crop in Bangladesh. The seed contains 40-45% oil and 20-25% protein. It also serves as an important raw material for industrial use such as in soap, paints, varnishes, hair oils, lubricants, textile auxiliaries, pharmaceuticals, etc. Its oil not only plays a great role as fat substitute in our daily diet but also nourish the economy of the nation. It is widely used as a cooking ingredient, condiment and for its medicinal value. Moreover, mustard oil cake is utilized as cattle feed and small quantities are also used as manure. It covers about 80% of the total oilseed acreage and about 71% of the total production (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 with the increasing population. Cultivation of low yielder local varieties, late sowing and proper fertilizer management are the major causes for poor yield of mustard in the country (Alam and Rahman, 2006). There is a great scope of increasing yield of mustard by selecting high yielding varieties and improving management practices. Time of sowing is very important for mustard production (Rahman *et al.*, 1988 and Mondal *et al.*, 1999). Sowing at proper time allows sufficient growth and development of a crop to obtain a satisfactory yield. The seed yield and maturity of mustard plants are greatly influenced by environmental conditions regardless of proper sowing of times. Different sowing dates provide variable

environmental conditions within the same location for growth and development of crop and yield stability (Pandey *et al.*, 1981). Determining suitable sowing date plays an important role in conformation of plant growth stages with desirable environmental conditions which results in maximum yield. Poor fertilizer management also an important causes for having reduced yield of mustard. Usually, mustard is cultivated in marginal land with low fertility. By supplying proper amount of fertilizer, total production of mustard can be increased. It is reported that application of mixed fertilizers (NPKS) would help to increase seed yield in mustard (Jagvir *et al.*, 2004). The plant density can be adjudged by the use of different doses of fertilizers. A very few research have so far been done with combined application of sowing date and fertilizer doses in mustard. Therefore, the present study is undertaken to assess the effect of sowing date and fertilizer level on the performance of recently released mustard cultivar BARI Sarisha-14.

## Materials and Methods

The experiment was conducted at the research field of Department of Crop Science and Technology, Rajshahi University, Rajshahi during the period from October, 2018 to February, 2019 with mustard (*Brassica sp.*) var. "BARI Sarishal-14". The site is 24. 370° N and 88.637° E latitude and 200 cm from the sea level and was belonging to the Agro Ecological Zone (AEZ-11) "High Ganges River Floodplain". The Randomized Complete Block Design (RCBD) was followed with three replications to be carried out the study. The study consisted three different sowing dates i.e. 31<sup>st</sup> October (S<sub>1</sub>), 10<sup>th</sup> November (S<sub>2</sub>) and 20<sup>th</sup> November (S<sub>3</sub>) as well as three levels of fertilizers viz. F<sub>1</sub>:80-20-30 kg/ha NPK (Farmers practice), F<sub>2</sub>:90-30-40-25-1.0 kg/ha NPKSB (MYG) and F<sub>3</sub>:100-40-50-35-1.5 kg/ha NPKSB (HYG). The unit plot size was 3m X 2m. 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 50 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

### *Effect of sowing date*

Observations on growth and yield attributes of mustard revealed that the sowing date differed significantly in respect of plant height, no. of leaves/plant, no. of branches/plant, days to maturity, siliqua length, no. of siliqua/plant, no. of seeds/siliqua, 1000 seed weight and seed yield (Table 1). Except days to maturity and siliqua length, the highest values of all the above parameters (98.53cm, 26.07, 9.50, 93.18, 23.78, 2.53g and 1.49 t/ha) were found from sowing date of 10<sup>th</sup> November whereas the lowest values (81.32cm, 18.51, 9.13, 84.78, 16.53, 2.89g and 0.98t/h) of those parameters were observed from 20<sup>th</sup> November. The above findings were agreed by Mondal and Islam (1993), where they revealed that sowing in the 1<sup>st</sup> week of November gave the highest yield attributes and yield of mustard than in last week of October and November, respectively. Shahidullah *et al.* (1997) also reported similar findings.

### *Effect of fertilizer*

Plant characters and seed yield varied significantly in response to different levels of fertilizer (Table I). The High Yield Goal (HYG) level showed superiority in respect of plant height (92.63cm), no. of leaves/plant (21.96), no. of branches/plant (9.42), days to maturity (79.89), no. of siliqua/plant (89.67), 1000 seed weight (3.29g) and seed yield (1.30t/ha). The lowest values of all the above parameters (82.77cm, 20.74, 9.20, 78.78, 79.89, 3.04g and 3.04t/ha) were recorded from the treatment of farmers practice. The study also explored that the effect was found non-significant in case of Siliqua length and no. of seeds/siliqua. Mondal *et al.* (1996) reported that high fertilizer level of 150-90-100-30-4-1 kg/ha of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, S, Zn and B, respectively ensured the highest seed yield of mustard (1.40 t/ha). Ahmed *et al.* (1999) also recorded the higher yield contributing characters and yields by high fertilizer management in mustard

Table 1. Main effect of sowing date and fertilizer on the growth and yield attributes of mustard

Treatments	Plant height (cm)	No. of leaves/plant	No. of branches/plant	Days to maturity	Siliqua length (cm)	No. of siliqua/plant	No. of seeds/siliqua	1000 seed wt. (g)	Seed yield (t/ha)
<b>Sowing date</b>									
S <sub>1</sub>	85.96b	19.20b	9.32b	80.56a	5.24a	86.00b	19.78b	3.00b	1.20b
S <sub>2</sub>	98.53a	26.07a	9.50a	77.56b	5.08c	93.18a	23.78a	2.53a	1.49a
S <sub>3</sub>	81.32c	18.51c	9.13b	80.44a	5.14b	84.78b	16.53c	2.89c	0.98c
CV (%)	8.89	3.87	6.77	1.99	3.03	5.02	11.10	4.84	3.71
LSD (5%)	2.56	0.27	0.21	0.52	0.05	1.44	0.72	0.08	0.02
<b>Fertilizer</b>									
F <sub>1</sub>	82.77b	20.74c	9.20b	78.78b	5.16a	86.56b	20.11a	3.04b	1.15c
F <sub>2</sub>	90.41a	21.08b	9.40a	79.88a	5.15a	87.74b	19.78a	3.09b	1.23b
F <sub>3</sub>	92.63a	21.96a	9.42a	79.89a	5.17a	89.67a	20.20a	3.29a	1.30a
CV (%)	8.89	3.87	6.77	1.99	3.03	5.02	11.10	4.84	3.71
LSD (5%)	2.49	0.26	0.20	0.50	0.49	1.40	0.70	0.07	0.02

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

**Combined effect of sowing date and fertilizer**

All the recorded parameters significant variations due to combined effect of sowing date and fertilizer level (Table 2). Higher plant height (105.40cm); maximum no. of leaves/plant (26.70) and no. of branches/plant (9.73); longest siliqua (5.40 cm); highest no. of siliqua/plant (95.00) and no. of seeds/siliqua (25.00); higher 1000 seed weight (3.80g) and seed yield (1.53 t/ha) of mustard were obtained from 10<sup>th</sup> November sowing date (S<sub>2</sub>) with higher level of fertilizer (F<sub>3</sub>- HYG) which were significantly different from all other treatments. Only in case of no. of branches/plant it was statistically similar with treatments S<sub>1</sub>F<sub>1</sub> and S<sub>2</sub>F<sub>2</sub>. On the other hand, mustard seed sowing on 20<sup>th</sup> November (S<sub>3</sub>) and lower fertilizer level (F<sub>1</sub>-farmers practice) produced the lower plant height (75.43cm); minimum no. of leaves/plant (17.71) and no. of branches/plant (8.93); shortest siliqua (5.03 cm); lowest No. of siliqua/plant (82.00) and no. of seeds/siliqua (16.00); lower 1000 seed weight (2.80g) and seed yield (0.93t/ha) which were also statistically different from all other treatments. In case of no. of branches/plant, it was statistically identical with treatments S<sub>1</sub>F<sub>2</sub> and S<sub>3</sub>F<sub>2</sub> where as S<sub>1</sub>F<sub>1</sub> and S<sub>1</sub>F<sub>3</sub> for siliqua length.

Table 2. Combined effect of sowing date and fertilizer on the growth and yield attributes of mustard

Treatments	Plant height (cm)	No. of leaves/plant	No. of branches/plant	Days to maturity	Siliqua length (cm)	No. of siliqua/plant	No. of seeds/siliqua	1000 seed wt. (g)	Seed yield (t/ha)
S <sub>1</sub> X F <sub>1</sub>	81.67f	18.02f	9.66a	80.00c	5.07d	86.00cd	20.00c	2.90e	1.01f
S <sub>1</sub> X F <sub>2</sub>	88.11d	18.83e	9.02e	81.00b	5.13c	85.00d	20.33c	2.93e	1.27e
S <sub>1</sub> X F <sub>3</sub>	88.11d	19.00e	9.22cd	80.00c	5.20b	87.00c	19.00d	2.97e	1.33d
S <sub>2</sub> X F <sub>1</sub>	91.22c	25.50b	9.43b	78.67d	5.05d	91.67b	23.3b	3.30c	1.49b
S <sub>2</sub> X F <sub>2</sub>	99.00b	25.00b	9.64a	78.00e	5.16bc	92.89b	23.00b	3.50b	1.47c
S <sub>2</sub> X F <sub>3</sub>	105.40a	26.70a	9.73a	76.00f	5.40a	95.00a	25.00a	3.80a	1.53a
S <sub>3</sub> X F <sub>1</sub>	75.43g	17.71g	8.93e	81.67a	5.03d	82.00e	16.00f	2.80f	0.93h
S <sub>3</sub> X F <sub>2</sub>	84.11e	19.40d	9.08de	80.00c	5.16bc	85.33d	17.00e	2.97e	0.97g
S <sub>3</sub> X F <sub>3</sub>	84.40e	20.8c	9.37bc	80.33c	5.18b	87.00c	16.80e	3.10d	1.03f
CV (%)	8.89	3.87	6.77	1.99	3.03	5.02	11.10	4.84	3.71
LSD (5%)	2.42	0.25	0.19	0.49	0.48	1.36	0.68	0.07	0.02

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

The results obtained in the present study were supported by various authors. Rahman (2003) conducted an experiment on mustard with nitrogen and recorded the highest plant height with the plants treated with 100 kg N/ha (79.3 cm), which was about 29.36% longer than that of the control (61.3 cm).

Mondal *et al.* (1999) stated that the 7<sup>th</sup> November planting date produced the highest number of siliqua plant<sup>-1</sup> and reduced in the late sowings. Kalra *et al.* (1985) and Bukhtiar *et al.* (1992) stated that delaying in planting dates reduced the seed yield plot<sup>-1</sup>. The seed yield of mustard under this present study was fully supported by Buttar and Aulakh (1999) and Mamun (2005).

### Conclusion

The study concluded that mustard seeds need to be sowed on 10<sup>th</sup> November and 100-40-50-35-1.5 kg/ha NPKSB is to be provided for getting the targeted yield as well as desired return from mustard cultivation in “High Ganges River Floodplain zones” of Bangladesh.

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