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Short Communication

Yield attributes and oil content of different mustard (*Brassica campestris* l.) varieties effected by different levels of fertilizers

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Abstract: An experiment was conducted at the Agronomy Field Laboratory and Department of Biochemistry and Molecular Biology, Bangladesh Agricultural University, Mymensingh during the period from November 2013 to February 2014 to find out the appropriate fertilizer dose and best variety on the yield and oil content of mustard (*Brassica* spp). The experiment consisted of four fertilizer treatments viz., 0 fertilizer dose (control), 50% of recommended fertilizer dose, 100% recommended fertilizer dose and 150% of recommended fertilizer dose and three varieties viz. BINA Sarisha-5, BINA Sarisha-8 and Tori-7. The experiment was laid out in a two factor randomized complete block design with three replications. Both fertilizer dose and variety had significant effect on plant height (cm), number of branches plant^{-1}, number of siliqua plant^{-1}, siliqua length (cm), number of seeds siliqua^{-1}, 1000 seed weight (g) and oil content (%). The interaction of fertilizer dose and variety had significant effect on all the plant characters except oil content of mustard (*Brassica* spp). The best result of the above characters was recorded in 100% recommended fertilizer dose in combination with BINA Sarisha-8. The next best result was obtained from 100% recommended fertilizer dose in combination with BINA Sarisha-5.

Keywords: mustard; recommended fertilizer dose; variety; yield; oil content

1. Introduction

Mustard (*Brassica* spp.) is one of the most important oilseed crops throughout the world after soyabean and groundnut (FAO, 2004). Worldwide the total annual production of rapeseed and mustard is 63.04 million tons of seed from an area of 34.33 million hectares (FAO, 2013). It has a remarkable demand for edible oil in Bangladesh. It takes up the first position of the list in respect of area and production among the oilseed crops cultivated in this country (BBS, 2013). Total cultivated area under mustard cultivation is 0.234 million hectares which produces 0.203 million tons of oil per year (BARI, 2011).

The average yield of cultivated mustard is only 0.8 t/ha (Anon, 2006). The major reason behind poor yield of mustard in the country is the cultivation of low yielder local varieties with poor fertilizer management (Alam and Rahman, 2006). Due to intensive cultivation, the deficiency of the nutrient is reported to be very obvious in several parts of the country particularly in the north western region. Appropriate agronomic management could lift up the yield of mustard closer to the level of variety potentiality. Plant architecture differs among varieties. So, there is a need for optimizing the fertilizer in order to facilitate nutrient supply, and thus, providing a congenial crop environment for better growth and higher yields. Though the fertilizer requirements for all the HYV of mustard are relatively higher but it is true that the production of oil can easily go above that losses. In the recent years, Bangladesh Institute of Nuclear Agriculture (BINA) has developed a number of high yielding varieties of mustard with yield potential up to 2.5 t/ha. As high yield potential of a variety is the prerequisite for increasing the production of a crop there is ample scope of replacing the traditional farmers Tori, grown as Maghi Sarisha by the HYV varieties with yield ranging 2.1-2.5 t./ha, having similar crop duration like

traditional type. Taking into consideration the above perspectives, the current study was done to assess the effect of levels of fertilizer dose and different varieties on the yield and oil content of mustard and to screen out the suitable variety (s) tested against different fertilizer dose for maximizing yield.

2. Materials and Methods

The research work was undertaken to examine the effect of fertilizer dose and variety on the yield and oil content of mustard.

2.1 Location

The experiment was conducted at the Agronomy Field Laboratory, Bangladesh Agricultural University for agronomical parameters and at the Department of Biochemistry and Molecular Biology, Bangladesh Agricultural University for biochemical parameter during the period of November 2013 through February 2014.

2.2 Seed and variety

BINA Sarisha-5, BINA Sarisha-8 and Tori-7 were selected for the experiment. The first two varieties were collected from the Agronomy Field Laboratory, Bangladesh Agricultural University and the third variety was collected from the local seed market of Mymensingh.

2.3 Experimental treatments

The experimental treatments are as follows:
Factor A: Variety (Three)
V1= BINA Sarisha-5, V2= Tori-7, V3= BINA Sarisha-8
Factor B: Fertilizer dose
T0= 0 fertilizer dose (control)
T1=50% of recommended fertilizer dose*
T2=100% recommended fertilizer dose
T3=150% of recommended fertilizer dose
* recommended fertilizer dose (BINA, 2008):
Urea = 180 kg ha^{-1}, TSP = 140 kg ha^{-1}, MoP = 100 kg ha^{-1}, Gypsum = 120 kg ha^{-1}, Zinc oxide = 2 kg ha^{-1}.

2.4 Design and sowing of seeds

The experiment was laid out in a Randomized Complete Block Design with three replications. There were 4 fertilizer treatments for three varieties with three replications. The seeds at the rate of 7 kg ha^{-1} were sown on 20 November, 2013 after final land preparation. Intercultural operations such as weeding and thinning, irrigation, pest management were done as per requirement.

2.5 Harvesting and threshing

The crop was harvested plot wise when 90% siliqua were matured.

2.6 Collection of experimental data

At maturity, 10 randomly selected plants were collected to record the data on yield contributing characters such as plant height, number of branches per plant, number of pods per plant, and number of seeds per pod and 1000 grain weight.

2.7 Oil content

The oil content was determined according to Folch, 1956.

2.8 Statistical analysis

The collected data were analyzed statistically by using the ANOVA technique. The Test of significance of all parameters was done with Duncan's Multiple Range Test (DMRT). The mean comparison was carried out by DMRT technique (Gomez and Gomez, 1984).

3. Results

3.1 Effect of variety

All the varieties significantly differed in respect to all yield contributing characters. The highest plant height (126.1cm) was produced by the variety BINA Sarisha-8 and the lowest plant height (62.47cm) by Tori-7 (Table

1). The highest (6.67) number of branches plant^{-1} was recorded in BINA Sarisha-8 and the lowest (3.49) number of branches plant^{-1} in Tori-7. Highest (119.0) number of siliqua was produced by the variety BINA Sarisha-8 and the lowest (65.01) by Tori-7. Longest siliqua (4.48 cm) was found in BINA Sarisha-8 and shortest (3.54 cm) in Tori-7. The number of seeds siliqua^{-1} produced by the variety BINA Sarisha-8 was significantly higher (13.53) than Tori-7 (20.59). Higher 1000 seed weight (3.46g) was found in the variety BINA Sarisha-8 due to its bolder seeds. Lower 1000 seed weight (2.56 g) was found in the variety Tori-7 due to its smaller seed. The highest oil content (41.73%) was found from BINA Sarisha-8 and the lowest (40.49 %) from Tori-7.

Table 1. Effect of variety on yield contributing and biochemical characters of mustard.

Variety	Plant height (cm)	Branches plant^{-1} (no.)	Siliqua plant^{-1} (no.)	Siliqua length (cm)	Seeds Siliqua^{-1} (no.)	1000 seed wt(g)	Oil content (%)
V1	90.97 b	5.03 b	92.07 b	4.27 b	17.43 b	3.23 b	41.50 a
V2	62.47 c	3.49 c	65.0 c	3.54 c	13.53 c	2.56 c	40.49 b
V3	126.1 a	6.67 a	119.0 a	4.48 a	20.59 a	3.46 a	41.73 a
S$\bar{x}$	0.090	0.120	0.140	0.0130	0.040	0.009	0.190
Level of	**	**	**	**	**	**	**
CV%	0.33	8.08	0.52	1.18	0.80	1.12	1.57

In a column, figures having common letters(s) do no differ significantly as per DMRT.
** = Significant at 1% level of probability.

Table 2. Effect of fertilizer dose on yield contributing and biochemical characters of mustard.

Fertilizer dose	Plant height (cm)	Branches plant^{-1} (no.)	Siliqua plant^{-1} (no.)	Siliqua length (cm)	Seeds Siliqua^{-1} (no.)	1000 seed wt(g)	Oil content (%)
T0	80.02 d	3.75 d	55.80 d	3.75 d	15.92 d	2.95 d	38.50 d
T1	90.95 c	4.71 c	86.41 c	4.01 c	17.03 c	3.06 c	40.69 c
T2	104.8 a	6.37 a	120.6 a	4.42 a	18.34 a	3.21 a	43.75 a
T3	96.92 b	5.43 b	105.2 b	4.20 b	17.44 b	3.12 b	42.02 b
S$\bar{x}$	0.104	0.136	0.160	0.015	0.046	0.011	0.216
Level of significance	**	**	**	**	**	**	**
CV%	0.33	8.08	0.52	1.18	0.80	1.12	1.57

In a column, figures having common letters(s) do no differ significantly as per DMRT.
** = Significant at 1% level of probability.

Table 3. Effect of interaction of fertilizer dose and variety on different crop characters of mustard.

Interaction	Plant height (cm)	Branches plant^{-1} (no.)	Siliqua plant^{-1} (no.)	Siliqua length (cm)	Seeds Siliqua^{-1} (no.)	1000 seed wt(g)	Harvest index (%)	Oil content (%)
V1T0	80.22 h	3.67 efg	60.89 k	3.89 e	16.15 h	3.16 f	40.96 f	38.88 a
V1T1	91.56 g	4.20 def	82.29 j	4.22 d	17.48 g	3.21 e	43.02 c	40.97 b
V1T2	98.92 e	6.64 b	122.7 c	4.58 b	18.21 e	3.30 d	47.99 a	43.93 c
V1T3	93.17 f	5.61 c	102.3 e	4.37 c	17.87 f	3.26 de	44.98 b	42.23 d
V2T0	51.95 l	2.92 g	25.45 l	3.16 h	12.21 l	2.45 i j	37.75 i	37.87 e
V2T1	60.36 k	3.13 g	64.66 j	3.49 g	13.52 k	2.55 h	39.01 h	39.80 f
V2T2	72.26 i	4.36 de	90.78 f	3.86 e	14.55 i	2.62 g	41.84d e	42.59 g
V2T3	65.29 j	3.55 fg	79.16 i	3.66 f	13.84 j	2.62 g f	39.91 g	41.69 h
V3T0	107.89 d	4.67 d	81.06 h	4.19 d	19.4 d	3.26 de	41.25 ef	38.74 i
V3T1	120.93 c	6.78 b	112.28 d	4.313 c	20.1 c	3.41 c	42.05 d	41.30 j
V3T2	143.29 a	8.13 a	148.43 a	4.82 a	22.26 a	3.7 a	44.87 b	44.75 k
V3T3	132.30 b	7.12 b	134.2 b	4.58 b	20.62 b	3.48 b	42.11 d	42.15 l
S$\bar{x}$	0.180	0.236	0.277	0.026	0.079	0.018	0.240	-
Level of significance	**	**	**	**	**	**	**	NS
CV%	0.33	8.08	0.52	1.18	0.80	1.12	0. 95	1.57

In a column, figures having common letters(s) do no differ significantly as per DMRT.
** = Significant at 1% level of probability.
NS = Non significant.

3.2 Effect of fertilizer dose

It was observed that the fertilizer dose affected the yield contributing characters significantly (Table 2). The tallest plant (104.8cm) was produced with 100% recommended fertilizer dose which was statistically superior to the other fertilizer doses. The highest (6.37) number of branches plant^{-1} was recorded from the treatment of 100% recommended fertilizer dose which was significantly different from the second highest treatment of 150% of recommended fertilizer dose. The highest number of pods plant^{-1} (120.6) was produced by 100% recommended fertilizer dose followed by 150% of recommended fertilizer dose. The lowest number (55.80) was produced by control treatment. Application of 100% recommended fertilizer dose produced the longest siliqua (4.42cm) followed by 150% of recommended fertilizer dose. The shortest siliqua (3.75cm) was produced by the control treatment. The highest number of seeds siliqua^{-1} (18.34) was obtained with the application of 100% of recommended fertilizer dose. The lowest number of seeds siliqua^{-1} (15.92) was produced by control treatment. The highest (3.21g) 1000 seed weight was found in 100% recommended fertilizer dose and the lowest (2.95g) 1000 seed weight was found in control treatment. It was observed that the fertilizer dose significantly affect oil content percentage of mustard (Table 1). The highest oil content (43.75%) produced by 100% recommended fertilizer dose which was significantly different from other fertilizer treatments. The lowest oil content (38.50%) produced by control treatment.

3.3 Effect of interaction

The yield contributing and oil content were significantly affected due to the interaction of fertilizer dose and variety and 100% recommended fertilizer dose with BINA Sarisha-8 produced tallest plants than those of other interactions (Table 3). The shortest plant was obtained from no fertilizer application in Tori-7 variety. The highest (8.13) number of primary branches was recorded in 100% recommended fertilizer dose x BINA Sharisha-8 and the lowest (2.92) in control fertilizer with Tori-7 (Table 3). Interaction of 100% recommended fertilizer dose x BINA Sharisha-8 produced the highest number of siliqua plant^{-1} (148.43) whereas the lowest number of siliqua plant^{-1} (25.45) was obtained by in no fertilizer application with Tori-7. The longest siliqua (4.82cm) was found in 100% recommended fertilizer dose with BINA Sharisha-8 and shortest siliqua (3.16cm) was found from control fertilizer dose x Tori-7. The highest number of seeds siliqua^{-1} was obtained in 100% recommended fertilizer dose with BINA Sharisha-8 and lowest in control fertilizer dose x Tori-7. Trend of effect of weight of 1000 seeds were not regular. The highest (3.7g) weight of 1000 seeds was found in the interaction of 100% recommended fertilizer dose with BINA Sharisha-8. Lowest (2.45g) 1000 seed weight was found in control fertilizer dose x Tori-7. Although the fertilizer dose and the variety had individual significant effect on oil content but their interaction had no significant effect on oil content of mustard.

4. Discussion

The present piece of research work was conducted to find out the effect of fertilizer dose and variety on seed yield, yield components and oil content of mustard (*Brassica* spp.). The findings showed that fertilizer dose influenced plant height (cm), number of branches plant^{-1}, number of siliqua plant^{-1}, siliqua length (cm), number of seeds siliqua^{-1}, 1000 seed weight (g), and oil content (%). The highest number of branches plant^{-1}, number of siliqua plant^{-1}, siliqua length (cm), number of seeds siliqua^{-1}, 1000 seed weight (g), and oil content (%) was obtained from 100% recommended fertilizer dose and lowest was found in 0 fertilizer dose (control). The findings are in line with Meena *et al.* (2013) who stated that Application of 100 % RDF produced other yield attributes.

Yield contributing characters and oil content (%) were highest in BINA Sarisha-8 and lowest in Tori-7. Mamun (2005) also revealed that yield contributing characters and oil content are higher in HYV of mustard.

5. Conclusions

The variety BINA Sarisha-8 with 100% recommended fertilizer dose may be recommended for the resource rich farmers of Old Brahmaputra Floodplain (AEZ-9) for higher yield and economic return.

Conflict of interest

None to declare.

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