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SHORT COMMUNICATION

Evaluation of Yield Performance of Three Important Mustard Varieties Released by Bangladesh Institute of Nuclear Agriculture

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ABSTRACT

An experiment was conducted during 01 November, 2022 to 31 March, 2023 at Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD) agricultural farm to study the yield performance of Binasarisha-4, Binasarisha-7 and Binasarisha-9 at BAPARD Agricultural Farm. Binasarisha-7 gave the maximum plant height (138.86cm) during harvesting stage other than two varieties Binasarisha-4 (108.67cm) and Binasarisha-9 (137.57cm). Binasarisha-7 also performed the highest siliqua per plant (110.86) other than two varieties Binasarisha-4 (87.57) and Binasarisha-9 (89.64). Binasarisha-4 preformed more branches per plant (4.94), maximum length of siliqua (6.53cm) and highest number of seeds per siliqua (30.63) other than Binasarisha-7 and Binasarisha-9. But thousand seed weight was maximum in Binasarisha-7. After all, the highest yield was given by Binasarisha-7 (2.28 t/ha) and the lowest yield was given by Binasarisha-9 (1.92 t/ha). It can be concluded as Binasarisha-7 was the best among the three mustard varieties and it can be extended to the local farmer of this region in Gopalganj district.

Key words: Growth, Mustard, Seed, Siliqua, Variety, Yield

Introduction

Mustard is one of the most important oil producing crops in the world that belongs to the family Ccruciferae or Brassicaceae. The three mustard species (*Brassica napus*, *Brassica campestris*, and *Brassica juncea*) that produce edible oil, which are the world's third most important source of edible vegetable oil after palm and soybean (Zhang and Zhou, 2006 and Adnan et al., 2013). *Brassica napus* and *Brassica campestris* are considered as"rapeseed," and *Brassica juncea* is considered as mustard. About seven oilseed crops are grown in the Bangladesh but the rapeseed and mustard (Local and HYV) alone occupies about 270139 ha of the total 444648 ha of the oilseed cultivated land and 311740 metric ton among the total 954182 metric tons which are about 60% of the oilseed production in Bangladesh (BBS, 2019). Cumilla, Tangail, Jeshore, Faridpur, Pabna, Rajshahi, Dinajpur, Kushtia, Kishoregonj, Rangpur and Dhaka are the major mustard growing districts of Bangladesh (BBS, 2019). It is a high energy food and a carrier of fat soluble vitamins including vitamin A, D, E and K in the body. It is used as salad, green manure, leaf and stem as vegetables in the various mustard growing countries of the world. Mustard oil is mainly used for the edible purpose. Oil cake is used as manure and animal feed. In Bangladesh it is an important source of cooking oil that meet the one third of edible oil requirement of the country (Ahmed, 2008). The price of edible oil is increasing day by day and the Bangladesh has been facing acute shortage of edible oil for the last several decades. For that it needs to import oil and oilseeds from abroad to meet up the deficiency of edible oil. Our internal production can meet only about 21% of our total consumption which can meet only a fraction of the cooking oil requirement of the country and the rest 79% is needed to import (Begum et al., 2012) from oil producing country. Due to insufficient oil production, a huge amount of foreign exchange involving over 160 million US Dollars is being spent every year for importing edible oils in Bangladesh (Rahman, 2002). Mustard seed contains about 40-44% oil. We can meet up the shortage of edible oil and by increasing production of mustard. The average yield of mustard (1,087 kg/ha) in our country is very poor compared to the advanced countries like Germany, France, UK and Canada. Oilseed production and area are gradually declining in our country due to (i) low yield potential of oilseed varieties (ii) high disease and pest infestation compared to other crops (iii) yield instability due to microclimatic fluctuation (iv) expansion of irrigation facilities and availability of more profitable crops in place of in cropping patterns. There are some HYVs of

mustard, which have been released by Bangladesh Agricultural Research Institute (BARI) and Bangladesh Institute of Nuclear Agriculture (BINA). The yield of different varieties varied significantly due to different Agro-Ecological Zones (AEZs). The productivity and quality of mustard and rapeseeds can be improved by detecting the appropriate variety for respective region. For this reason, three important mustard varieties were selected for the experiment to find out the best variety for the Kotalipara upazila under the district of Gopalganj in Bangladesh with their yield performance.

Materials and methods

The field experiment was conducted at Bangabandhu Academy for Poverty Alleviation and Rural Development (BAPARD) Agricultural Farm, Kotalipara, Gopalgonj during 01 November, 2022 to 31 March, 2023. The location of the site is between21°51´and 23°10´ north latitude and between 89°56´ and 90°10´ east longitude. The topography of the farm area is medium high land and the soil is sandy loam type. The average temperature of this location varies from 12.1 °C to 36.1 °C. Heavy rainfall occurs during rainy season.

Binasarisha-4, Binasarisha-7 and Binasarisha-9 were used for the experiment. Seed was collected from Bangladesh Institute of Nuclear Agriculture (BINA), Mymensing, Bangladesh. The four cross ploughing was done and raised plot was prepared. The seed was sown during 15 November, 2022. Seed was sown in line sowing method and the spacing was (25cm×20cm). Before sowing the plot was prepared by cleaning the wastage from the field. Total 12 plots were prepared. The size of the plot was (6.5m×8m) and about 50 cm drain was kept between two plots. Randomized Completely Block Design (RCBD) was used with 4 replications of three varieties. Varieties were-V_1= Binasarisha-4, V_2= Binasarisha-7, V_3= Binasarisha-9.

Fertilizer was used as the recommendation of Bangladesh Institute of Nuclear Agriculture (BINA) (https://bina.gov.bd). Urea 220 kg/ha, TSP 200 kg/ha, MoP 140 kg/ha, Zypsum 150 kg/ha, Zinc Sulphate 10 kg/ha and Boric acid 7 kg/ha was the fertilizer dose. All fertilizers and ½ of Urea was applaied as a basal dose during land preparation. Rest of Urea was applied after 25 days of seed sowing. Irrigation and drainage were done at proper time. Pest and diseases was controlled when necessary.

Data was recorded on the following parameters: Plant height during harvesting (cm), Branches per plant, Siliqua per plant, Length of siliqua, Seed per silliqua, Thousand Seed weight (g), Seed yield (t/ha). All data was taken carefully at proper time.

Results and discussion

In the result, height of plant (cm) at harvesting stage was observed from 108.67cm to 138.86cm (Table-1). Maximum plant height was recorded with V_2 (138.86cm), which was statistically similar with V_3 (137.57cm) but statistically dissimilar with V_1 (108.67cm). As a result, the Binasarisha-7 gave the highest plant height during harvesting and the Binasarisha-4 gave the lowest plant height during harvesting stage. Shamsuddin et al. (1987) and Mondal and Gaffer (1983), reported that different varieties of mustard differed significantly in plant height. Barman et al. (2016) conducted an experiment with BINA Sarisha-5, BINA Sarisha-8, Tori-7 and find out that the variety had significant effect on plant height. Ali and Rahman (1986) observed significant variation in plant height in different varieties of mustard.

Branches per plant were observed from 3.70 to 4.94 (Table-1). Maximum branches per plant were recorded with V_1 (4.94). The minimum number of branches per plant was recorded in V_3 (3.70) which were statistically similar with V_2 (4.16). As a result, the Binasarisha-4 gave the highest branches per plant and the Binasarisha-9 gave the lowest branches per plant. Mamun et al. (2014) reported that BARI Sarisha-13 performed well in terms of branches plant^{-1} (6.14) when evaluated the mustard varieties BARI Sarisha-13, BARI Sarisha-15, BARI Sarisha-16 and SAU Sarisha-3. Khaleque (1989) observed 3.9 and 3.1 branches/plant in TS-72 and Sonali Sharisha, respectively. BARI (2001) reputed that under poor management number of branch plant^{-1} was higher (4.2) in the variety SS-75 and lower (2.1) in the variety BARI Sarisha-8. Under medium management, best performance was Dhali (5.5) and worst performance was BARI Sarisha-8. Under higher management, highest was in Dhali (5.9) and lowest in (3.0) Nap-248.

Siliqua per plant was observed from 87.57 to 110.86 (Table-1). Maximum siliqua per plant was recorded with V_2 (110.86). The minimum siliqua per plant was observed V_1 (87.57) which was statistically similar with V_3 (89.64). As a result, the Binasarisha-7 gave the highest siliqua per plant and the Binasarisha-4 gave the lowest siliqua per plant because of the plant height of the Binasarisha-7 is higher than the Binasarisha-4 and Binasarisha-9. Mamun et al. (2014) reported that BARI Sarisha-13 performed well in terms of siliqua per plant (126.90) when they evaluated four varieties (BARI Sarisha-13, BARI Sarisha-15, BARI Sarisha-16 and SAU Sarisha-3).

Length of siliqua (cm) was observed from 4.88cm to 6.53cm (Table-1). Maximum length of siliqua was recorded with V_1 (6.53cm). The minimum siliqua per plant was observed V_2 (4.88cm) which was statistically similar with V_3 (5.53cm). As a result, the Binasarisha-4 gave the maximum length of siliqua and the Binasarisha-7 gave the lowest length of siliqua. Hussain et al. (1996) observed the longest pod (8.07 cm) in BLN-900 and the shortest pod length (4.83 cm) in Hyola-401.

The number of seed per siliqua was observed from 25.84 to 30.63 (Table-1). Maximum number of seed per siliqua was recorded with V_1 (30.63), which was statistically similar with V_3 (28.68) but statistically dissimilar with V_2 (25.84). As a result, the Binasarisha-4 gave the highest number of seed per siliqua and the Binasarisha-7 gave the lowest number of seed per siliqua. Laxminarayana and Pooranchand (2000) found no significant variations in seeds siliqua^{-1} among the cultivars. Das *et al.* (1999) reported that MM 7 (Mutant) produced the highest number of seeds siliqua^{-1} (29.2)

Table:1 Plant height at harvest (cm), Branches per plant, Siliqua per plant, Length of siliqua (cm), Seed per siliqua, Thousand Seed weight (g), Seed Yield (t/ha).

Treatment (Variety)	Plant height at harvest (cm)	Branches per plant	Siliqua per plant	Length of siliqua (cm)	Seed per siliqua	Thousand Seed weight (g)	Seed Yield (t/ha)
V_1 (Binasarisha-4)	108.67b	4.94a	87.57b	6.53a	30.63a	3.71b	1.99b
V_2 (Binasarisha-7)	138.86a	4.16b	110.86a	4.88b	25.84b	3.98a	2.28a
V_3 (Binasarisha-9)	137.57a	3.70b	89.64b	5.53b	28.68a	3.74b	1.92b
F-test	*	*	*	*	*	*	*
CV (%)	11.55	4.48	2.42	4.47	13.64	4.78	10.68

In a column, figure with same letter do not differ significantly; *Significant at 5% level of significance; NS= Non Significant

followed by MM 20 (Mutant) (28.0) and Binasarisha-4 (27.8) at Dinajpur. Mamun *et al.* (2014) evaluated the effect of variety on growth and yield of rapeseed mustard under rainfed conditions and reported that BARI Sarisha-13 performed well in terms of seeds siliqua^{-1} (25.36).

Weight of thousand seed (g) was observed from 3.71 to 3.98g (Table-1). The maximum weight of thousand seed was observed with V_2 (3.98g). The minimum weight of thousand seed was observed with V1 (3.71g) which was statistically similar with V_3 (3.74g). As a result, the Binasarisha-7 gave the maximum weight of thousand seed and the Binasarisha-4 gave the minimum weight of thousand seed. Karim *et al.* (2000) stated that cultivars showed significant influence in weight of thousand seeds. They found higher weight of 1000-seed in J-3023 (3.43 g), J-3018 (3.42 g) and J-4008 (3.50 g). Mamun *et al.* (2014) evaluated the four varieties (BARI Sarisha-13, BARI Sarisha-15, BARI Sarisha-16 and SAU Sarisha-3) and reported that BARI Sarisha-13 performed well in terms of 1000 seed weight (4.00) considering the other variety, which was similar with Binasarisha-7.

Yield (t/ha) is an important factor. The highest seed yield was observed from 1.92 t/ha to 2.28 t/ha (Table-1). The maximum seed yield was observed with V_2 (2.28 t/ha). The minimum seed yield was observed with V_3 (1.92) which was statistically similar with V_1 (1.99 t/ha). As a result, the Binasarisha-7 gave the maximum seed yield and the minimum seed yield was given by Binasarisha-9 because of the siliqua per plant and thousand seed weight of Binasarisha-7 was higher than Binasarisha-4 and Binasarisha-9. BARI (2001) showed that seed yield and other yield contributing characters significantly varied among the varieties. Rahman (2002) stated that yield variation existed among varieties and the highest seed yield was observed in BARI Sarisha-7, BARI Sarisha-8 and BARI Sarisha-11 (2.00-2.50 t/ha) and lowest yield in variety Tori-7 (0.95-1.10 t/ha). Hakim *et al.* (2014) evaluated two varieties (Early Mustard and S-9) were against six Zn levels and reported that S-9 ranked 1st with 1960.30 kg/ha seed yield, while variety Early Mustard resulted 1677.90 kg/ha seed yield.

Conclusion

The result of the study showed that Binasarisha-7 gave maximum plant height during harvesting stage, more siliqua per plant and more thousand seed weight other than two varieties (Binasarisha-4 and Binasarisha-9). The highest yield was given by Binasarisha-7 (2.28 t/ha) and the lowest yield was given by Binasarisha-9 (1.92 t/ha) in the experiment field. It can be concluded as Binasarisha-7 was the best variety among the three varieties. So the cultivation of Binasarisha-7 is more profitable for farmer's level in the Agro Ecological Zone 14 and it can be extend to the local area.

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