

Yield performance of promising Aman rice variety BINA dhan-17 with BRRI dhan 58 in Boro season at Chapainawabganj, Bangladesh

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An experiment was conducted to examine the suitability and productivity of BINA dhan-17 (Aman variety) cultivating in the Boro season. The experiment consisted of one Boro variety, namely BRRI dhan 58 and one Aman variety BINAdhan-17, and it was conducted at the experimental field of BINA substation, Chapainawabganj, from December 2020 to May 2021. The experiment was laid out in randomized complete block design with three replications. Higher yield (9.03 t ha⁻¹) and short crop duration were recorded in BINA dhan-17 compared to the check variety BRRI dhan 58 (7.17 t ha⁻¹).

Keywords: T. Aman, Boro season, BINA dhan-17, Effective tiller, Rice yield, Green super rice.

Introduction

Rice, the staple food crop for the people of Bangladesh. About 84.67% cropped area of Bangladesh is used for rice production, with an annual production of 30.42 million tons from 10.4 million ha of land (BBS, 2015). The average yield of rice in Bangladesh is 2.92 t ha⁻¹, which is very low (BBS, 2015). The geographic and agronomic conditions of Bangladesh are favorable for rice cultivation. However, paddy soil fertility may be prolonged in the coming years due to the increasing population pressure and demand for food. Rice demand would increase by 25% to keep pace with population growth (Maclean et al., 2002). Bangladesh is a small country with a large population, and each year, nearly 1.47 million people are added to its current population of about 162.2 million, and at present, population growth is 1.37% (BBS, 2015). The pressure on Bangladesh's land resources to produce more rice will aggravate in the coming years due to the increasing population and demand for food. High fertilizer responsiveness is an essential criterion for a high-yielding rice variety, and nitrogen is one of the major nutrient elements for crop production that can contribute a lot to a higher rice yield (Chang, 1964). Future technologies will rely on adopting high-yielding cultivars and efficient use of different nutrient manure or fertilizers. Bangladesh has three rice-producing seasons, namely Aus, Aman, and Boro. Boro rice is commonly known as winter rice. The term Boro is Bengali originated from the Sanskrit word "Boro" which refers to cultivation from November-May under irrigated conditions (Lal, 2013). It is photo-insensitive, transplanted rice cultivated in waterlogged, low-lying, or medium land with supplement water. According to the Department of Agriculture Extension, during 2017-2018 total of 48.59 lac hectare lands were used for Boro rice production, which was 8.55% more than 2016-2017 and production was 195.78 lac ton 8.66 percent higher than 2016-2017. According to previous records (Rakib, A., 2019), BINA dhan-17 has BINA released transplanted Aman variety. It is photo-insensitive, Green Super Rice (GSR), which means 20% less total nitrogen requirement. It is drought tolerant, with a 30% less requirement of water. It gives 7.5 t/ha yields within 112-118 days (seed to seed) in the Aman season. In Bangladesh, farmers use 48.59 lakh hectare lands for Boro rice cultivation (Mainuddin, M., 2021). If BINA dhan-17 was cultivated in Boro season, it would be a more productive short duration Boro variety. Information is not available on the cultivation of BINA dhan-17 in the Boro season. Based on this, our experiment has been undertaken to determine the suitability of BINA dhan-17 cultivating in Boro season, to know yield potentiality and lifetime.

Materials and Methods

The experiment was conducted at the research field of BINA sub-station, Chapainawabganj district, from December 2020 to May 2021 to study the suitability of BINA dhan-17 cultivating in Boro season with potential yield within a short duration. The field experiment was laid out in Randomized Complete Block Design (RCBD) with three replications (Gomez, 1984). The size of each unit plot was 3 m × 4 m (12 m²). The total area of the experiment was 90 m², and the number of plots was 6. The BINA dhan-17 yield is at least 33 percent more productive than that of other varieties of Aman paddy, and the production cost is around one-third lower. A relatively thinner paddy, BINA dhan-17, is harvested one month earlier than other varieties of Aman paddy, allowing the cultivation of different winter crops. The paddy of BINAdhan-17 is long, thin, and 1000 seeds weigh 23.3 g. BRRI dhan58 is a short duration medium high yielding variety, ripe grain color like straw color, lifetime is 150-155 days. Seedling produced in ideal seedbed

sowing after germination on 17-12-2020. Thirty-nine days aged single seedling transplanted each hill maintain 20 cm distance between row and 20 cm distance between hills on 15. Nitrogen, Phosphorus, Potassium, Zinc, and Sulphur are used as Urea, TSP, MoP, Zinc Sulphate, and Gypsum. The Doses were 200 kg/ha, 100 kg/ha, 150 kg /ha, 4 kg/ha and 80 kg/ha, respectively. The total TPS, MoP, Zinc Sulphate, Gypsum were applied as basal doses. One-third of Urea was applied after seven days of transplanting. The urea was applied at top-dress at two equal slips at 30 days and 45 days after transplanting. To control soil pests, Furadan was applied at 3 kg/ha. To control pre-emergence weed, pre-tillachlor was applied. Virtako 40 WG was applied to control yellow stem borer infestation @ 75 g/ha. To control Blast and sheath blight infection, Nativo was applied @ 200 g/ha, respectively, and weeded three times at 10, 25, and 40 days after transplanting to control weed infestation. Irrigations were done several times when necessary. Data were recorded on the plant height (cm), No. of effective tillers/hill, No. of grains/panicle, No filled grains/ panicle, No. of Unfilled grains/panicle, Panicle length (cm), Days to 50% flowering, Duration and Yield (t ha⁻¹). All data were compiled in MS Excel Program and statistically analyzed by Minitab (Minitab, 2019).

Results and Discussion

Plant height

The highest plant height was observed in BRRRI dhan58 (103.60 cm), which was statistically dissimilar to BINA dhan-17 (84.70 cm), which showed medium plant height (Fig. 1). The difference in the plant may occur due to varietal genetic character it is similar to Sarkar (Sarkar, 2014) variable plant height due to varietal differences.

No. of filled grains/panicle

A higher no. of filled grains was found in BINAdhan-17 (125) compared to BRRRI dhan58 (121.3) (Fig. 1). Variation in grain filling may have occurred due to adopted genetic, environmental, or cultural management practices (Chowhan, 2017).

No. of unfilled grains/panicle

There was a significant difference between these two varieties in the number of unfilled grains per panicle. A higher no. of unfilled grains was found in BINA dhan-17 (72.5) compared to BRRRI dhan58 (49.6) (Fig. 1). Haque et al. (2016) supported this result, who reported wide genotypic variation in phenological traits among 14 Aus cultivars.

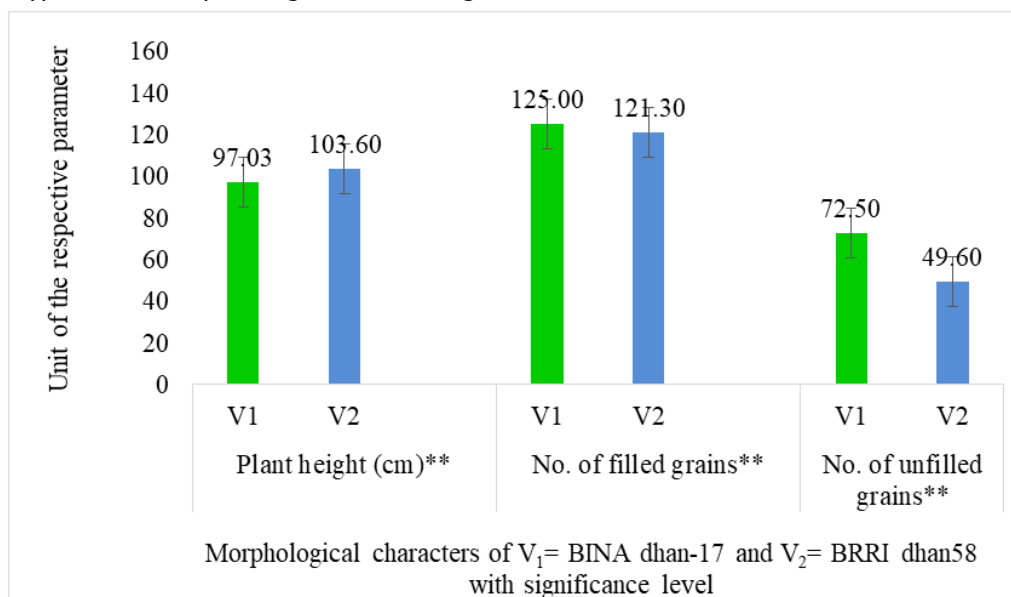


Fig. 1. The performance of two rice varieties for plant height (cm) and the number of filled and unfilled grains per panicle. **Note:** **significant at P 0.01.

Flag leaf length

The tested variety BINA Dhan-17 gave 31.50 cm length of flag leaf than the check variety BRRRI dhan58 having 30.10 cm flag leaf (Fig. 2). Flag leaf plays an essential role in supplying food materials to the emerging panicle and rice spikelets. The more length of flag leaf is good for rice plant.

Panicle length

Significant results were found in panicle length between varieties. BINA dhan-17 had a higher panicle length (25 cm) than BRRRI dhan 58 (49.6) (Fig. 2). The difference in the plant may occur due to varietal genetic character; it is similar to Sarkar (2014) variable plant height due to varietal differences.

No. of effective tiller hill⁻¹

Maximum no. of tillers/hill was recorded in BRRRI dhan58 (15.2) followed by BINA dhan-17 (13.60) (Fig. 2). In earlier, Jisan et al. (2014) concluded that variation in the number of tillers per hill might be due to varietal characters.

1000 seed weight

Both the varieties showed almost similar results for 1000 seed weight with no statistically significant difference (Fig. 2). However, it is also an essential factor of differentiation among the varieties of a large population.

Grain yield

There was a significant difference between the two varieties in yield performance. According to Fig. 2, higher grain yield was observed in plots of BINA dhan-17 (10.84 kg plot⁻¹) compared to BRRRI dhan58 (8.61 kg plot⁻¹). This result was supported by Dutta et al. (2002), who observed that yield was affected by the filled grains panicle⁻¹. Kiani and Nematzadeh (2012) observed that filled grains panicle⁻¹ correlated significantly with grain yield. Tahsin et al. (2017) reported varietal differences in grain yield.

Days to maturity

Lesser days to maturity were found in BINA dhan-17 compared to BRRRI dhan58. This discussion proved that maturity might differ due to variety difference; it is supported by Ghosh et al. (2015), who has recorded variation of days to maturity due to different varieties, and Haque et al. (2016) reported wide genotypic variation in phenological events among 14 aus cultivars. The duration also depends on cultural management, soil, and climatic condition (edaphic factor), which agrees with Ahmed et al. (2015), demonstrated significant differences in attaining phenological stages due to varieties and variable management practices.

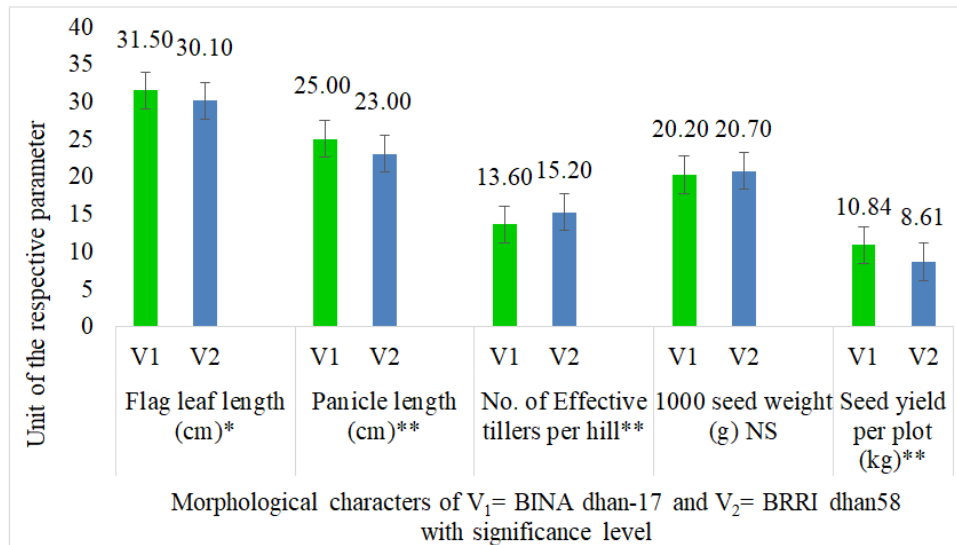


Fig. 2. Performance of two rice varieties for yield and yield attributing characters. **Note:** *,** significant at P 0.05 and 0.01, NS-nonsignificant.

Conclusion

The increasing population of the country demands more production of food. As rice is our staple food, more emphasis is given to rice yield. Adopting suitable varieties would increase rice production, and undoubtedly BINA dhan-17 is one of the promising high-yielding rice varieties, and it had a more significant edge over BRRRI dhan58 in terms of yield performance. In the light of this experiment, it can be suggested that BINA dhan-17 can be used as a Boro variety without compromising yield, and further trials and experiments can be conducted to include BINA dhan-17 in the Boro slot of several cropping patterns.

Conflict of Interest

The authors have no conflict of interest about this research results and publication of this article.


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