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# Growth and Yield Performance of Six Aman Rice Varieties of Bangladesh

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## Authors' contributions

This work was carried out in collaboration among all authors. Author SK recorded data, wrote the protocol and wrote the first draft of the manuscript. Author MMAM designed the study, performed the statistical analysis. Authors MIK and MR managed the analyses of the study. Author MMIM managed the literature searches. All authors read and approved the final manuscript.

## Article Information

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# ABSTRACT

A field experiment was conducted with six rice varieties to determine their growth and yield performance. The experiment was laid out in a randomized complete block design (RCBD) with four replications. All the growth and yield contributing attributes varied significantly among the six rice varieties. The results revealed that in all rice varieties maximum growth performance observed at 58-68 Days after transplanting and maximum dry matter production was observed at 68 days after transplanting. Maximum number of filled spikelet observed in Binadhan-17 (164.89/ penical) and that was significantly different from other varieties. Percent of sterile spikelet was highest in BRRI dhan39 (12.9%) and that was statistically similar with Binadhan-16 (11.96%) and BRRI dhan33 (12.36%). Maximum 1000-seed weight was observed in Binadhan-17 (27.25 g). Highest

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grain yield was obtained from Binadhan-17 (6.13 t/h) that was significantly different from other varieties. Lowest grain yield observed in BRRI dhan39 (4.49 t/h) that was statistically similar to BRRI dhan33 (4.57 t/h) and Binadhan-7 (4.86 t/h).

Keywords: Rice varieties; growth; yield.

## 1. INTRODUCTION

Rice (Oryza sativa L.) is the major staple food crop in Bangladesh, covering about 75% of the total cropped area. Ninety percent global rice production occurs in tropical and sub-tropical Asian countries [1]. Worldwide, rice provides 27% of dietary energy supply and 20% dietary protein [2]. It constitutes 95% of the cereal consumed and supplies more than 80% of the calories and about 50% of the protein in the diet of the general people of Bangladesh [3]. Being the 4<sup>th</sup> largest rice producer of the world, Bangladesh comprises an area of about 10.27 million hectares for rice production [4]. Total rice production in Bangladesh was about 10.59 million tons in the year 1971 when the country's population was only about 70.88 million. However, the country is now producing about 35.5 million m tons to feed her 157 million people [5]. Thus, Bangladesh will require about 27.26 million tons of rice for the year 2020. The cultivated area of rice decreased for last decade due to increase of cultivation of more profitable contemporary crops. However, the demand of rice has been increasing day by day with increasing population. To fulfill the rice requirement, it is important to increase the rice vield. Under present circumstance can be possible to overcome by increasing high yielding rice production. The objective of this experiment is to determine the best performance of growth and yield of rice variety.

The yield of rice depends on its different growth parameters, i.e. leaf area index, dry matter production and its partitioning, tillering, etc. [6]. There are several important factors those have tremendous influence on the growth and development, tiller production, grain formation and other yield contributing characters i.e., age of seedling [7], spacing [8]. A number of reports showed that indigenous rice cultivars possess a wide diversity in ecological, morphological and physiological characteristics [9]. The yield contributing characters especially number of effective tillers/hill, number of grains/panicle, grain and straw vields were significantly affected when compared to late transplanting. Many of them obtained better results from early transplanting than late transplanting [10].

## 2. MATERIALS AND METHODS

A field experiment was conducted during Kharif-II (Aman) season of 2016 at BINA substation Ishurdi. The experiment site lies between 25-27°N latitude, 8.5°E Longitude and 98 meters altitude. The climate is characterized by the alternate hot rainy season. The experiment was laid down in Randomized Complete Block Design (RCBD) with six rice varieties (i.e., Binadhan-7, Binadhan-11, Binadhan-16, Binadhan-17, BRRI dhan33 and BRRI dhan39) and four replications. Pre-germinated seed were sown in the wet seedbed. Twenty-one days old seedlings were transplanted with one seedling per hill maintaining 20x15 cm spacing. The experimental plot was uniformly fertilized [11] with Urea, TSP, MoP, Gypsum and Zinc sulphate @ 130, 50, 80, 44.5 and 2.0 kg/ha respectively. The total TSP, MoP, Gypsum, Zinc sulphate, one third of urea were applied as basal dose and Furafuran 5G @10 kg/ha was mixed with these fertilizers and applied to the experimental field to control soil borne pest. The rest of the urea was top dressed at two equal split doses at 30 days after transplanting (DAT) and at 50 DAT. Virtako @ 75 g/ha was applied with two split doses of urea to prevent stem borer infestation. Rifit 500 EC @ 988 mL/ha was applied as pre-emergence weedicide to control weeds [12]. For controlling of weeds hand weeding was done with the help of "Khurpi" after 30 days after transplanting and 50 days after transplanting. Irrigation was applied as per requirement but no major irrigation was applied as aman rice is grown in rainfed condition. During the experimentation fungal diseases were controlled by applying Amistar Top @ 500 mL/ha and Eminent Pro @ 790 mL/ha. Some insect pest like grass hopper and rice bug were controlled by spraying Syfanon 57 EC @ 988 mL/ha.

After 38 days of transplanting, every day, 5 plants were harvested and oven dried for determining total dry matter and growth rate. After physiological maturity, one quadrate (1 m<sup>2</sup>) was harvested in every plot for the determination of yield contributing parameters. All data were subjected to statistical analysis separately by using analysis of variance technique by MSTAT software. The difference among treatment means

was compared by using least significant difference test at 5% probability levels [13].

## 3. RESULTS AND DISCUSSION

#### 3.1 Tiller Number

Binadhan-7 variety showed significant and highest number of tillers per hill (41). Effective tiller number is also higher in Binadhan-7 (29) compare to other varieties but the difference between total number of tiller and effective tiller was higher in binadhan-7 compare to other varieties. All tillers of Binadhan-17 were effective so total number of tiller and effective tiller are same in Binadhan-17 (27). Less effective tiller observed in BRRI dhan33 variety (15) (Fig. 1). Jisan et al. [14] concluded that, variation in number of tillers per hill might be due to varietal characters.

## 3.2 Absolute Growth Rate

Absolute growth rate is high in Binadhan-17. Maximum growth of all varieties was observed at 58- 68 Days after transplanting. Absolute growth rate reduced in minus value at 68 days after transplanting in all varieties. At 58-68 days after transplanting maximum growth observed in Binadhan-17 and minimum in BRRI dhan39.

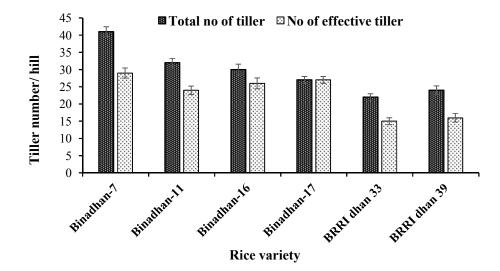


Fig. 1. Total number of tiller and effective tiller of six rice varieties

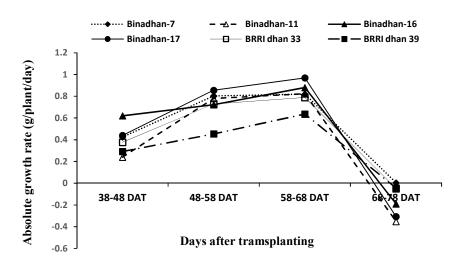


Fig. 2. Absolute growth rate of six rice varieties

#### 3.3 Dry Matter Production

Dry matter production was increased up to 68 days after transplanting but after that dry matter production decreased for all rice varieties. This was for reduction of absolute growth rate. At 68 days after transplanting maximum dry matter production was observed in Binadhan-17 (34.36 g Plant<sup>-1</sup>) and minimum in BRRI dhan39 (23.2 g/Plant) (Fig. 3).

## 3.4 Number of Filled and Sterile Spikelet

Maximum filled spikelet observed in Binadhan-17 (164.89/panicle) and that was significantly different from other varieties. Minimum filled spikelet observed in Binadhan-7 (96.33/Panicle) and that was statistically similar to other varieties. The highest percent of sterile spikelet

observed in BRRI dhan39 (12.9%) and that was statistically similar with Binadhan-16 (11.96%) and BRRI dhan33 (12.36%). Lowest percent of sterile spikelet was observed in Binadhan-11 (7.97%) and that was similar to Binadhan-7 (8.57%) (Fig. 4). Variation in grain filling may have occurred due to genetic, environmental or cultural management practices adopted. Dutta et al. [15] observed that yield was affected by the filled grains/panicle. Kiani and Nematzadeh [16] observed that filled grains/panicle correlated significantly with grain yield. Roy et al. [17] reported that the number of spikelets per panicle in indigenous rice is generally lower. Sarkar [18] reported that number of filled grains/panicles influenced significantly due to variety. Rice produces 15-20% sterile grains [19]. Sohel et al. [20] reported that difference in spikelets sterility varied significantly by variety and plant spacing.

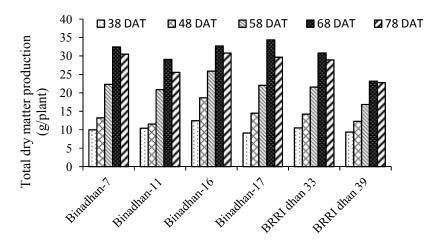


Fig. 3. Total dry matter production of six rice varieties

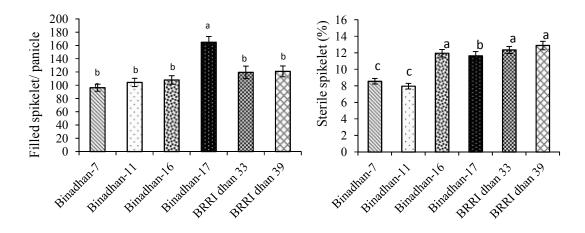
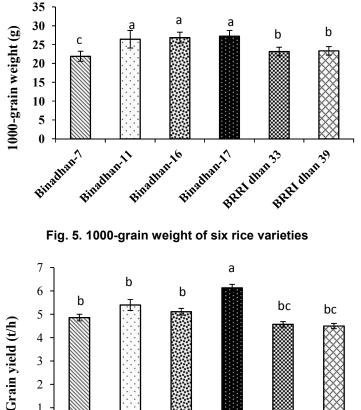


Fig. 4. Filled spikelet and percent of sterile spikelet per panicle of six rice varieties

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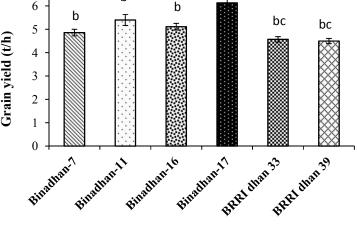


Fig. 6. Grain yield of six rice varieties

## 3.5 1000-grain Weight

Maximum 1000-grain weight was observed in Binadhan-17 (27.25 g) that was statistically similar to Binadhan-11 (26.45 g) and Binadhan-16 (26.88 g). Minimum 1000-grain weight observed in Binadhan-7 (21.94 g) that was statistically different from other varieties (Fig. 5). Roy et al. [17] studied on 12 rice varieties and found difference in thousand weight of grains due to morphological and varietal variation. Mondal et al. [21] stated that 1000-grain weight differed significantly among the 17 aman cultivars studied.

# 3.6 Grain Yield

Maximum grain yield observed in Binadhan-17 (6.13 t/h) that was significantly different from other varieties. Minimum grain yield observed in BRRI dhan39 (4.49 t/h) that was statistically similar to BRRI dhan33 (4.57 t/h) and Binadhan-7 (4.86 t/h) (Fig. 6). Maximum absolute growth rate, total dry matter. Filled spikelet per panicle and also maximum 1000-seed weight collectively contributed to higher grain yield in Binadhan-17 compare to other varieties. Varietal differences of grain yield were reported by Biswas et al. [22]. The genotypes, which produced higher number of effective tillers per hill and higher number of grains per panicle also showed higher grain yield in rice [15]. Yield differences due to varieties were recorded by Islam et al. [23] who observed variable grain yield among varieties.

#### 4. CONCLUSION

In conclusion, from the data pertaining to the different varieties, it may be indicated that not

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only maximum growth rate and maximum tiller number indicates good yield but also less inactive tiller, maximum filled grain, maximum 1000 grain weight collectively contribute to maximum yield in Binadhan -17 and alter that contribute to minimum grain yield in BRRI dhan39.

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# **COMPETING INTERESTS**

Authors have declared that no competing interests exist.

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