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A STUDY ON COMPARATIVE PERFORMANCES OF DIFFERENT RICE VARIETIES AVAILABLE IN AMAN SEASON IN BARISHAL DISTRICT OF BANGLADESH

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Abstract

An experiment was done at a farmer's field in Barishal district to evaluate the comparative performance of one hybrid rice variety- Sorno balam, with four modern varieties BR 11, BRRI dhan 52, BRRI dhan75 and BRRI dhan 87 in Transplanted aman season of 2021. Hybrids and conventional rice varieties differed significantly among themselves to different parameters under study. The highest grain yield (6.40 t/ha) was recorded from the hybrid Sorno balam followed by BRRIdhan87 (5.23 t/ha) and the lowest in BRRI dhan 75 (4.20 t/ha). Further, hybrid Sorno balam produced the highest straw yield (8.7 t/ha), which varied significantly with all other varieties. Minimum days to first flowering 80.67 and maturity (114.33) were noticed in BRRIdhan75 followed by Sorno balam (115.67 and 153.33), respectively. The hybrid variety had a heavier grain weight (26.50 g) than the conventional varieties (21-25 g). It is noted that the hybrid variety maintained a distinct statistical edge over the conventional varieties regarding most of the parameters. Thus, the hybrid Sorno balam was found to be superior to modern varieties for transplanting in the aman season in the Barishal district of Bangladesh.

Keywords: Hybrid, Conventional varieties, Transplanted aman, Grain, Yield.

Introduction

Agriculture is the main base for the development of Bangladesh. Throughout the country, agricultural activities are conducted actively for crop and allied sectors in times of scarcity of natural resources (Khushi *et al.* 2020). Since the independence of the country, agriculture has been a significant source of employment, livelihood, and food security for most rural people besides providing the raw materials to industry and also contributing to the country's exports (Rahman, 2017). The agriculture sector contributes 13.31 percent of country's GDP (BBS, 2018). The crops and horticulture sub-sector contribute 7.10 percent and only rice contributes 53 percent of the crop and horticulture sub-sector. In Bangladesh, 66 percent of the labor force depends on agriculture for their employment. Bangladesh has a population of about 159.9 million with a growth rate of 1.37 percent per annum, giving a population density of 1063 per square kilometer (BER, 2016). Bangladesh is an agricultural country sacred with a climate favorable for rice cultivation. Aus, Aman, and Boro- three rice crops cultivation are possible in the same land in a year since the soils are fertile, the rain-fed or irrigated flood plain land, fertilizer, and other inputs are available (Anwar *et al.* 2020). In the case of high yielding variety (Aus, Aman, and Boro), area, production, and yield growth rates have increased significantly. Bangladesh is the fourth largest rice-producing country in the world (FAOSTAT, 2012) and the third largest (FAPRI, 2009) consumer of rice in the world (Khatun *et al.* 2020). Rice is the staple food of Bangladesh, occupies nearly 90% of the country's total net cropped area, and more than 99% of the people eat rice as their main food @416 g/person/day (Shelley *et al.* 2016; HIES, 2010). It is also the most important crop in Bangladesh regarding area, production and contribution to national economic development (Awal *et al.* 2007; Dutta *et al.* 2002). But Bangladesh has been facing an acute rice shortage for a long time to cope with the rapid population rise (Ghosh *et al.* 2015; Haque *et al.* 2016). Therefore, it has become indispensable to produce more rice to achieve the goal of self-sufficiency in food. Accordingly, production per unit of land area and maximum cropping intensity, are crucial factors (Lal, 2013). However, yields of existing modern rice varieties have become stale-mate. Hybrid rice was successfully developed in China where about 50% rice area is now under it (Varmani, 1994; Yuan, 1994). Good hybrid rice has the potential to yield 14-28% more than the best inbred or pure line variety grown under similar environmental conditions (Sarkar, 2014; Siddiq, 1993). Bangladesh has recently introduced some hybrid rice varieties from China and India. Therefore, the present experiment was undertaken to evaluate the performances of hybrid rice compared with the recently BRRI released rice varieties in Aman season at the farmer's field of Babuganj upazila in Barishal district in 2021.

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Materials and Methods

The experiment

The experiment was conducted at Babuganj upazila of Barishal district from July 2021 through November 2021. The experiment consists of four BRRI-released rice varieties viz. BR11, BRRIdhan52, BRRIdhan75, BRRIdhan85 and one Aman hybrid variety (Sorno balam). The field experiment was laid out in Randomized Complete Block Design (RCBD) with three replications. The distance between the two replications was 1 m and 0.5 m between the two plots. The size of each unit plot was 5 m × 10 m (50 m^2).

Cultivation

Seedling produced in ideal seed bed sowing after germination on 1st June, 2021. Thirty-three days aged single seedling transplanted each hill maintain 25 cm distance between row and 20 cm distance between hills on 3rd July, 2021.

Fertilization

Urea, TSP, MoP, Zinc Sulphate and Gypsum were used 267, 109, 134, 8 and 59 kg/ha, respectively according to the fertilizer recommendation guide (BARC, 2012). The total TPS, MoP, Zinc Sulphate and Gypsum were applied as basal doses during final land preparation. One-third of the urea was applied after seven days of transplanting. The rest of the urea was applied at the top dress at two equal slips at 30 days and 45 days after transplanting.

Pest management

To control soil pests Vitafuran 5g was applied @10 kg/ha. To control pre-emergence weed Rifit 500 EC was applied @1L/ha. Mipcin 75 WP was applied @1.3 kg/ha to control green plant hopper infestation. Virtako 40 WG was applied to control yellow stem borer infestation @75g/ha. To control Blast and sheath blight infection Trooper 75 WP and Knowin 50WP were applied @400 g/ha and 1 kg/ha, respectively. Three hand weeding's were done 10, 25 and 40 days after transplanting to control weed infestation. Two irrigations were done at 25 and 55 days after the transplanting of seedlings.

Data collection

Data were recorded on the plant height (cm), number (No.) of effective tillers/hill, and number of grains/panicle, number of filled grains/ panicle, number of unfilled grains/panicle, panicle length (cm), Days to first flowering and maturity, duration and yield (t/ha). The STAR program (A IRRI developed program) compiled and analyzed all the data statistically.

Results and Discussion

Plant vegetative parameters

Plant height (cm)

The tested varieties differed statistically with each other regarding plant height. It was noticed that the hybrid variety produced the tallest plants (121.10 cm) and the other treatments were statistically shorter than this. However, the BRRIdhan87 had a notable height (115.40 cm) significantly better than BRRIdhan75 (84.13 cm), BRRIdhan52 (112.27cm) as well as BR11 (85.90 cm) (Fig. 1). Similar findings were found by Khatun et al. 2020.

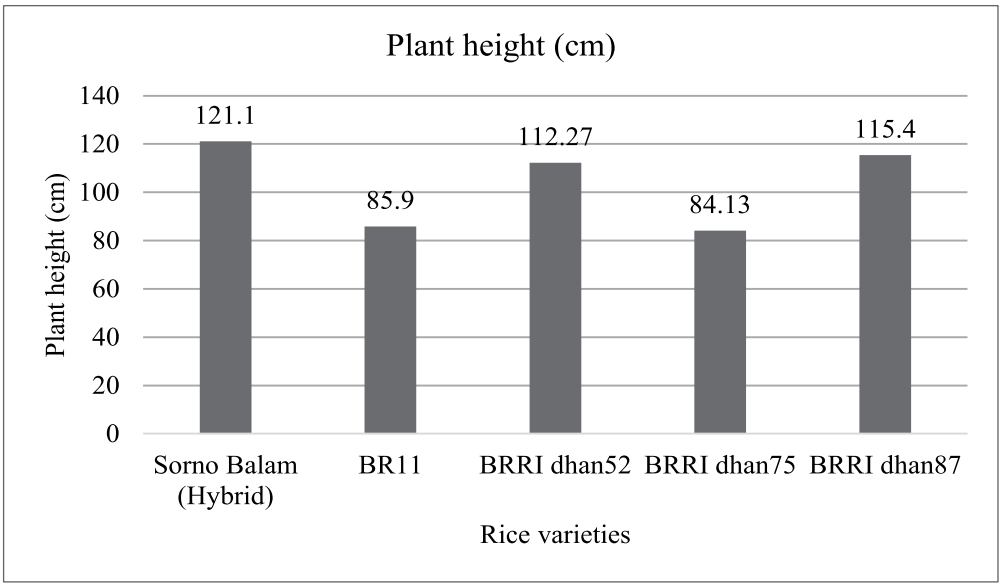

Figure 1. Plant height (cm)

Tillers/hill

The BRRIdhan87 had produced a high range of effective tillers/hill (19.67) whereas BRRIdhan75 possessed the lowest number (15.00). The hybrids as well as BRRIdhan52 produced the same range of effective tillers/hill (17.00) which were statistically similar (Fig. 2) (Khatun et al. 2020).

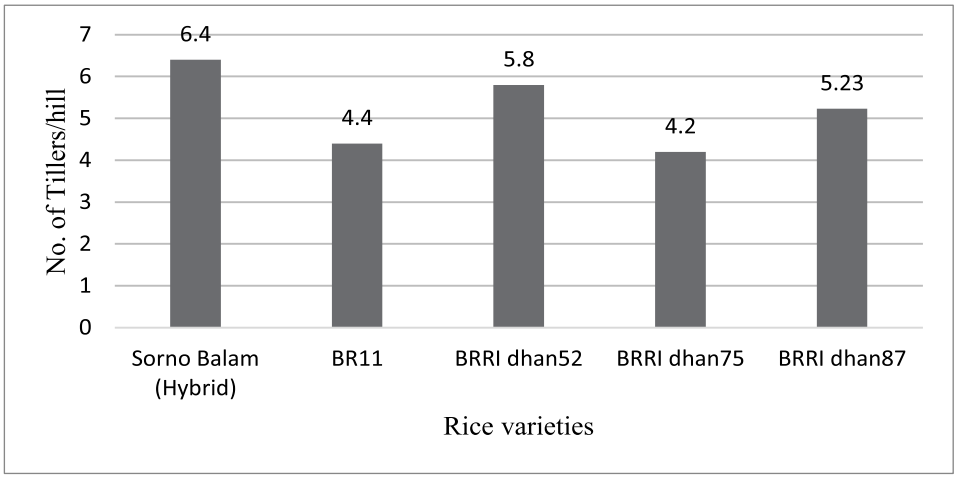

Figure 2. Number of tillers per hill

Plant reproductive parameters

Data on yield and yield contributing characters revealed that both the hybrid and the modern varieties exerted significant influence on the parameters under study (Table 1).

Table 1. Comparative performances of the hybrid rice variety with the modern conventional varieties at the farmer's field of Barishal district in 2021

Cultivars	Panicle length (cm)	Days of first flowering	Days to maturity	Grains/ panicle	Sterile spikelets /panicle	1000 grains weight (g)	Grain yield (t/ha)	Straw yield (t/ha)	Harvest Index (%)
Sorno Balam (Hybrid)	26.67	115.67	153.33	234.00	6.00	26.50	6.40	8.70	42.3
BR11	27.97	117.33	154.33	263.33	15.33	21.20	4.40	6.70	39.6
BRRI dhan52	27.87	109.67	150.00	282.00	13.00	25.27	5.80	7.77	42.7
BRRI dhan75	25.73	80.67	114.33	190.67	6.00	23.00	4.20	6.47	39.4
BRRI dhan87	27.23	91.33	127.00	221.33	8.33	24.40	5.23	7.38	41.5
Significance level	NS	***	***	***	***	***	**	*	**
LSD	2.2409	3.8125	3.6703	24.122	2.5261	1.4941	0.845	1.332	2.782

Notes: LSD: Least Significant Difference, NS: Non-Significant, *: 5% Level of Significance, **: 1% Level of Significance

Panicle length (cm)

The longest panicle was closely formed by BR11 (27.97 cm), followed by BRRIdhan52 (27.87 cm). However, the hybrid variety, BRRIdhan75 and BRRIdhan87 were statistically similar. Variation among the treatments regarding no. of panicle/hill was not pronounced (Table 1). A similar result was found by Islam et al. 2017.

Days to first flowering and maturity

The BRRI dhan75 became the earliest to flower (80.67) and mature (114.33) in comparison with the other varieties (Table 1). The conventional variety BR11 required maximum days (117.33 days) for flowering and 154.33 days for maturity (Islam et al. 2017).

Filled grain/panicle

BRRI dhan52 obtained the highest filled-up grain (282/panicle) but did not differ significantly from BR11 (263.33/panicle). BRRIdhan52 had a clear statistical edge over BR11, BRRIdhan75, BRRidhan87, and hybrid in this respect (Table 1) (Islam et al. 2017).

Sterile spikelets/panicle

The highest Sterile spikelets per panicle were found in BR11 (15.33) and the lowest Sterile spikelets per panicle were observed in the hybrid variety (6.00) which was similar with BRRIdhan75 (Table 1) (Khatun et al. 2020).

1000-grain weight (g)

It is noted that the grains of the hybrids were heavier, compared to those of the BRRI-released varieties. The highest grain weight (26.50g) was exhibited by the Sorno balam hybrid followed by significantly different BRRIdhan52 (25.27g) (Table 1). The BRRI varieties had a medium range (21-25 g) of grain weight and were statistically lighter with respect to the hybrid (Khatun et al. 2020).

The yield of grain (t/ha)

The hybrid Sorno balam obtained the highest grain yield (6.40 t/ha), which significantly varied with the rest of the treatments (Table 1). However, the yield of BRRIdhan52 (5.80 t/ha) was statistically higher than those of BRRIdhan87 (5.23 t/ha) as well as other varieties (4.20-4.40 t/ha) Similar results were found by Kantun et al. 2020, Islam et al. 2017 and Ahmed et al. 2015.

The yield of straw (t/ha)

The hybrid produced the top straw yield (8.7 t/ha) which differed statistically from the rest of the treatments. BRRIdhan52 produced a good amount of straw (7.77 t/ha) significantly higher than BR11 (6.7 t/ha), BRRIdhan75 (6.47 t/ha) and BRRIdhan87 (7.38 t/ha) (Table 1) (Khatun et al. 2020).

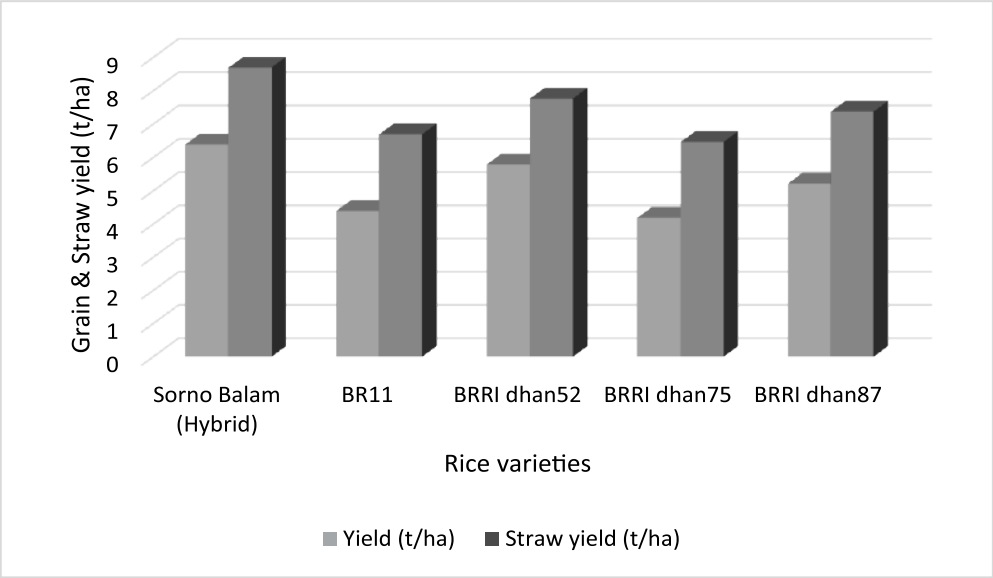

Figure 3. Grain and straw yield under different varieties

Harvest index (%)

The harvest index was significantly influenced by different hybrids and varieties (Table1). The hybrid and the BRRI varieties were statistically similar among themselves except BRRIdhan75 which was significantly lower than the rest of the treatments.

Conclusion

Over the years, Bangladesh had made great success in agricultural growth and structural reform. The agricultural commodity of crops, livestock, fisheries, and forestry sectors has increased and diversified. Bangladesh's most pressing issue is food security. To improve households' food security status and standard of living, existing resources must be properly utilized through boosting by technical efficiency. This research studied the comparative performance of different modern and traditional varieties of T. aman rice available in Babuganj Upazila of Barishal district in Bangladesh. The farmers of the Barishal district generally used T. aman-Grass pea- Fallow cropping pattern. For this reason, the cropping intensity of this region was low. It has to be concluded that the hybrid rice (Sorno balam) variety was performed better and found to be superior in terms of 1000 seeds weight (26.50 g), grain yield (6.40 t/ha) as well as straw yield (8.70 t/ha) than the conventional varieties (BR11, BRRI dhan52, BRRI dhan75, BRRI dhan87) of aman rice. So, the hybrid variety of rice (Sorno balam) would be recommended for cultivation during aman season in the study area.

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