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Performance of Binadhan-12 compared to BRRI dhan49 and Sylheti Pajam in farmers' observation trials of Khagrachari

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ABSTRACT

The performance of different selected rice varieties was evaluated in this study to determine the suitability of a specific BINA-released variety for cultivation in a particular location. The focus was on an Aman season variety, and the experiment was conducted in farmers' fields under the supervision of the Bangladesh Institute of Nuclear Agriculture (BINA) substation, Khagrachari. Three varieties were selected for the trial: Binadhan-12, BRRI dhan49, and Sylheti Pajam. The experiment followed a Randomized Complete Block Design (RCBD) with three replications. Sylheti Pajam exhibited the tallest plants, longest panicles, and highest straw yield, but had the lowest number of tillers per hill, effective tillers per hill, and grain yield. It also required the longest duration to reach maturity. BRRI dhan49 ranked second in terms of grain yield, duration, and straw yield. Binadhan-12, known for its fine grain quality, showed the highest grain yield with the shortest maturity duration, making it highly attractive to both consumers and local growers. While all three varieties showed potential for local cultivation, Binadhan-12 was preferred due to its high yield and short growth duration during the Aman season.

INTRODUCTION

Bangladesh, a South Asian developing country is fighting to feed its ever-increasing population with vulnerable climate change conditions. According to (Islam et al. 2011), people who are exposed to the most severe climate-related dangers are frequently least equipped to handle the associated impacts because of their poor ability for adaptation, and they will likely grow even more vulnerable in the future. About 24.5 million hectares of land in Bangladesh is problematic in nature (Khan et al., 2008). This problem soil impedes the process of cultivating crops to support the economy. Rice being the staple food of Bangladeshis needs advanced varieties and associated technologies to stand with the adverse changing climate and problematic regions of the country. The country is struggling to survive with such conditions through innovation and demonstration of new technologies to improve its agricultural production. Out of the three rice growing season (Aus, Aman, Boro: 17,963 acre total rice growing area), Aman rice occupied 14,143 acre area with 15,426 MT production during 2022-2023. But during Aman season, flood is a common phenomenon. During 2023-2024, area of 37.925 Sq-km was affected by flood in Bangladesh (BBS, 2024). Flash flood is one of the most severe kinds of flood for crops.

In recent years, the Bangladesh Institute of Nuclear Agriculture (BINA) has released several high-yielding and stress-tolerant rice varieties aimed at improving rice cultivation in diverse environments. Khagrachari, a hilly region in the

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Chittagong Hill Tracts, presents unique challenges for rice cultivation due to its varying topography, soil types, and climatic conditions. Identifying rice varieties that perform well in such environments is vital for increasing yields and improving the livelihoods of local farmers. Farmers' Observation Trials (FOTs) provide a practical approach to evaluating the performance of improved varieties under real field conditions, incorporating farmer participation in the assessment process.

To mitigate the effect of floods Binadhan-12 was released in 2020. It is a high-yielding, Submergence tolerant short duration (125-130 days) modern variety of rice suitable for coastal regions and other flood-prone regions of the country. The variety can withstand being completely submerged for 25 days. This variety can also be grown in typical settings with higher yields. In this study, the field performance of Binadhan-12 is evaluated and compared with two popular rice varieties named BRRI dhan49 and Sylheti Pajam (local rice variety) which is popular in the Khagrachari district of Bangladesh. All the taken varieties have opportunities to offer low input costs, withstand local disease severity and easily go with the community status to ensure food security.

Approximately 11.38 percent of the nation's gross domestic product came from the agriculture sector in FY 2022-2023, while 45.4% of the employed population in the nation works in agriculture (BBS, 2024). To ensure more contribution of Agriculture to the national economy through selection of suitable varieties for the region, farmers' observation trials were performed. Farmers' observation trials are one of the significant participatory approaches to find out the actual field performance of a variety and recommend area-specific varietal adaptation. Moreover, an effective feedback can be ensured between growers and scientists during the trials (Ashby, 1986).

MATERIALS AND METHODS

An experiment was carried out at farmers' fields in the Khagrachari district during 2023-2024 Aman growing season (Mid July to 20th November) under BINA substation Khagrachari to demonstrate the performance of Binadhan-12 and to identify suitable areas for cultivation. At the same time, encouraging of the famers for further cultivation was another purpose. Three upazilas were selected namely Sadar, Panchari & Matiranga to experiment. The experiment was materialized followed a randomized complete block design (RCBD) with 3 replications. One BINA released variety, Binadhan-12, one BRRI released variety BRRI dhan49 and another local variety named Sylheti Pajam was used as the trial materials. Line spacing was 25 cm and row spacing was 20 cm maintained. Every replication had a space of 11 decimals. The whole experiment took around 9 bigha (297 decimals) with 27 replications in total.

Experimental rice varieties

Binadhan-12 is a submergence-tolerant variety. The breeding line is IR07F287. Occasionally water-logged fields can be used for this paddy. During 2013, National Seed Board sanctioned this as flash flood tolerant variety. It performs better in normal areas than in water-logging areas. A full-grown plant height is 85-90 cm. 1000 seed weight is 16 gm, the grains are like Minicates (Mia MAB, 2017). This short duration (125-130 days) variety is also high-yielding. After 20-25 days of submergence, the bottom part of the seedlings produces new plants and maintain yield.

BRRI dhan49 is developed by Bangladesh Rice Research Institute (BRRI), Gazipur, Bangladesh. Origin of this variety is BR 6592-4-6-4 (Bangladesh). It was released in 2007. Main characteristics can be described as plant height will be medium, medium slender like Naizersail seed (Mia MAB, 2016) shape. Planting season and time is Kharif II, T. Aman, Mid June-Mid July. Harvesting time is late October. Yield is around 5.5t/ha.

Sylheti Pajam is an aromatic aman rice variety. Pajam first appeared in Sylhet in 1912. Local Pajam was crossed with a high-yielding semi-dwarf Bangladeshi rice variety. A local variety was used in many backcrosses in 2001. Adaptability was seen, with landrace lines offered for station trials in 2010 and a participatory variety selection in 2013. Local selection took place

during the 2016 district season, and the rice was submitted for release in 2017. In November 2018, the committee submitted a variety release application, which was made available nationwide. In 2017, this variety yielded the most in Rangamati field testing. Rice technology was developed in June 2018, and the variety's identifying code was created in July 2019.

Cultivation practices

Seedbeds are prepared for seedling production on 10th July 2023. Seedlings of 25 days were transplanted. Fertilization was done according to the schedule prescribed by the breeder. Nitrogen fertilizer (Urea), phosphorus fertilizer (TSP), potassium fertilizer (MOP), calcium and sulfur enriched fertilizer (Gypsum), Zn containing fertilizers (zinc sulphate) were used 55 kg, 45 kg, 20 kg, 03 kg and 1.5 kg/acre respectively. A basal dose of fertilizers was used during the land preparation process (total amount of TSP, MOP, Zinc Sulphate & Gypsum). Volatile fertilizer Urea was used in three splits (7, 30 & 45 days after transplanting); the last 2 splits were used as top dressing. During the land preparation soil was sterilized against soil pests using Vitafuran 5g (McDonald Bangladesh Pvt. Limited) @10 kg/ha. Pre-emergence weeds were suppressed by Pretilachlor group of weedicides within 5 days of transplanting. Manual weeding was done in the field 3 times in the season, starting from 10 days after transplanting to 15-day intervals. Irrigation was done as per the condition of the field. To manage the infestation of green plant hoppers, 1.3 kg/ha of Mipcin 75 WP (Padma Oil Company Limited) was administered. To suppress the infestation of yellow stem borer, Virtako 40 WG (Syngenta Bangladesh) was treated at a rate of 75g/ha. Trooper 75 WP (Auto Crop Care Limited) and Know in 50 WP (McDonald Bangladesh Pvt. Limited) were applied at 400g/ha and 1kg/ha, respectively, to suppress blast and sheath blight infections.

Data collection

Plant height in centimeters, the number of tillers per plant, number of effective tillers per hill, the length of the panicle in centimeters, grain yield (t/ha), straw yield (t/ha) and days to maturity all were recorded from the field. After collection, data were sorted, analyzed and interpreted using Statistix 10 (Miller Landing Rd, Tallahassee, FL 32312) and Microsoft Excel computer software.

RESULTS AND DISCUSSION

Plant height

The highest plant height was observed in Sylheti Pajam (125.60 cm). Each plant height was statistically significantly different from other varieties. The medium plant height was recorded in BRRI dhan49 (99.20 cm) followed by Binadhan-12 (87.70 cm). The lowest plant height was observed in Binadhan-12 which was statistically differed from others (Table 1). The difference in plant may occur due to varietal genetic character and in accordance with the observation of Sarkar (2014).

Number of tiller/hill

Maximum number of tillers/hill was recorded in BRRI dhan49 (14.30) followed by Binadhan-12 (13.30) and minimum tillers/hill was found in Sylheti Pajam (10.60). There were no statistical differences in number of tiller per hill among these varieties (Table 1). It agrees with (Jisan et al. 2014) where variation in number of tillers per hill might be due to varietal characters.

Number of effective tiller/hill

BRRI dhan49 had maximum tiller number (13.30) followed by Bindhan-12 (12.70) and Sylheti Pajam had lowest effective tillers (10.60). All varieties were statistically similar in production of effective tiller per hill (Table 1).

Panicle length

Highest panicle length was found in Sylheti Pajam (24 cm) which is statistically different from the lowest one, which is Binadhan-12 (22 cm). But in BRRI dhan49 panicle length was (23 cm) similar to both Sylheti Pajam and Binadhan-12. (Table 1).

Table 1: Growth and yield contributing characters of three popular Aman varieties in Farmers' observation trials of Khagrachari

Variety	Plant Height (cm)	Number of Tiller/Plant	Number of Effective Tiller/Hill	Panicle Length (cm)
Binadhan-12	87.7c	13.3	12.7	22.0b
BRRI dhan 49	99.2b	14.3	13.3	23.0ab
Sylheti Pajam	125.6a	10.6	10.6	24.0a
CV	2.6	15.9	15.2	5.4
SE	2.2	1.7	1.5	0.7
LSD (1%)	8.20	-	-	2.42

In a column means having similar letter(s) are statistically similar and those having dissimilar letter(s) differ significantly by LSD at 0.01 level of probability

Days to maturity

It is revealed that Sylheti Pajam required maximum days to maturity (145) which was significantly differ from others varieties (Figure 1). The second highest days to maturity was found in BRRI dhan49 (133) which was significantly differed from others varieties. Binadhan-12 required minimum days to maturity (128). The observation in this study is supported by Ghosh et al. (2015) who recorded variation of days to maturity due to different varieties. 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 is in accordance with the study of Ahmed et al. (2015).

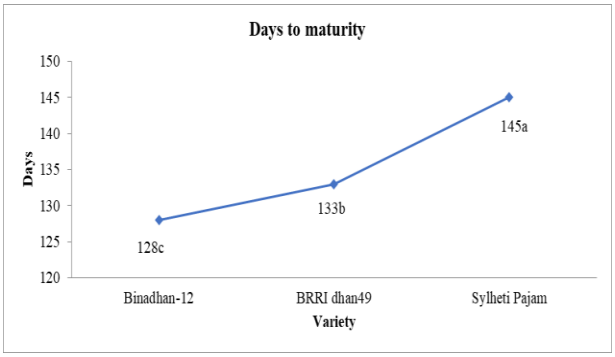

Figure 1: Days to maturity of different varieties

Straw Yield

There were significant differences among two varieties, the maximum and the minimum value in respect of straw yield. Sylheti Pajam showed maximum result in straw yield (7.7 t/ha) and Binadhan-12 resulted straw yield of 6.6 t/ha which was the lowest value. But BRRI dhan49 yielded medium (7.2 t/ha) among three which was statistically similar to other two varieties.

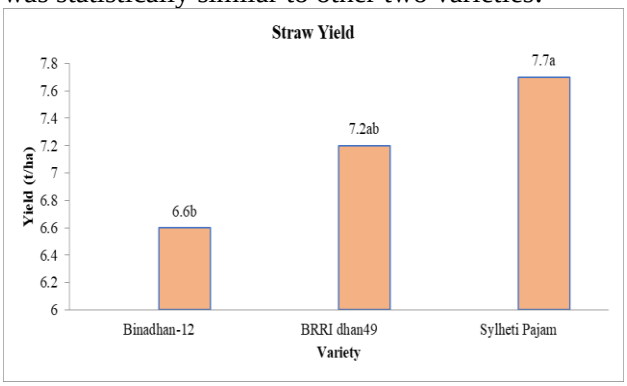

Figure 2: Straw yield of different varieties

Grain Yield

Binadhan-12 provided maximum yield (4.5 t/ha) followed by BRRI dhan49 (4.3 t/ha) and Sylheti Pajam yielded the lowest (3.1 t/ha). Binadhan-12 and BRRI dhan49 were significantly identical in respect of grain yield but both differ from Sylhelti Pajam (Figure 3). This result is supported by Dutta et al. (2002) who observed that yield was affected by the filled grains/panicle. Kiani and Nematzadeh (2012) observed that filled grains/panicle correlated significantly with grain yield.

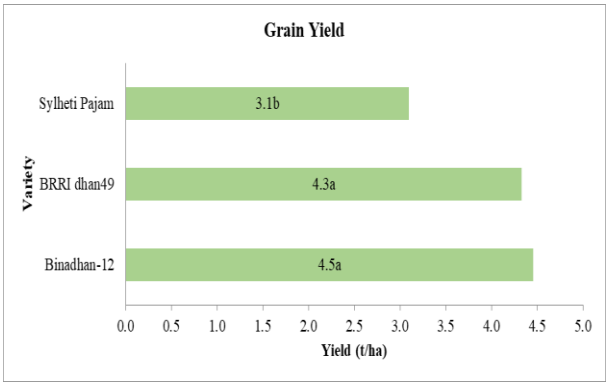

Figure 3: Grain yield of different varieties

CONCLUSION

A wide variation was found in growth and yield contributing characters, duration and yield among three Aman varieties in Khagrachari. The maximum plant height, panicle length and straw yield were observed in Sylheti Pajam with lowest number of tiller per hill, number of effective tiller per hill and grain yield. In respect of duration Sylheti Pajam took maximum days to be matured. BRRI dhan49 was a second highest yielding variety with second highest duration and straw yield. Farmers grow Binadhan-12 for short duration with highest yield. Farmers also prefer Binadhan-12 for its fine grain. In the rice market of Khagracari Binadhan-12 is the most popular variety among the consumers. All three varieties were potential for cultivating in Aman season in Khagrachari for their demand, yield and short duration and deserve further experimental validation.

REFERENCES

Ashby JA (1986). Methodology for the participation of small farmers in the design of on-farm trials. Agricultural Administration, *22*(1), 1-19.

BBS (2024). Yearbook of Agricultural Statistics of Bangladesh. Bureau of Statistics, Statistical Division, Ministry of Planning, Government of the People's Republic of Bangladesh, Dhaka

Mia MAB (2016). BRRI dhan 49 – Digital Herbarium of Crop Plants. (https://dhcrop.bsmrau.net/brri-dhan-49-2)

Mia MAB (2017). Binadhan-12 – Digital Herbarium of Crop Plants. (https://dhcrop.bsmrau.net/binadhan-12)

Islam MB, Ali MY, Amin M and Zaman SM (2011). Climatic variations: farming systems and livelihoods in the high barind tract and coastal areas of Bangladesh. Climate change and food security in South Asia, 477-497.

Khan MS, Rahman MM, Begum RA, Alam MK, Mondol ATMA, Islam MS and Salahin N (2008). Research experiences with problem soils of Bangladesh, Soil Science Division, Bangladesh Agricultural Research Institute, Joydebpur, Gazipur-1701. 3.

Sarkar SC (2014). Performance of five selected hybrid rice varieties in Aman season. Dept of Agricultural Botany, Sher-e-Bangla Agril, Univ., Dhaka. pp. 25-26, 44-46.

Jisan MT, Paul SK and Salim M (2014). Yield performance of some transplant Aman rice varieties as influenced by different levels of nitrogen. Journal of Bangladesh Agricultural. University. 12(2), 321–324.

Ghosh UK, Khan AR and Karim MA (2015). Growth performance of Aus rice varieties under rainfed condition. International Journal of Advanced Multidisciplinary Research, 2(11), 29–35.

Haque KMS, Karim MA, Bari MN and Islam MR (2016). Genotypic variation in the effect of drought stress on phenology, morphology and yield of aus rice. International Journal of Bioscience, 8(6), 73-82.

Ahmed AR, Dutta BK and Ray DC (2015). Response of some rice varieties to different crop management practices towards morphological and yield parameters. International Journal of Science Research Publication, 5(2), 1-6.

Dutta RK, Mia MAB and Khanam S (2002). Plant architecture and growth characteristics of fine grain and aromatic rices and their relation with grain yield. International Rice Communication & Newsletter. 51, 51–56.

Kiani G and Nematzadeh G (2012). Correlation and path coefficient studies in F2 populations of rice. Notulae Scientia Biologicae, 4(2), 124-127.