Bangladesh Agron. J. 2024, 27(1): 19-22

INFLUENCE OF DATE OF TRANSPLANTING ON THE YIELD PERFORMANCE OF SALT TOLERANT RICE VARIETIES DURING *BORO* SEASON

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(**Received:** 03 November 2024, **Accepted:** 31 March 2025)

Keywords: Dry-season *Boro* rice, Salt-tolerant rice varieties, Transplanting date optimization, Coastal region agriculture

Abstract

Future food security in Bangladesh relies heavily on effective adaptation strategies for dry-season *Boro* rice production in coastal regions. This study focused on yield performance by evaluating the different transplanting dates as an adaptation approach for dry-season *Boro* rice. An experiment was conducted in Kamargati village, Kaliganj upazila under Satkhira district to assess the effect of rice variety, transplanting date, and their interaction on the yield performance of salt-tolerant *Boro* rice during December 2023 to February 2024. The study included three varieties: BRRI dhan67, BRRI dhan97, and BRRI dhan99, with five transplanting dates: 15th December, 30th December, 15th January, 30th January, and 15th February. The experiment followed a split-plot design with three replications. Results showed that var. BRRI dhan67 yielded the highest grain (5.58 t ha^{-1}) when transplanted on 15th December. In the transplanting from 15th to 30th December, BRRI dhan99 outperformed BRRI dhan97 in terms of yield. However, after 15th January, increasing soil and water salinity led to crop damage, resulting in no yield. The challenge of early transplantation arises due to the prevalence of T. *Aman* rice in the area, while late transplanting faces difficulties from increasing salinity in soil and water. The results indicate significant differences in yield based on the variety and planting date, with var. BRRI dhan67 consistently producing higher yields in early stages.

Introduction

Rice (*Oryza sativa*) is a crucial staple crop, feeding billions of people worldwide. The *Boro* season, or winter rice, is one of the most important for attaining high yields in Bangladesh (Uddin, 1993; Sikder *et al.,* 2021). To mitigate the challenges posed by saline conditions, salt-tolerant rice varieties have been developed, showing promise for sustaining rice production in affected regions (Thirumeni *et al*., 2024).

Transplanting time is crucial in the *Boro* season as it significantly affects yield performance. Delayed transplanting may expose the crop to lower temperatures and shorter day lengths, which can negatively impact flowering, grain filling, and yield as a whole (Khan *et al*., 2022).

Because of the high salinity levels, Bangladesh's *Boro* season salt-tolerant rice varieties still show yield variability depending on transplanted time (Islam *et al*., 2021). Alam *et al*. 2020 showed that by avoiding the crucial reproductive stage during periods of high salinity, early transplanting in December enabled salt-tolerant cultivars to yield more. In saline-affected areas, yield and water productivity can also be increased by modifying the dates of planting and utilizing salt-tolerant rice cultivars (Sarangi *et al*., 2021).

Farmers can optimize planting schedules to enhance production and minimize crop loss by conducting research on salt-tolerant rice cultivars under different transplanting dates. It is

possible to improve the management of rice production in vulnerable areas in order to ensure both food security and economic stability by knowing how transplanting date affects yield, especially in saline are. In order to determine the best time to plant in saline-prone salt-tolerant rice cultivars in *Boro* season under various transplanting dates was done.

Materials and Methods

Experimental site

The experiment was conducted at farmer's field in Kamargati village under the Kaliganj upazila of Satkhira (AEZ 13, Ganges Tidal Floodplain) during *Boro* season from December 2023 to May 2024.

Experimental details

The study consisted of three BRRI salt tolerant varieties viz, BRRI dhan67, BRRI dhan97 and BRRI dhan99 with five transplanting dates: 15th December, 30th December, 15th January, 30th January, and 15th February. The experiment was laid out in a split-plot design with three replications. Forty-five days old seedlings were transplanted in 5 m × 5 m rows using 2-3 seedlings hill^{-1} maintaining spacing of 20 cm × 20 cm. Fertilizer and cultural practices were followed as per BRRI recommendations.

Data collection and analysis

The crops were harvested at different dates because of variety and different date of transplanting. The maturity of crops was determined at the time when 90% of the grains became golden yellow in colour. Then the harvested crops of each plot and variety were bundled separately, properly tagged and brought to the threshing floor. Grains were separated from the plants by pedal thresher. The grains then were cleaned, weighed and dried in the sun. Then the grain moisture content was adjusted to 14% moisture content. Finally grain yields unit^{-1} area were converted to t ha^{-1}. Data were collected on yield and yield attributes and mean difference were compared by least significant difference (LSD) test.

Results and Discussion

Effect of transplanting dates on grain yield

The results showed that a significant variation in yield across transplanting dates and rice varieties, emphasizing the importance of optimal planting time for maximizing yield. Rice var. BRRI dhan67 showed the maximum yields of 5.58 and 5.13 t ha^{-1} when transplanted on December 15 followed by December 30. However, yield dropped sharply to 2.83 t ha^{-1} by mid-January and reached zero by January 30. BRRI dhan97 showed consistently lower yields across all dates, with a peak yield of 3.54 t ha^{-1} on December 15, followed by a gradual decline to 3.33 t ha^{-1} by December 30, and further reductions in January. BRRI dhan99 exhibited moderate performance, at 4.12 t ha^{-1} on December 15, decreasing steadily to 1.91 t ha^{-1} by January 15, and ceasing production in late January.

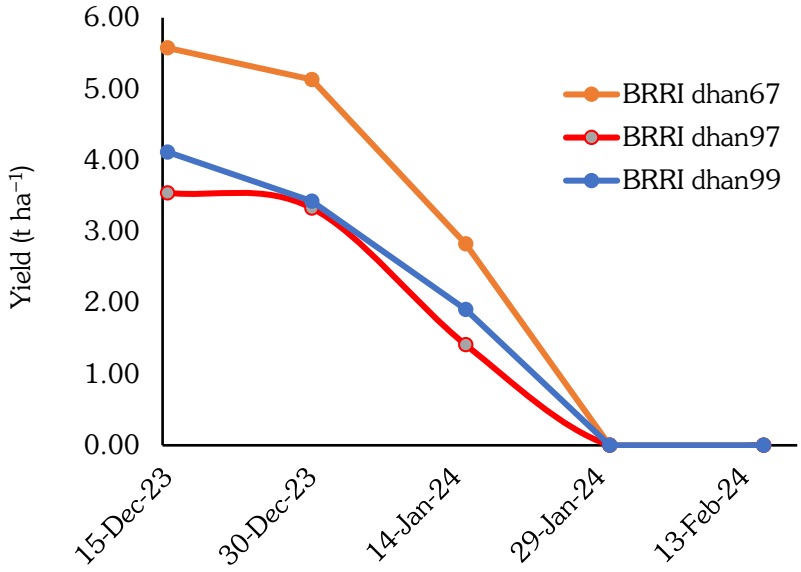

Fig. 1. Yield (t ha^{-1}) of different varieties over time

The Fig. 1 showed that all varieties marked decline in yield over time, reaching zero by late January. Salam *et al*. (2019) identified BRRI dhan67 as a high-yielding variety in saline-affected areas, corroborating its peak performance in this study. However, delays in transplanting expose crops to adverse environmental conditions, such as increased salinity and temperature fluctuations, leading to reduced yields.

Effect of Environmental Conditions on Yield

Rising soil and water salinity from January to April had a negative impact on rice yields (Fig. 2).

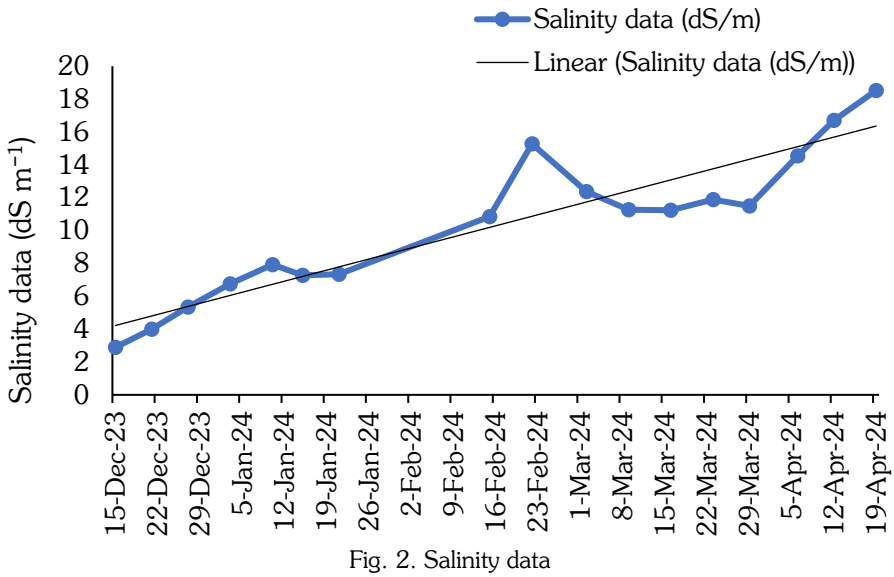

Fig. 2. Salinity data

BRRI dhan67, recognized as salinity tolerance (Islam & Gregorio, 2013; Salam *et al*., 2019), performed best under optimal conditions but suffered yield reductions under increased

salinity stress in January. The reduced yields of BRRI dhan97 after December 30 may also reflect its sensitivity to temperature fluctuations, as noted by Najeeb *et al*. (2021).

Conclusion

The results showed the critical importance of transplanting dates in maximizing rice yield under saline conditions. The optimal transplanting *Boro* rice was identified as December 15–30, with yields declining significantly beyond this period. Rice var. BRRI dhan67 identified the most promising variety for saline-prone areas, while BRRI dhan97 and BRRI dhan99 require further evaluation to enhance performance under sub-optimal planting conditions. However, this study's limitation to a single location highlights the need for broader research to account for varying environmental factors across different regions. Future studies should include more varieties and locations to better understand yield performance across different environments.

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