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Performance evaluation of Improved Rice (*Oryza sativa* L.) varieties under farmers' field conditions in the coastal agro-ecosystem of south 24 parganas, West Bengal during Kharif 2025

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Abstract

Rice is the principal staple food crop of eastern India, and varietal improvement remains a key strategy for enhancing productivity under diverse agro-climatic conditions. A collaborative field evaluation was conducted by The Neotia University and Mali Seeds Pvt. Ltd. during Kharif 2025 at Kasipur village, West Bengal, to assess the performance of six rice varieties for yield and yield-attributing traits. The experiment included four Mali rice varieties (Mali-4, Mali-1712, Mali-1919, and Kalachampa) and two check varieties (CR 1017 and CR 510). Significant differences were observed among the varieties for all traits studied. Mali-4 recorded the highest grain yield (6.21 t ha^{-1}), along with superior effective tillers per plant and filled grains per panicle. Mali-1712 exhibited the maximum plant height and panicle length, whereas Mali-1919 showed early flowering characteristics. The results indicate that Mali-4 possesses high yield potential and adaptability under coastal West Bengal conditions and can be recommended for wider cultivation.

Keywords: Rice, varietal evaluation, grain yield, Mali Seeds, coastal agriculture, Kharif season

Introduction

Rice (*Oryza sativa* L.) is one of the most important cereal crops worldwide and serves as the staple food for more than half of the global population. In India, rice occupies approximately 45 million hectares and contributes significantly to national food security. The eastern and coastal regions of West Bengal are characterized by diverse agro-ecological conditions, where productivity is influenced by varietal adaptability, climatic variability, and soil conditions.

The development and evaluation of high-yielding rice varieties are essential for sustaining production and improving farmers' income. Private seed companies and academic institutions play a vital role in identifying suitable cultivars through collaborative field trials. Mali Seeds Pvt. Ltd. has developed several promising rice varieties targeted for eastern Indian conditions. Therefore, a field study was undertaken jointly by Mali Seeds Pvt. Ltd. and The Neotia University during Kharif 2025 to evaluate the agronomic performance and yield potential of selected rice varieties under farmers' field conditions in Kasipur village of coastal West Bengal.

Materials and Methods

Experimental Site

The field experiment was conducted during the Kharif

season of 2025 at Kasipur village, South 24 Parganas district, West Bengal, India. The area falls under the coastal agro-climatic zone and is characterized by humid tropical conditions with monsoon rainfall during the crop-growing season.

Experimental Materials

Six rice varieties were evaluated:

- Mali-4
- Mali-1712
- Mali-1919
- Kalachampa
- CR 1017 (Local Check)
- CR 510 (National Check)

Experimental Design and Crop Management

The experiment was laid out following a Randomized Block Design (RBD) with three replications. Standard agronomic practices recommended for transplanted rice cultivation were followed throughout the crop growth period. Healthy seedlings were transplanted at recommended spacing and crop management practices were uniformly maintained across all treatments.

Observations Recorded

Data were recorded on the following parameters:

1. Days to 50% flowering
2. Plant height (cm)
3. Effective tillers per plant
4. Panicle length (cm)
5. Panicle weight (g)
6. Filled grains per panicle
7. 1000-grain weight (g)
8. Grain yield (t ha^{-1})

The collected data were subjected to analysis of variance (ANOVA), and treatment means were compared using the Critical Difference (CD) test at 5% probability level.

Results and Discussion

Days to 50% Flowering

Significant variation was observed among the rice varieties for flowering duration. Mali-1919 recorded the earliest flowering (115.67 days), followed by Kalachampa (125.03 days). Mali-4 was the latest flowering variety (145.33 days). Earliness is often desirable for escaping late-season stresses and fitting into multiple cropping systems.

Plant Height

Plant height ranged from 130.41 cm to 174.43 cm. Mali-1712 exhibited the tallest plants (174.43 cm), significantly superior to all other varieties. The shortest plants were observed in CR 1017 (130.41 cm). Taller plant stature may contribute to greater biomass production, although excessive height may increase lodging susceptibility.

Effective Tillers per Plant

Effective tillers are a major determinant of grain yield. Mali-4 recorded the highest number of effective tillers per plant (15.53), which was significantly higher than the

remaining varieties. Kalachampa produced the lowest number of tillers (8.10).

Panicle Length and Panicle Weight

Mali-1712 produced the longest panicles (27.92 cm), while Mali-4 exhibited comparatively shorter panicles (23.99 cm). However, Mali-4 registered the highest panicle weight (3.44 g), indicating superior grain filling and sink strength.

Filled Grains per Panicle

The number of filled grains per panicle varied significantly among varieties. Mali-4 recorded the highest value (124.97), followed closely by Mali-1919 (122.67) and CR 510 (121.90). Enhanced grain filling directly contributes to increased yield performance.

Thousand Grain Weight

The highest 1000-grain weight was observed in Mali-4 (28.00 g), followed by Mali-1919 (27.63 g). Kalachampa recorded the lowest test weight (22.43 g). Higher grain weight is generally associated with better grain quality and yield.

Grain Yield

Grain yield differed significantly among the evaluated varieties. Mali-4 produced the highest grain yield of 6.21 t ha^{-1} , followed by CR 510 (5.74 t ha^{-1}) and CR 1017 (5.61 t ha^{-1}). Mali-1712 recorded the lowest yield (5.08 t ha^{-1}).

The superior yield performance of Mali-4 can be attributed to its higher effective tillers, greater panicle weight, maximum filled grains per panicle, and higher test weight. These findings suggest that Mali-4 effectively converts its yield components into enhanced grain productivity under coastal agro-ecological conditions.

Table 1: Mean performance of rice varieties evaluated during Kharif 2025

Variety	Days to 50% Flowering	Plant Height (cm)	Effective Tillers/Plant	Panicle Length (cm)	Panicle Weight (g)	Filled Grains/Panicle	1000 Grain Weight (g)	Yield (t ha^{-1})
Mali-4	145.33	135.44	15.53	23.99	3.44	124.97	28.00	6.21
Mali-1712	140.90	174.43	12.11	27.92	3.00	115.65	23.00	5.08
Mali-1919	115.67	140.30	12.63	25.70	3.20	122.67	27.63	5.43
Kalachampa	125.03	141.54	8.10	26.06	2.70	114.57	22.43	5.48
CR 1017 (LC)	125.70	130.41	12.87	25.10	2.81	119.97	24.27	5.61
CR 510 (NC)	133.67	134.52	12.13	25.07	2.86	121.90	25.67	5.74
Grand Mean	131.05	142.78	12.23	25.64	3.00	119.95	25.17	5.59
SE(d) $\pm$	0.70	0.64	0.38	0.64	0.17	0.95	0.25	0.24
CD (P=0.05)	1.56	1.43	0.85	1.42	0.38	2.12	0.56	0.53

Conclusion

The collaborative varietal evaluation conducted by Mali Seeds Pvt. Ltd. and The Neotia University demonstrated significant variability among rice varieties for yield and yield-contributing traits under coastal West Bengal conditions. Among all tested entries, Mali-4 emerged as the best-performing variety with the highest grain yield (6.21 t ha^{-1}), maximum effective tillers, highest panicle weight, filled grains per panicle, and 1000-grain weight. Mali-1919 showed promise as an early-duration variety, while Mali-1712 exhibited superior vegetative growth characteristics. Based on overall performance, Mali-4 may be recommended for large-scale cultivation and future demonstration trials in coastal regions of West Bengal.

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