

# Three new disease-resistant rice varieties developed by BRRI



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Rice farmers in Bangladesh face two broad categories of challenges: biotic (biological) and abiotic (environmental) stress. Biotic stresses include diseases caused by bacteria, fungi, and viruses such as Blast, Tungro, Bacterial leaf blight (BLB), brown spot, sheath blight, and sheath rot along with all insect infestations. These factors significantly reduce rice yields by about 15% in the Boro season, 24% in Aus, and 18% in Aman. According to the UN Food and Agriculture Organization (FAO), up to 37% of global rice production is lost annually due to pests and diseases. In Bangladesh, these losses average around 18% across all seasons, though severe outbreaks can cause much higher damage. Of the 32 identified rice diseases in the country, 10 are considered major, affecting both yield and grain quality.

Abiotic stresses such as floods, drought, waterlogging, salinity, and temperature extremes also severely impact rice productivity. Climate change is intensifying these stresses, making sustainable production increasingly challenging. To address this, the Bangladesh Rice Research Institute (BRRI) has developed 39 stress-tolerant rice varieties, including those tolerant to salinity, drought, submergence, cold, and tidal conditions. These varieties contribute about 20% of the country's total rice production and play a crucial role in ensuring food security.

While BRRI has made notable progress in developing climate-resilient varieties, advances in pest- and disease-resistant varieties had lagged behind. However, recent breakthroughs mark a significant shift. BRRI has successfully developed three disease-resistant varieties: BRRI

dhan101, BRRI dhan114 and BRRI dhan117 offering effective solutions against major rice diseases like BLB and Blast.

**BRRI dhan101: A Defense Against Bacterial Leaf Blight (BLB):** BRRI dhan101 is a high-yielding Boro variety resistant to bacterial leaf blight (BLB), a devastating disease caused by *Xanthomonas campestris* pv. *oryzae*. The disease spreads through seeds, irrigation water, and wind, causing yellowing and drying of leaves, ultimately reducing yield. This variety has upright, long, and broad dark-green leaves. Its average yield

**BRRI dhan114& 117: Breakthroughs in Blast-Resistant Varieties:** Rice blast, caused by *Pyricularia oryzae*, is one of the most destructive diseases in Boro rice. It can attack the plant at any stage from seedling to maturity affecting leaves, nodes, and panicles. In severe cases, it can lead to total crop failure. To combat this, BRRI developed BRRI dhan114 the country's first blast-resistant rice variety. Scientists introduced the blast resistance gene (*Pb9*) using advanced breeding techniques, including marker-assisted selection. This variety was approved for cultivation by the National Seed Board in May 2025 after

average yield of 8.6 tons per hectare, which is about 1.5 tons higher than BRRI dhan114. With proper management, the yield can reach up to 9.90 tons per hectare. The grains are medium-bold and golden in color. Its growth duration ranges from 129 to 135 days, which is comparable to the popular Boro variety BRRI dhan28. The grain contains 24.2% amylose and 9.3% protein, producing non-sticky, fluffy rice suitable for consumer preference. A key strength of this variety is its combined tolerance and resistance traits. In addition to salinity tolerance, BRRI dhan117 shows strong resistance to blast disease and has demonstrated a high level of resistance (score 0-3) under artificial inoculation conditions. This combination of short duration, higher yield, salinity tolerance, and blast resistance positions BRRI dhan117 as a strategically important variety for enhancing productivity and resilience in coastal and stress-prone rice ecosystems.

**Economic and Environmental Impact:** The introduction of these resistant varieties has major economic and environmental implications. Blast-resistant BRRI dhan114& 117 eliminates the need for fungicide application, significantly reducing production costs for farmers. In Bangladesh, farmers spend thousands of crores of taka annually on fungicides during the Boro season. With the adoption of resistant varieties, much of this cost can be saved.

**A Strategic Way Forward:** The development of BLB- and blast-resistant varieties marks a major milestone in Bangladesh's agricultural advancement. These innovations not only protect yields but also reduce dependence on chemical inputs, lower production costs, and promote environmental sustainability. To fully leverage these benefits, policy support is essential. Increased investment in research and development, along with strong promotion of resistant varieties, can accelerate adoption and maximize impact.

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is 7.72 tons per hectare, which can reach up to 9 tons with proper management. The grains are long, slender, and golden. Its growth duration is 142 days, four days shorter than the popular BRRI dhan58. The 1000-grain weight is about 23.1 grams. The grain contains 25% amylose and 9.8% protein, producing non-sticky, high-quality rice. A key feature of BRRI dhan101 is the presence of strong BLB resistance genes (*Xa21*, *Xa4*, and *Xa7*). Under artificial inoculation, it has demonstrated high resistance (score=1). After three years of field trials and successful farmer-level evaluations, the variety was officially released in 2022 and has already gained popularity in BLB-prone areas.

extensive field testing. It has all the desirable traits of modern high-yielding varieties. Its growth duration is 154 days, similar to BRRI dhan89 and 4-5 days shorter than BRRI dhan28. The plant has strong stems, preventing lodging, and features long, erect, dark-green leaves. The grains are medium-bold, white, and produce fluffy, tasty rice. The amylose content is 27%, and protein content is 7.7%. The average yield is 8.2 tons per hectare, with potential yields up to 10.23 tons under optimal conditions.

Then most recently developed BRRI dhan117, a short-duration Boro rice variety that is both salinity-tolerant and blast-resistant. BRRI dhan117 has an