



DRR Dhan 90 (IET 29581): A Nitrogen Use Efficient Rice Variety Adapted to Low Soil Nitrogen Input Conditions

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Abstract

DRR Dhan 90 [IET 29581 (RP6255-BV-RIL-1696)], a low soil nitrogen (N) tolerant rice variety with nitrogen use efficiency (NUE), was developed from the cross of BPT5204/Varadhan. The entry was evaluated in All India Coordinated Research Project on Rice (AICRPR) multi-location Low Nitrogen Tolerance Trials (LNT) during 2021-2024 under 0% N application and 50% of recommended N dosage conditions. DRR Dhan 90 consistently outperformed the checks in Zone VII under low N conditions. Under 50% N condition, the mean grain yield in Zone VII was 4590 kg/ha with superiority over Improved Samba Mahsuri (14%), Rasi (22%) and Varadhan (39%). Under 0% N condition, the variety recorded a mean grain yield of 4098 kg/ha with superiority of 26%, 2% and 46% over the respective checks. The variety exhibited moderate resistance to leaf blast, neck blast, sheath rot and moderate resistance to brown plant hopper, white-backed plant hopper, stem borer and whorl maggot. DRR Dhan 90 possesses desirable grain and cooking quality traits with short bold grains, intermediate amylose content (22.7%) and head rice recovery (64.7%). Based on its consistent multi-environment superiority for yield and adaptability to low N condition, DRR Dhan 90 was released for commercial cultivation in the irrigated ecosystems of Andhra Pradesh, Telangana and Karnataka by the Central Sub-Committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops vide S.O. 6123 (E) dated December 31, 2025 (CG-DL-E-31122025-268976).

Keywords: Rice, nitrogen use Efficiency, low nitrogen soil, grain yield and good head rice recovery.

Introduction

Rice (*Oryza sativa* L.) is one of the major staple food crops cultivated extensively under irrigated ecosystems in India, covering nearly 20-22 million hectares, which constitutes about half of the total rice cultivation area in India. Rising fertilizer costs, reduced nitrogen use efficiency, and environmental concerns associated with excessive N application necessitate the development of rice varieties adapted to low N input conditions. Breeding rice varieties with improved nitrogen use efficiency is

therefore an important strategy for sustainable rice production under changing climate scenarios. With this objective, breeding programme for development of low N tolerant rice varieties with nitrogen use efficiency was initiated during 2011 under the National Innovations in Climate Resilient Agriculture (NICRA) project at ICAR-Indian Institute of Rice Research. Several genotypes including released rice varieties and landraces were evaluated and crossing material was developed. The segregating generations

were advanced through pedigree selection under low nitrogen and irrigated conditions. The promising culture RP6255-BV-RIL-1696 was identified based on superior yield performance, adaptation and grain quality. Subsequently, the entry was nominated as IET 29581 in AICRPR LNT trials during *Kharif*-2021. The entry consistently performed well under low soil N conditions across multiple locations and years and was released as DRR Dhan 90 for irrigated ecosystems of Zone VII comprising the states of Karnataka, Telangana and Andhra Pradesh.

Yield Performance

DRR Dhan 90 exhibited stable grain yield performance across coordinated trials conducted during 2021–2024 under low N conditions. Under 50% recommended N application, the weighted mean grain yield in Zone VII was 4590 kg/ha; 4387 kg/ha in Karnataka, 5194 kg/ha in Telangana and 4457 kg/ha in Andhra Pradesh. The variety showed substantial superiority over the low N susceptible check, Improved Samba Mahsuri and positive checks Rasi and Varadhan. Under 0% N application, DRR Dhan 90 recorded a weighted mean grain yield of 4098 kg/ha in Zone VII with corresponding weighted mean grain yields in Karnataka (4290 kg/ha), Telangana (3612 kg/ha) and Andhra Pradesh (4347 kg/ha). The variety consistently maintained superior performance even under low N (0% N) conditions, indicating its suitability for low N input cultivation systems (Table 1, Figure 1A).

Disease and Insect Pest Reaction

DRR Dhan 90 exhibited moderate resistance to important diseases such as leaf blast, neck blast, sheath rot and grain discoloration in National Screening Nursery evaluations conducted during 2021-2023. The variety also showed moderate resistance to major insect pests including BPH, WBPH, stem borer and whorl maggot.

Grain and Cooking Quality

DRR Dhan 90 possesses desirable grain and cooking quality characteristics. The variety recorded good

hulling percentage (78.4%), milling percentage (68.7%) and head rice recovery (64.7%). The grains are short bold type with kernel length of 5.47 mm and kernel breadth of 2.15 mm. The variety possesses intermediate amylose content (22.7%), alkali spreading value of 4.0 and gel consistency of 22.3 mm, indicating acceptable cooking quality (Figure 1B).

Recommendation and Adaptation

DRR Dhan 90 is suitable for cultivation under irrigated ecosystems of Karnataka, Telangana and Andhra Pradesh in Zone VII. The variety performs well under reduced nitrogen conditions including 0% N and 50% recommended N application, thereby reducing fertilizer dependence and improving nitrogen use efficiency.

Table 1: Yield performance of DRR Dhan 90 under low nitrogen conditions

Zone/ State	Mean grain yield (kg/ha)	Superiority over ISM (%)	Superiority over Rasi (%)	Superiority over Varadhan (%)
50% of Recommended N				
Zone VII	4590	14	22	39
Karnataka	4387	29	53	39
Telangana	5194	23	43	21
Andhra Pradesh	4457	-	-	67
0% of Recommended N				
Zone VII	4098	26	2	46
Karnataka	4290	33	13	45
Telangana	3612	33	50	27
Andhra Pradesh	4347	38	12	85



Figure 1A: Field view of DRR Dhan 90 under N-50% treatment



Figure 1B: Single plant view of DRR Dhan 90 under N-low, N-50% and N-Rec treatments (Left); Paddy, Brown rice and Polished rice of DRR Dhan 90 (Right).