



## DRR Dhan 65 (IET 27641) - A High Yielding Low Soil Phosphorous Tolerant and Climate Resilient Rice Variety Developed from Wild Introgression Lines

Divya Balakrishnan\*, Sarla Neelamraju, Vijai Pal Bhadana, Jyothi Badri, Subba Rao LV, Sundaram RM, Subrahmanyam D, Voleti SR, Padmavathi G, Swamy AVSR, Senguttuvel P, Magrauthia SK, Anantha MS, Aravind Kumar J, Prasad MS, Laha GS, Ladhakshmi D, Jhansi Lakshmi V, Padmavathi Ch, Padmakumari AP, Jhansi Rani B, Mahendrakumar R, Sreedevi B, Mangaldeep Tuti, Surekha K, Brajendra, Suneeta K, Revathi P, Gireesh C, Fiyaz RA, Kalyani MB, Suvarna Rani Ch, Sruthi K, Nirmala B, Nagarjuna E, Vijay Kumar M, Thaseen M, Pradeep Reddy M, Prasad Babu Adari, Malathi Surapaneni, Vishnu Prasanth V and Siddique EA

ICAR-Indian Institute of Rice Research (ICAR-IIRR), Rajendranagar, Hyderabad - 500030

\*Corresponding author Email: [dbiirr23@gmail.com](mailto:dbiirr23@gmail.com)

Received : 24<sup>th</sup> November, 2023; Accepted : 18<sup>th</sup> December, 2023

### Abstract

The wild species of *Oryza* are an important source of genetic variability for the improvement of yield and tolerance to biotic and abiotic stresses. Phosphorus (P) is the second most important key nutrient, vital for plant growth and development at all stages. Phosphorous deficiency is one of the factors limiting rice yields and farmer's profitability so it is necessary to identify genotypes with stable yield and tolerance to P deficiency. Keeping in view the unlimited potential of wild species for yield enhancement and stress tolerance, interspecific population between *Oryza rufipogon* in the back ground of *Oryza sativa* genotype KMR3 was developed by advanced back cross breeding strategy. DRR Dhan 65 (IET 27641) (RP Bio 4919-B-B NSR86) is an interspecific wild introgression line, a derivative of KMR 3 / *O rufipogon* with short bold grains which is high yielding under both normal and low soil phosphorous conditions. It has seed to seed maturity of 130-135 days and gives an average yield of 6.5 t/ ha (under normal conditions; 60 kg/ha of P, *i.e.*, recommended dose) and 4.7 t/ ha (under low Phosphorus; 40 kg/ha of P). It was released for cultivation in Andhra Pradesh, Telangana, Karnataka, Chhattisgarh, Jharkhand and Maharashtra states through Central Sub-committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops vide S.O. 4065(E) dated 31<sup>st</sup> August, 2022 [CG-DL-E-31082022-238490].

**Keywords:** Irrigated rice, low P tolerance, climate resilience, wild introgression lines.

### Introduction

Considering the unlimited potential of wild species for identification of yield enhancing genes, interspecific population between *Oryza sativa* and *Oryza rufipogon*; was developed with a primary objective to identify yield QTLs. DRR Dhan 65 (IET 27641) is a wild introgression line developed by ICAR-IIRR using parental lines a) IR 58025A, a widely used CMS line having long grain type and early maturity along with good milling and eating qualities, b) an Indian accession

of *Oryza rufipogon* (IC 22015/WR120) collected from Kerala, India, which was maintained at ICAR-IIRR (erstwhile DRR) was used as a donor parent and c) KMR3, restorer line for popular high yielding hybrid KRH 2. An advanced backcross strategy was followed to develop the population. The high yielding lines in the genetic background of KMR 3 were characterized for three years and were further advanced based on single panicle selection up to BC<sub>3</sub>F<sub>10</sub> and the seed was

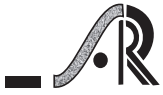


multiplied. The population was tested during four wet seasons (2014, 2015, 2016 and 2018) under normal irrigated conditions (N-100 kg/ha, P- 60 Kg/ha, K-60 kg/ha) and during two dry seasons of 2016 and 2018 under low phosphorus (Olsen P 1.8 kg/ha). NSR86 is a selection from a back cross introgression line 377-24 from this population which showed high yield under both Low P and irrigated conditions across the seasons compared to recurrent parent KMR 3. *O. rufipogon* introgressions into restorer line KMR3 helped to improve yield and tolerance to low Phosphorus in soil. The promising line, RP Bio 4919-B-B NSR86 was identified and nominated in AICRIP LPT trial-2019 after successfully performing in the 2018 pilot trial. Subsequently, the entry performed well in all the four years and released as low P tolerant rice variety DRR Dhan 65 through Central Sub-committee on Crop Standards, Notification and Release of Varieties for Agricultural Crops vide S.O. 4065(E) dated 31<sup>st</sup> August, 2022 [CG-DL-E-31082022-238490] suitable for cultivation in Andhra Pradesh, Telangana, Karnataka, Chhattisgarh, Jharkhand and Maharashtra.

DRR Dhan 65 (IET 27641), is similar to the recurrent parent, KMR 3 possessing good cooking quality with short bold grain type and higher yield. It also has resistance to leaf blast, neck blast and sheath blight. It is high yielding under both low soil phosphorus and normal irrigated condition. It recorded average grain yield advantage of +24.23% and +17.26% (in terms of weighted average) over the positive check Swarna (late duration) under 100% and 50% application of phosphorous, respectively. It also showed a yield advantage of +75.71, +22.4, +44.51 and +69.02 over Rasi (Positive check), Swarna (Positive Check), Improved Samba Mahsuri (negative check) and DRR Dhan 60 (recently released variety), respectively considering weighted mean average of *khariif* 2018, 2019, 2020 and 2021 under normal (100% of recommend dose of fertilizer (RDF) phosphorus condition. Similarly, at low phosphorus condition it yielded with +45.67, +9.91, +37.1 and, +68.91 over these checks.

IET 27641 (NSR 86) exhibited tolerant reaction to leaf blast, neck blast, sheath blight and BPH. During 2019, based on NSN 2, IET 27641 showed field tolerance to BPH at Maruteru with a DS of 3.0. During 2020, IET 27641 exhibited low over all disease score and high promising index under NSN-1 for Neck blast. IET 27641 possesses short bold grain type with high HRR (67.5%) and acceptable grain quality parameters of amylose content (25.93%), soft GC (45) and ASV (5.0) and is comparable to the recurrent parent, KMR 3 in all the grain and cooking quality parameters. Based on the grain yield efficiency index GYEI values of stable and nutrient use efficient genotypes, IET 27641 identified as the II top culture in 2020, IV top culture in 2019 in the agronomy trials. The wild introgression line NSR 86 (377-24) is identified as one of the heat tolerant line with high yield and minimum yield loss under heat stress at IIRR and also in multi-location testing conducted by AICRIP Physiology at 7 different locations all over India. IET 27641 is also having agro-morphological and grain characteristics similar to KMR 3 with enhanced stress tolerance and is very high yielding compared with parent KMR 3 and other long duration checks.

Thus, DRR Dhan 65 is high yielding with tolerance to low soil phosphorous. It has exhibited good grain quality along with tolerance to various biotic and abiotic stresses. Based on background genotyping, it has shown > 96.00% recovery of recurrent parent genome. Considering better yield performance of the variety in P deficit as well as under normal conditions and stress tolerance, grain and cooking quality traits it can replace short bold or late duration varieties like Swarna, specifically for those areas which are endemic to blast disease and/or with P deficient soils, thus significantly reducing the cost of cultivation. Therefore, DRR Dhan 65 is potential late duration climate resilient rice variety for the low-input areas of the country for making rice cultivation more economical.



**DRR Dhan 65 under Normal irrigated conditions**



**DRR dhan 65**



**Grain type**



**DRR Dhan 65 under Low phosphorus conditions**