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ICAR - Indian Institute of Rice Research

Rajendranagar, Hyderabad - 500 030, T.S.

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FOREWORD

Rice is the staple food for more than two thirds of Indian population contributing to 40% to the total food grain production thereby, occupying a pivotal role in the food and livelihood security of the people. ICAR - Indian Institute of Rice Research (ICAR-IIRR) was established by the Indian Council of Agricultural Research (ICAR) in 1965 with its headquarters at Hyderabad to organize and coordinate multi-location testing of varietal and crop management for all rice eco systems prevailing in the country. A total of 62 varieties, 3 hybrids and 40 unique genetic stocks were developed by ICAR-IIRR along with non-varietal technologies and rice-based products of impact. These technologies have potential for application in different ecologies. ICAR-IIRR has taken the lead to bring out the book on **"Innovative technologies and services available @ ICAR - Indian Institute of Rice Research",** which gives comprehensive information on the technologies developed by the Institute and available for licensing/commercialization in addition to the contractual and collaborative research services offered by the Institute. I am happy to note that the institute has signed a total of 36 Memorandum of Agreements (MOAs) for its rice hybrids, varieties, genetic stocks and non-varietal technologies with various private seed companies for their large-scale seed production and popularization among the farming community and also for research purpose. These efforts, I am sure will help in transferring the best innovations from ICAR-IIRR to the end users and stakeholders and hope that this book would be used as a ready reckoner of the technologies developed by ICAR-IIRR.

(T.R. Sharma)

Date : 22 April 2022
Place : New Delhi

PREFACE

Rice is one of the premier cereal crops of the world and is the staple food of more than half of the world's population. India stands first in rice area and second in production after China with rice cultivation being a way of life for millions of people directly or indirectly ensuring food and livelihood security. So far, a total of 1436 high yielding rice varieties and hybrids have been released for different ecologies in the country out of which a total of 65 have been developed and released by ICAR-IIRR. Among them, 18 varieties and 2 hybrids have also been registered with Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) and many are under process of registration. A total of 40 unique and novel germplasm developed by ICAR-IIRR is registered with ICAR-National Bureau of Plant Genetic Resources, New Delhi. ICAR-IIRR has also developed few non-varietal technologies and rice-based health care products and some of them have been registered with Indian Patent Office.

Public-Private partnerships will play an increasing role in the advancement of agricultural research under the IPR regime. The transfer of IPR enabled agricultural technologies through commercial route will gain greater importance in the economy development and finally help in attaining the goal of transferring the best innovation to the end user. ICAR has framed "ICAR guidelines for Intellectual Property Management and Technology Transfer/ Commercialization (IPM&TTC)" in 2006 and later amended in 2014 and 2018 for implementation by its constituent institutions across the country. The IPM&TTC guidelines enable the institutes to improve the Public-Private partnerships, collaboration of research work with interested parties, licensing of technologies etc., This whole process would lead to equity in terms of socio-economic benefit through employment and income generation, a boost to agri-business and incentive reward system to the innovator.

As the compilation of latest technologies available at ICAR-IIRR with detailed information is an important document, the Institute has taken efforts to bring out this book **'**Innovative technologies and services available @ ICAR - Indian Institute of Rice Research**'**. It carries comprehensive information on latest technologies available at ICAR-IIRR and would serve as a ready reckoner for all stakeholders, who are interested in licensing for large-scale production, marketing and popularization of the varietal and non-varietal technologies developed by the Institute, in addition to availing the services offered. I hope the publication would be very useful to the private seed companies, agritech start-ups, agri incubators, all the rice researchers, farmers and personnel of both public and private seed sectors.

(Dr. R.M. Sundaram)
Director, ICAR-IIRR, Hyderabad

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INTRODUCTION

ICAR - Indian Institute of Rice Research (ICAR-IIRR) was established by the Indian Council of Agricultural Research (ICAR) in 1965 as All India Coordinated Rice Improvement Project (AICRIP) at Hyderabad to organize and coordinate multi-location testing of varietal and crop management technologies and practices for all rice growing ecosystems prevailing in the country. It was re-designated as Directorate of Rice Research (DRR) in 1983 with added mandate of pursuing research on irrigated rice for strengthening and stabilizing rice production in the country in addition to research coordination. The Directorate was upgraded to the status of a national institute under the name 'ICAR-Indian Institute of Rice Research (ICAR-IIRR)' during the Golden Jubilee year on 15th December 2014.

ICAR-IIRR has developed 62 rice varieties and 3 hybrids, most of the which are released by Central Sub Committee on Crop Standards, Notification and Release of Varieties (CSC on CSN &RV) in addition to a variety, Shanti released by the State Variety Release Committee (SVRC) for various rice growing ecosystems. In addition, the Institute has also developed and validated several non-varietal technologies through the AICRIP. This book gives the information of ICAR-IIRR varieties and hybrids registered with Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) and varieties under process for registration with PPV&FRA and details of novel Genetic Stocks registered with ICAR-National Bureau of Plant Genetic Resources (ICAR-NBPGR), New Delhi in addition to the non-varietal technologies developed by the Institute.

ICAR-IIRR, based on the conviction that innovation and entrepreneurship are important for social and economic development and scrupulously following the ICAR guidelines for Intellectual Property Management and Technology Transfer/Commercialization, has made significant strides in commercialization (*i.e.,* licensing) of rice varieties, hybrids, and non-varietal technologies by signing of Memorandum of Agreements (MOAs) on non-exclusive basis. The objectives of such licensing are (i) commercializing technologies developed by ICAR-IIRR (ii) helping the entrepreneurs in commencing business utilizing the R&D back up of the institute through training and consultancy services (3) Ultimately benefiting the farming community with availability of quality seed in large quantities and also providing easy access to non-varietal technologies.

So far, the institute has signed a total of 36 Memorandum of Agreements (MOAs) for its rice hybrids, varieties, genetic stocks and non-varietal technologies with various private seed companies for their large-scale seed production and popularization among the farming community and also for research purpose.

List of ICAR-IIRR released Varieties & Hybrids suitable for different ecosystems

S. No.	Variety & Hybrid Name	Year of release	Ecosystem
1.	Jaya (DRR Dhan 1)	1968	Irrigated Medium
2.	Sona (DRR Dhan 3)	1973	Irrigated Medium
3.	Cauvery (DRR Dhan 2)	1974	Rainfed Upland Early
4.	Akashi (DRR Dhan 4)	1977	Rainfed Upland Early
5.	Phalguna (DRR Dhan 6)	1978	Rainfed Shallow Lowland
6.	Sasyasree (DRR Dhan7)	1980	Irrigated Mid Early
7.	Swarnadhan (DRR Dhan 8)	1980	Rainfed Shallow Lowland
8.	Rasi (DRR Dhan 5)	1982	Irrigated Early
9.	Vikas (DRR Dhan 9)	1983	Saline/Alkaline Tolerant rice
10.	Manasarovar (DRR Dhan 10)	1985	Rainfed Shallow Lowland
11.	Seshu (DRR Dhan 11)	1986	Irrigated Early
12.	Srinivas (DRR Dhan 12)	1986	Irrigated Early
13.	Sonasali (DRR Dhan 13)	1986	Irrigated Medium
14.	Vikramarya (DRR Dhan 14)	1986	Irrigated Medium
15.	Prasanna (DRR Dhan 15)	1986	Rainfed Upland Very Early
16.	Suraksha (DRR Dhan 17)	1988	Irrigated Medium
17.	Tulasi (DRR Dhan 18)	1988	Rainfed Upland Very Early
18.	Salivahana (DRR Dhan 19)	1988	Rainfed Shallow Lowland
19.	Pranava (DRR Dhan 16)	1989	Rainfed Shallow Lowland
20.	Aditya (DRR Dhan 21)	1989	Rainfed Upland Very Early
21.	Kasturi (DRR Dhan 24)	1989	Scented Rice
22.	Nagarjuna (DRR Dhan 20)	1991	Rainfed Shallow Lowland
23.	Vibhava (DRR Dhan 22)	1991	Irrigated Medium
24.	Ravi (DRR Dhan 23)	1991	Rainfed Upland Very Early
25.	Ajaya (DRR Dhan 25)	1992	Irrigated Medium
26.	Nidhi (DRR Dhan 26)	1997	Irrigated Early
27.	**DRRH-1 (DRR Sankar Dhan 1)**	**1998**	**Hybrid**

S. No.	Variety & Hybrid Name	Year of release	Ecosystem
28.	Krishna Hamsa (DRR Dhan 28)	1998	Irrigated Early
29.	Triguna (DRR Dhan 27)	1998	Irrigated Mid Early
30.	Vasumati (DRR Dhan 30)	2001	Scented Rice
31.	Dhanrasi (DRR Dhan 31)	2003	Rainfed Shallow Lowland
32.	Shanthi (DRR Dhan 29)	2004	Irrigated Mid Early
33.	Sugandhamati (DRR Dhan 32)	2005	Scented Rice
34.	**DRRH-2**	**2005**	**Hybrid**
35.	Jarava (DRR Dhan 33)	2005	Saline/Alkaline Tolerant rice
36.	Improved Samba Mahsuri (DRR Dhan 34)	2008	Rainfed Shallow Lowland
37.	Varadhan (DRR Dhan 36)	2008	Irrigated Mid Early
38.	Sampada (DRR Dhan 37)	2008	Irrigated Medium
39.	Akshyadhan (DRR Dhan 35)	2008	Irrigated Medium
40.	DRR Dhan 38	2010	Irrigated Medium
41.	DRR Dhan 39	2010	Saline/Alkaline Tolerant rice
42.	**DRRH-3**	**2010**	**Hybrid**
43.	DRR Dhan 40	2014	Irrigated Medium
44.	DRR Dhan 41	2015	Aerobic
45.	DRR Dhan 42	2015	Irrigated Early and Drought
46.	DRR Dhan 43	2015	Irrigated Early
47.	DRR Dhan 44	2015	Irrigated Early and Drought
48.	DRR Dhan 45	2016	Irrigated medium and Biofortified
49.	DRR Dhan 46	2016	Irrigated mid early
50.	DRR Dhan 47	2017	Irrigated Early
51.	DRR Dhan 48	2017	Irrigated medium and Biofortified

S. No.	Variety & Hybrid Name	Year of release	Ecosystem
52.	DRR Dhan 49	2017	Irrigated medium and Biofortified
53.	DRR Dhan 50	2017	Irrigated Late, Drought and Submergence
54.	DRR Dhan 51	2017	Irrigated medium
55.	DRR Dhan 52	2018	Irrigated Early Transplanted
56.	DRR Dhan 53	2020	Irrigated medium
57.	DRR Dhan 54	2021	Aerobic
58.	DRR Dhan 55	2021	Aerobic
59.	DRR Dhan 56	2021	Irrigated
60.	DRR Dhan 57	2021	Aerobic
61.	DRR Dhan 58	2021	Irrigated
62.	DRR Dhan 59	2021	Irrigated
63.	DRR Dhan 60	2021	Irrigated
64.	DRR Dhan 62	2021	Irrigated
65.	DRR Dhan 63	2021	Irrigated

Note: Varieties and hybrids registered with PPV & FRA are highlighted in green colour, while the hybrids have been given in bold font.

New varieties released by ICAR-IIRR

DRR Dhan 42 (IR64 Drt1) - A drought tolerant rice variety

IR64 *Drt1* (DRR Dhan42) a drought tolerant variety developed by introgression of yield QTL under drought *qDTY2.2* and *qDTY 4.1* using marker aided selection. DRR Dhan 42 produces high yield under drought stress conditions at reproductive and grain filling stages. Improving yield of varieties along with drought tolerance is very difficult. Hence, instead of developing drought tolerant varieties, the concept of introgressing yield QTLs under drought in high yielding back ground without reducing yield under normal condition is the ideal strategy to maximise rice yields in drought prone areas.

Duration: 120-125 days

Grain type: Long slender

Yield potential under moderate drought: 3.5-4.0 t/ha

Yield potential under severe drought: 1.5 to 2.5 t/ha

Yield potential under normal condition: 5.5 to 6.0 t/ha

Resistant to Blast, moderately resistant to bacterial blight and brown spot

Released for the states: Andhra Pradesh, Telangana, Chhattisgarh, Madhya Pradesh, Jharkhand, Puducherri and Tamil Nadu.

DRR Dhan 44

Variety DRR Dhan 44 an early duration, high yielding, long slender grain variety suited to trans-planted and direct seeded aerobic cultivation with good weed competitive ability. Registered with PPV&FRA with No: 218 of 2019.

The salient features

Parentage: IR71700-247-1-1-2/IR03L120

Yield potential: 70-80 quintals /ha

Yield at farmer's field in 10 acre block: 70 quintals /ha

Days to maturity: 115-120 days

Yield advantage

- 25.4 and 31.1% over Sahbhagidhan and Narendra 97.
- 9.8% over Pant Dhan 11 in Uttrakhand.
- 31.97% over Govind in Haryana.
- 34.72% over Prabhat and Rajendra Bhagvati in Bihar

Grain type and quality: It has long slender grains, good cooking quality with more than 60% head rice recovery.

Biotic stress tolerance: Resistant blast, moderate resistant to BB, BPH and WBPH

Abiotic stress resistance: It has tolerance to drought at reproductive stage and high nutrient use efficiency.

Other traits: Weed competitive ability and performed well under aerobic cultivation

Released for the states: Uttrakhand, Haryana and Bihar.
Suited to other states: Uttar Pradesh, Jharkhand, Chhattisgarh, Andhra Pradesh and Telangana.

DRR Dhan 47

A high yielding drought tolerant variety responsive to low light intensity

DRR Dhan 47 (IET-23356) (RP 5125-17-6-3-1-IR84898-B-B) is a long bold rice variety with distinguishable morphological features like lodging resistance, non-shattering and drought tolerance with blast resistance developed through pedigree breeding.

DRR Dhan 47 (IET-23356) can be cultivated in irrigated and low fertile areas. A suitable heat tolerant variety for Rabi season. It exhibited resistance to blast and also shown yield superiority under drought conditions across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP) with lodging resistance and has distinguishable morphological features like strong culm, light green foliage, creamish septum, long white split ligules, stigma non-pigmented, late senescence, erect and wide flag leaf, compact heavy and well exerted panicles, long bold grains and 90 day flowering duration.

Pedigree: IR78877-208-B-1-1/IR78878-53-2-2-2

Total Duration: 110 to 115 days

Yield potential: DRR Dhan 47 yields 6.0 t/ha. It exhibited yield superiority over national, zonal and local checks, with an increase over 12%, 33% and 18% respectively on over all mean in the states proposed. DRR Dhan 47 recorded 9.7 t/ha at farmer's field in Telangana state during rabi 2021

Grain and cooking quality: DRR Dhan 47 has good cooking quality with 65.7% HRR, 6.14 mm kernel length, 2.36 mm kernel breadth, 2.6 L/B ratio, 4.0 ASV, 21.6% amylose content, 58 mm of gel consistency and long bold grain type with occasional chalkiness.

a. whole grain, b. polished rice and c. cocked rice

Package of practices: Cultivated in areas with irrigated, low fertility and late sown conditions in case of delayed monsoons Lodging resistance, drought tolerant, heat tolerant, suitable for direct seeding and late sown conditions

DRR Dhan 47 can replace popular varieties like Sahbhagi Dhan, MTU1010, IR64 etc. The new variety can also be cultivated across the country in the blast affected areas.

Recommended States: Telangana, Andhra Pradesh, Kerala, Puducherry and Karnataka.

DRR Dhan 48

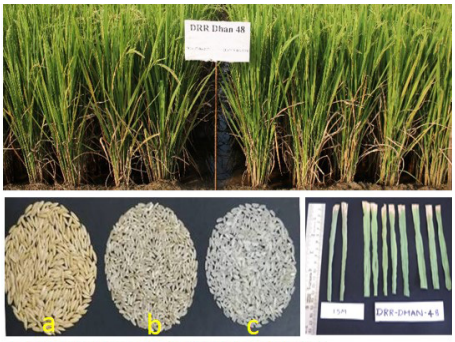
A high yielding Zinc rich fine grain variety with resistance to bacterial blight

DRR Dhan 48 (IET 24555) (RP5898-182-22-4-3-2-1), a high yield, zinc rich and bacterial blight resistant variety with medium slender grain. It is a biofortified high Zn (24 ppm) variety with around 6% and 41% higher yield than Samba Mahsuri and IR 64. The average zinc content in seed samples collected from farmer's field ranged from 25.2 to 27.4 and 22.2 to 23.3 ppm in brown and polished rice respectively. It possesses three major bacterial blight resistance genes *Xa21*, *xa13* and *xa5* and exhibited high level of resistance to bacterial blight across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: Improved samba Mahsuri/CSR27

Total Duration: 135 to 140 days

Yield potential: DRR Dhan 48 yields 6.0 to 6.5 t/ha. Significantly it yields 6% and 41% higher yield than BPT 5204 and IR 64 possessing high zinc and also got resistance to bacterial blight. DRR Dhan 48 recorded a bumper yield of 8.0 t/ha at farmer filed in Tamil Nadu state during Kharif 2021.



a. whole grain, b. brown/hulled rice and c. polished rice

Grain and cooking quality: DRR Dhan 48 has medium slender grain with high milling recovery (69.0%) and a high head rice recovery of 61.0%. It recorded desirable cooking quality traits in terms of intermediate amylose content (23.0%), GC of 32 mm, ASV of 7.0, with 5.8 mm kernel length and 1.9 mm kernel breadth, 3.0 L/B ratio and very translucent grains indicating good cooking quality. The average zinc content in milled rice is 23 ppm.

Package of practices: Similar to rice varieties of medium and late duration, which are cultivated in irrigated/transplanted areas.

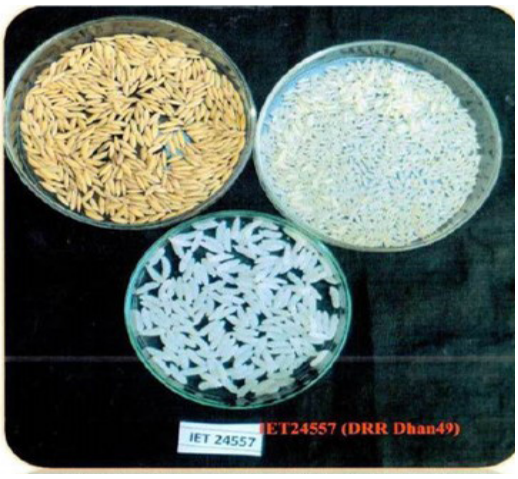
DRR Dhan 48 is a premium quality rice can replace fine grained varieties Samba Mahsuri. This variety can also be cultivated across the country in the bacterial blight affected areas.

Recommended States: Andhra Pradesh, Telangana, Karnataka, Tamil Nadu and Kerala

DRR Dhan 49

A High Zinc Content Variety

DRR Dhan 49 is a high yielding variety with high Zinc content. This variety contains very high Zinc content of 25.2 ppm which is higher than checks like Kalanamak and Chittimuthyalu. In addition to superior grain yield and high Zinc, it also possesses strong culm there by having tolerance to lodging. It contains erect and wide flag leaf which improves it photosynthetic ability. It is also having the desirable grain type of Medium slender.



Pedigree: RPBio226*1/CSR27

Total Duration: 125-130 days

- Since it is high yielding and having Medium slender grain type, tolerant to lodging, it is easily acceptable by farmers of Southern states Telangana, Andhra Pradesh, Karnataka and Tamil Nadu.
- Resistance to BLB and moderate resistance to RTD, sheath rot, neck blast and brown spot.
- High Zinc line (25.2 ppm) with BLB resistance having genes of *Xa21+xa13* and moderately tolerant to blast.
- Rice is a staple food in India and if we use biofortified rice variety like DRR Dhan 49 with high Zinc content, it will reach the poor, under nourished segment of the society. It will be very useful for pregnant women and children to overcome malnutrition.
- If this variety is multiplied in large scale and final polished rice is distributed through public distribution system, it will reach the poor and malnourished people easily.

Package of practices: DRR Dhan 49 is a high Zn (25.2ppm) variety with around 4% higher yield than IR64 with same duration suited under irrigated conditions identified for release in the states of Maharashtra, Gujarat and Kerala.

DRR Dhan 50

DRR Dhan 50 is a NIL variety with submergence QTL (*qSub1*) and drought tolerant QTLs (q*DTY2.1*+*qDTY3.1*) of late duration with high yield under irrigated / rainfed condition, submergence, water logged and drought conditions at reproductive stage, identified for release in Samba Mahsuri growing areas in the state of Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Bihar, Odisha, West Bengal, Uttar Pradesh and Madhya Pradesh. It is moderately resistant to leaf blast and Bacterial Leaf Blight (BLB). It has high milling recovery (69%) and head rice recovery (64%). It has medium slender grains, with 4.76mm kernel length and 1.83mm kernel breadth, 3.0 L/B ratio. It has intermediate AC (23%) and ASV (4.0), hard GC (27mm) and very translucent grains indicating good cooking quality.

DRR Dhan 50 has established its drought and submergence tolerance at reproductive and tillering stage with high yield. It is the first drought and submergence tolerant variety released in India with high yield potential under normal conditions.

Pedigree: Samba Mahsuri *Sub1**3/IR81896-B-B-195

Total Duration: 140-145 days

- Moderate resistant to BLB and blast.
- Lodging resistance, drought tolerant, submergence tolerance.
- Good cooking quality and medium slender grain type.

Recommended States: Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Bihar, Odisha, Chhattisgarh, Uttar Pradesh, Madhya Pradesh.

DRR Dhan 51

A high yielding short bold grain variety resistant to blast

DRR Dhan 51 is a blast resistant, high yielding, early maturity, short bold grain variety developed through the deployment of Marker assisted selection (MAS).

DRR Dhan 51 can be cultivated in areas with assured irrigation, where short bold grain rice varieties are preferred and widely cultivated. DRR Dhan 51 is a tall plant type, erect, high tillering and non-lodging plant habit. It possesses major blast resistance gene *Pi-2* and it has 95.6% genome similarity with Swarna. DRR Dhan 51 exhibited high level of resistance to blast across the country in multi-location trials of All India Coordinated Rice Improvement Project (AICRIP).

Pedigree: Swarna*2/C101A51

Total Duration:135-140 days

DRR Dhan-51

Paddy DRR Dhan-51

Polished DRR Dhan-51

Yield potential: DRR Dhan 51 showed superiority yield on recurrent parent Swarna in States Uttar Pradesh and Gujarat with + 8.9% and +16.7% in 2015 and 2016 respectively. In states of Telangana and Chhattisgarh also it showed on par yield with recurrent parent Swarna. Yield in irrigated conditions 45-50 q/acre.

Grain and cooking quality: DRR Dhan 51 also possesses excellent grain and cooking quality features on par with Swarna in terms of Hulling percentage (79.5), Head rice recovery (60.1), Kernel length (5.1), Kernel breadth (2.16), L/B ratio (2.44), Alkali spreading value (4.0) and Amylose content (26.7).

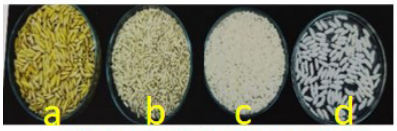
Package of practices: This variety is of early duration with high yield under irrigated conditions and good grain quality. It can be grown even with low N conditions.

Recommended States: Uttar Pradesh, Gujarat, Telangana and Chhattisgarh

DRR Dhan 52

A high yielding drought and heat tolerant variety with lodging and blast resistance

DRR Dhan 52 (IETS-23354) (RP5125-12-5-3-B-IR84898-B-B) is a drought and heat tolerant variety with lodging and blast resistant suitable for direct seeding. DRR Dhan 52 is a reproductive stage heat tolerant culture with high yield under elevated temperature up to 5-8°C, it recorded significant increase in chlorophyll and carotenoid content during heat stress at vegetative as well as reproductive stages. It has distinguishable morphological features like strong culm, basal leaf sheath pigmented, tip of lemma pigmented, stigma pigmented. It exhibited resistance to blast and moderate resistance to neck blast, sheath rot, sheath blight, brown spot and Rice tungro disease in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).



a. whole grain, b. brown/hulled rice and c. polished rice and d. cocked rice

Pedigree: IR 78877-208-B-1-1/IR78878-53-2-2-2

Total Duration: 110 to 115 days

Yield potential: DRR Dhan 52 yields 5.80 to 7.96 t/ha in Haryana; 5.78 to 6.60 tonnes/ha in Gujarat and 4.48 to 8.02 in Odisha. It has a yield advantage of 23% and 9% over the best check under elevated temperature and other physiological mechanisms related to heat tolerance. DRR Dhan 52 recorded a high yield of 9.87 t/ha at farmer's field in Telangana state during Rabi 2021

Grain and cooking quality: DRR Dhan 52 has long bold grain possessing good cooking qualities like 66% of Head Rice Recovery, 6.23 mm kernel length, 2.34 mm kernel breadth, 4 Alkali spreading value, 19.7% Amylose content, 55 mm Gel consistency

Package of practices: Cultivated in areas with irrigated/ transplanted and low fertile areas.

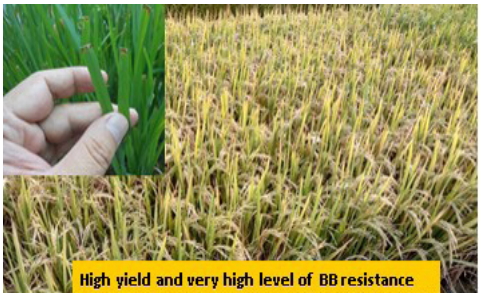
DRR Dhan 52 can replace popular varieties like Sahbhagi Dhan, MTU1010, IR64 etc. The new variety can also be cultivated as direct seeded variety across the country and also in the blast affected areas. Owing to its heat tolerance, DRR Dhan 52 is best suitable for rabi cultivation.

Recommended States: Haryana, Gujarat, Bihar and Odisha.

DRR Dhan 53

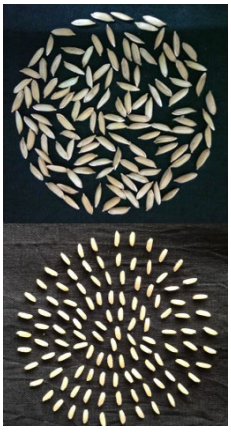
A high-yielding, bacterial blight resistant, fine-grain type rice variety

Bacterial blight (BB) of rice caused by *Xanthomonas oryzae* pv. *oryzae* is one of the major production constraint especially in irrigated and rainfed lowland ecosystem in India. It is primarily a disease of monsoon season of high yielding rice varieties grown under heavy nitrogen fertilization resulting in yield loss up to 50%. Indian Institute of Rice Research, Hyderabad has released a high yielding fine-grain type rice variety named as DRR Dhan 53 (IET 27294) through marker assisted backcross breeding which is highly resistant to bacterial blight of rice.



Characters and yield potential: DRR Dhan 53 (Improved Samba Mahsuri*3/PAU 3554) can be cultivated in areas with assured irrigation and has inbuilt bacterial blight resistance. It possesses the major bacterial blight resistance genes, *Xa21+xa13+xa5+Xa38* with seed-to-seed maturity of 130-135 days and average yield of 5.50-6.0 t/ha. The variety has semi-dwarf stature and non-lodging habit, with long deflexed panicles which are completely exerted (100% exertion). The variety exhibited very high level of bacterial blight resistance and significantly increased yield (>7%) over the recurrent parent across different locations in All India Coordinated Rice Improvement Project (AICRIP). Under conditions of bacterial blight incidence, the variety shows a significant yield advantage of 15-30% compared to bacterial blight susceptible variety like Samba Mahsuri.

Grain and cooking quality: DRR Dhan 53 possesses medium-slender grain type with very good HRR (78.7%), intermediate amylose content (22.2), optimum GC (22) and intermediate ASV (5.0) and is comparable to the recurrent parent, Improved Samba Mahsuri in all the grain and cooking quality parameters. On account of its grain quality, it gets premium price as Samba Mahsuri.



Package of Practices: Similar to medium and late duration fine grain high yielding rice varieties which are cultivated in irrigated areas. DRR Dhan 53 is highly suitable for bacterial blight endemic areas and can replace bacterial blight susceptible varieties like Samba Mahsuri, Sona Mahsuri, HMT Sona, PKV HMT and other bacterial blight susceptible fine grain rice varieties.

The variety has been released for cultivation in irrigated and bacterial blight endemic areas of Andhra Pradesh, Telangana, Chhattisgarh, Karnataka, Tamil Nadu, Jharkhand, Odisha, Bihar, Gujarat and Maharashtra.

DRR Dhan 54

A high yielding short bold grain variety resistant to multiple diseases under direct seeded aerobic conditions in water limiting areas

DRR Dhan 54 (IET-25653, RP 5943-421-16-1-1-B), a high yielding multiple disease resistant culture with desirable grain quality traits suitable for cultivation under direct seeded aerobic conditions in water limiting areas with short bold premium grain and cooking quality, through pedigree breeding. DRR Dhan 54 (IET-25653) has thick and strong culm with semi dwarf stature which accounts for lodging resistance, medium green foliage and deflexed compact panicle with strong secondary branching. Mild pubescence is observed on lemma and tip of the lemma is yellowish. The variety has multiple disease resistance across the country in multi-location trails of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: RP 5124-11-4-3-2-1/IR 78877-208-B-1-1

Total Duration: 115 to 120 days

Yield potential: DRR Dhan 54 yields 4.25 to 5.61 t/ha. It has resistance to multiple diseases like leaf blast, sheath rot, Rice tungro disease and false smut and moderately resistant to neck blast, bacterial blight, brown spot and glume discoloration. DRR Dhan 54 recorded 8.2 t/ha at farmer's field in Telangana state during rabi 2021.

Grain and cooking quality: DRR Dhan 54 possess short bold grain with high hulling recovery (78.1%), milling recovery (69.7%) and a high head rice recovery (HRR) of 65.3%. It recorded desirable cooking quality traits in terms of intermediate amylose content (AC) (21.6%), GC of 44mm, ASV of 4.0, white kernel appearance and very occasional chalkiness.

Package of practices: Similar to rice varieties of short bold and mid early duration, which are suitable for cultivation under direct seeded aerobic conditions in water limiting areas. DRR Dhan 54 can replace popular varieties like Sahbhagi Dhan, MTU1010, IR64 etc. DRR Dhan 54 can also be cultivated across the country in the leaf blast, sheath rot, rice tungro disease and false smut affected areas.

Recommended States: Telangana, Haryana, Odisha, Bihar, Jharkhand and Gujarat.

DRR Dhan 55

A high yielding early aerobic rice variety

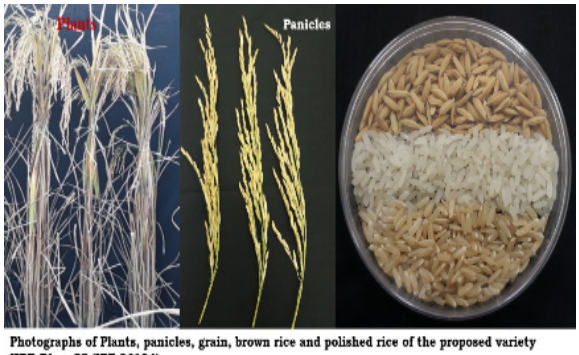
IET 26194 was evaluated in multi- locational trials i.e. Aerobic trials during Wet seasons of 2016-2019 under AICRIP. IET 26194 consistently out-performed the check varieties in Eastern zone (Zone III) and Central Zone (Zone V). The entry was named as **DRR Dhan 55** and identified for cultivation in Bihar State of Zone III and Chhattisgarh State of Zone V of the country.

Pedigree: MTU-1010 / IR79915-B-83-4-3

Total Duration: 115-120 days

Yield potential: Average yield under aerobic conditions 5 - 5.5 t/ha

Grain and cooking quality: IET 26194 has good hulling (78.07%), milling (68.90%) and head rice recovery (55.53%) in comparison with the checks and qualifying varieties. It possesses intermediate amylose content (22.58), medium alkali spreading value (7.0), medium gel consistency (22mm), long bold grain type (KL- 6.22 mm; KB- 2.22 mm) and other desirable grain quality parameters.



Photographs of Plants, panicles, grain, brown rice and polished rice of the proposed variety IIRR Dhan 55 (IET 26194)

Biotic stress Resistance: IET 26194 exhibited moderately resistant to leaf blast, neck blast, gall midge, rice thrips and plant hoppers

Highly suitable for direct seeded aerobic system

DRR Dhan 56

A High Yielding Long Slender Green Super Rice (GSR) variety

ICAR-Indian Institute of Rice Research, Hyderabad has developed an *early duration, highly vigorous, non-lodging, non-shattering, dark green in colour, and has long Slender grain variety possessing premium grain and cooking quality,* named as DRR Dhan 56 (IET 26803), through the project **"Green Super Rice (GSR) for the Resource-Poor of Africa and Asia"** in collaboration with IRRI, Philippines.

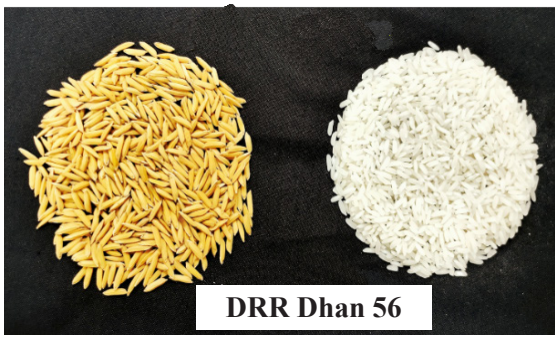
DRR Dhan 56 can be cultivated in areas of Punjab and Haryana with assured irrigation, where long slender grained rice varieties are preferred. The variety is early duration (115 days), high yielding, resistant to leaf blast (SI: 3.8), bacterial leaf blight (SI: 4.8) and false smut (0.25) across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: Samba Huang-Hua-Zhan*2 / Phalguna

Total Duration: 110-115 days

Yield potential: DRR Dhan 56 yields 5.2 tonnes/ha. DRR Dhan 56 recorded +**18.02 %, +6.75%** more yield over the best varietal check in states of Punjab and Haryana states.

Grain and cooking quality: DRR Dhan 56 possesses **very good grain quality attributes** in terms of hulling percentage (77.5%), Milling (68.9%), Head rice recovery (64.1 %), Kernel length (6.38 mm), Kernel breadth (2.0 mm), L/B ratio (3.18), and Gel consistency (22) Alkali spreading value (5) and Amylose content (23.15%).



Package of practices: Similar to rice varieties of early duration, which are cultivated in irrigated areas of Punjab and Haryana.

DRR Dhan 56 can replace varieties like Pusa 44, Sona Mahsuri, etc. The new variety can also be cultivated across the states in high lodging and shattering areas.

Recommended States: Punjab and Haryana States.

DRR Dhan 57

A high yielding early aerobic rice variety

IET 26171 was evaluated in multi- locational trials i.e., Aerobic trials during Wet seasons of 2016-2019 under AICRIP. IET 26171 consistently out-performed the check varieties in **Jharkhand (Zone III) and Chhattisgarh (Zone V).** The overall mean grain yield of IET 26171 in Zone III and Zone V was 4782 kg/ha, which is 13%, 17% and 16 % higher than National, Zonal and Local checks, respectively and it was released as **DRR Dhan 57.**

Pedigree: BPT 5204/Azucena

Total Duration: 115-124 days

Yield potential: Average yield under aerobic conditions 4.5 - 5.5 t/ha

Grain and cooking quality: DRR Dhan 57 has good head rice recovery (60%), short bold grains, with alkali spreading value (4.0), amylose content (23.4%) and gel consistency (53mm) indicating good cooking quality

Biotic stress Resistance: DRR Dhan 57 is a semi tall, high yielding, short bold grained variety and moderately resistance to major insect pests and diseases such as leaf blast, neck blast. Resistance to gall midge, rice thrips and moderate resistance to plant hoppers and Whorl Maggot

Highly suitable for dry direct seeded aerobic conditions

DRR Dhan 58

A high yielding fine grain variety tolerant to salinity and resistant to bacterial blight

DRR Dhan 58 is an *improved version of Improved Samba Mahsuri tolerant to seedling stage salinity, bacterial blight resistant, high yielding, fine grain variety possessing premium grain and cooking quality,* through the deployment of *Marker assisted selection* for the first time in South India.

DRR Dhan 58 can be cultivated in areas with assured irrigation especially in coastal areas where fine grained rice varieties are preferred and widely cultivated. It possesses seedling stage salinity tolerance QTL, *Saltol* along with three major bacterial blight resistance genes *Xa21, xa13* and *xa5* and exhibited good tolerance to salinity in coastal areas and high level of resistance to bacterial blight across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: Improved Samba Mahsuri*3/FL478

Total Duration: 130 - 135 days

Yield potential: DRR Dhan 58 yields 5.50 tonnes/ha. Significantly, under saline conditions, DRR Dhan 58 gives 24% more yield under saline conditions and 8% under normal conditions than the susceptible varieties.

Grain and cooking quality: DRR Dhan 58 also possesses excellent grain and cooking quality features on par with Improved Samba Mahsuri in terms of hulling percentage (79.1%), Head rice recovery (61.6%), Kernel length (5.46 mm), Kernel breadth (1.93 mm), L/B ratio (2.82), Kernel length after cooking (7.8 mm), Elongation ratio (1.63), Alkali spreading value (4.0) and Amylose content (23.35). On account of its grain quality, it gets premium price as Samba Mahsuri.

Package of practices: Similar to rice varieties of medium and late duration, which are cultivated in irrigated areas.

DRR Dhan 58 can replace fine grained varieties like Samba Mahsuri, Sona Mahsuri, HMT Sona, PKV HMT etc. The new variety can also be cultivated across the country in the bacterial blight affected areas.

Recommended States: Telangana, Andhra Pradesh, Tamil Nādu, Karnataka, Chhattisgarh, Orissa, Jharkhand, Bihar, Gujarat and Maharashtra.

DRR Dhan 59

A high yielding fine grain variety resistant to bacterial blight

DRR Dhan 59 an *improved, bacterial blight resistant, high yielding, long-bold grain type variety possessing premium grain and cooking quality,* developed through the deployment of *Marker assisted selection.*

DRR Dhan 59 can be cultivated in areas with assured irrigation, where long bold rice varieties are preferred and widely cultivated. It possesses a major bacterial blight resistance gene *Xa33* and exhibited high level of resistance to bacterial blight across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: Akshayadhan*2/FBR 1-15

Total Duration: 130-135days

Yield potential: DRR Dhan 59 yields 5.0-5.5 tonnes/ha. Significantly, under conditions of bacterial blight infestation, DRR Dhan 59 gives 11-12% more yield than any other bacterial blight susceptible variety.

Grain and cooking quality: DRR Dhan 59 also possesses excellent grain and cooking quality features on par with Akshayadhan in terms of hulling percentage (80.8%), Head rice recovery (56.2%), Kernel length (6.45 mm), Kernel breadth (2.30 mm), L/B ratio (2.8), Alkali spreading value (4.0) and Amylose content (26.57). On account of its grain quality, it gets premium price as that of Akshayadhan

Package of practices: Similar to rice varieties of medium and late duration, which are cultivated in irrigated areas.

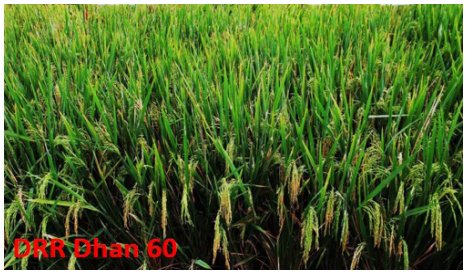
DRR Dhan 59 can replace long bold grain varieties like Akshayadhan, Sadabahar and other long bold varieties in those notified areas. The new variety can also be cultivated across the country in the bacterial blight affected areas.

Recommended States: Telangana, Andhra Pradesh, Tamil Nadu, Karnataka, Jharkhand

DRR Dhan 60

A high yielding fine grain variety tolerant to low soil phosphorous and resistant to bacterial blight

DRR Dhan 60 is an *improved version of Improved Samba Mahsuri tolerant to low soil phosphorous, bacterial blight resistant, high yielding, fine grain variety possessing premium grain and cooking quality,* developed through the deployment of *Marker assisted selection* for the first time in South India.



DRR Dhan 60 can be cultivated in areas with assured irrigation especially in coastal areas where fine grained rice varieties are preferred and widely cultivated. It possesses low soil phosphorous tolerance QTL, *Pup1* along with three major bacterial blight resistance genes *Xa21, xa13* and *xa5* and exhibited good tolerance to low soil phosphorus and high level of resistance to bacterial blight across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP).

Pedigree: Improved Samba Mahsuri*2/Swarna

Total Duration: 125-130 days

Yield potential: DRR Dhan 60 yields 5.19 t/ha (under 60 kg/ha of P, *i.e.,* recommended dose) and 4.8 t/ha (under 40 kg/ha of P). Significantly DRR Dhan 60 gives 26% (under 20 kg/ha); 23% (under 40 kg/ha) of P and 17% under 60 kg/ha of P, i.e., recommended dose) more yield than the susceptible varieties.

Grain and cooking quality: DRR Dhan 60 also possesses excellent grain and cooking quality features on par with Improved Samba Mahsuri in terms of Hulling recovery % (77.2%), Head rice recovery (64.5%), Kernel length (5.36 mm), Kernel breadth (2.12 mm), L/B ratio (2.52), Alkali spreading value (7.0) and Amylose content (23.23). On account of its grain quality, it gets premium price as Improved Samba Mahsuri.

Package of practices: Similar to rice varieties of medium and late duration, which are cultivated in irrigated areas.

DRR Dhan 60 can replace fine grained varieties like Improved Samba Mahsuri, Samba Mahsuri, Sona Mahsuri, HMT Sona, PKV HMT etc. The new variety can also be cultivated across the country in the bacterial blight affected areas.

Recommended States: Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Odisha, Chhattisgarh, Jharkhand, Bihar, Gujarat and Maharashtra

DRR Dhan 62

A high yielding fine grain rice variety durable resistant to blast and bacterial blight diseases

DRR Dhan 62 is an *improved version of Improved Samba Mahsuri durable resistant to blast and bacterial blight diseases, high yielding, fine grain rice variety possessing premium grain and cooking quality traits,* developed through the deployment of *Marker assisted Back cross method of breeding.*

DRR Dhan 62 can be cultivated in areas with assured irrigation where fine grained rice varieties are preferred and widely cultivated. DRR Dhan 62 is a MAS derived, durable blast and bacterial blight resistant high-yielding, fine-grain type rice variety having three major bacterial blight resistance genes, *Xa21+xa13+xa5* and two major blast resistance genes *Pi-2+Pi54.* DRR Dhan 62 exhibited highly resistant blast and bacterial blight reaction with an SI of 4.0 (BL), 3.5 (BB) in 2019 and 4.0 (BL), 3.3 (BB) in 2020 as compared to the recurrent parent, Improved Samba Mahsuri along with the variety also showed good level of resistance to neck blast, brown spot and sheath rot in 2019 and 2020.

DRR Dhan-62

Improved Samba Mahsuri

DRR Dhan-62

Pedigree: Improved Samba Mahsuri*2///ISM/C101A51//ISM/Tetep

Total Duration: 135-140 days

Yield potential: DRR Dhan 62 it recorded average yield advantage of +11.26% and +2.11% over the recurrent parent, Improved Samba Mahsuri during *Kharif* 2019 and 2020. Expected yield of the variety 18-20 q/ acre.

Grain and cooking quality parameters: DRR Dhan 62 possesses medium-slender grains with very good Hulling (77.0%), milling (67.4%), HRR (61.2%), acceptable amylose content (26.51%), GC (45 mm), intermediate ASV (4.0) and is comparable to the recurrent parent, Improved Samba Mahsuri in all the grain and cooking quality parameters.

Package of practices: The variety has durable, broad-spectrum blast and bacterial blight resistance due to which it is expected to perform well under areas endemic to the disease. DRR Dhan 62 can replace as a fine-grained varieties like Samba Mahsuri, Improved Samba Mahsuri, Sona Mahsuri, PKV HMT etc. in Blast and Bacterial blight endemic areas.

Recommended States: Andhra Pradesh, Telangana, Tamil Nadu, Karnataka, Odisha, Chhattisgarh, Jharkhand, Bihar, Gujarat and Maharashtra

DRR Dhan 63

A high yielding Zinc rich rice variety

DRR Dhan 63 (IET 26383) is a high yielding biofortified rice variety possessing high Zn (24.2 ppm) in polished grains as against 16-17 ppm existing in popular rice varieties. Although rice is a major food crop, it is a poor source of essential micronutrients such as Zinc leading to hidden hunger. In this context DRR Dhan 63 is found to be promising with enhanced Zn content and developed through pedigree method of breeding.

DRR Dhan 63 is semi-dwarf indica variety with medium duration and suitable for kharif season under irrigated ecosystem. It possesses distinguished morphological traits *viz.,* thick and strong culm, erect flag leaf, partly exerted, semi-erect and long panicles; non-lodging; short bold grains and non-shattering. Multilocation evaluation in AICRIP biofortification trials showed it's superiority in the states of Uttar Pradesh, Odisha and Kerala wherein it has out yielded the popular yield checks namely IR 64 and Samba Mahsuri by average yield gain of 18.5% and 9% respectively with an average Zinc content of 11.5% and 14.2% higher than IR 64 and Samba Mahsuri respectively. Possesses moderate resistance to leaf blast, BLB and planthoppers.

Pedigree: IET 17280 / Pusa Basmati 1

Total Duration: 127 to 130 days **Yield potential:** 5 t/ha

Grain and cooking quality: DRR Dhan 63 shows excellent grain and cooking quality characteristics *i.e.,* high milling recovery (70%), high head rice recovery (59.3 %), intermediate amylose (24.5%), intermediate ASV (4), soft GC (23 mm) with very occasionally chalky. It has short bold grains with 4.35 mm kernel length, 2.09 mm kernel breadth, and 2.08 L/B ratio.

Package of practices: Similar to that of medium duration rice varieties which are cultivated in irrigated areas.

DRR Dhan 63, a nutritionally rich variety combining high yield, high Zn content and good cooking quality features can easily be adopted by the farmers as it doesn't require additional cost of cultivation. DRR Dhan 63 with it's high Zn content in polished rice can help in alleviating Zinc malnutrition among people for whom rice is the primary source of nutrition.

Recommended States: Irrigated areas of Uttar Pradesh & Odisha (Zone III) and Kerala (Zone VII).

ICAR-IIRR varieties and hybrids registered with PPV&FRA, New Delhi

Krishna Hamsa

A mid early duration variety (120 days) released in 1997 for cultivation in rabi season in irrigated areas of Andhra Pradesh. Krishna Hamsa possessing cold tolerance at seedling stage and capable of performing well under heat stress at reproductive stage was found highly suitable for cultivation in boro season and made inroads to the states of Assam, Tripura and West Bengal, Odisha and Bihar as a boro variety. It shows resistance to blast and moderate resistance to brown spot. Registered with PPV&FRA with No: 69 of 2012.

Parentage	:	Rasi/Fine Gora
Year of release	:	1997
Ecology	:	Irrigated Mid Early
CVRC/SVRC	:	CVRC
Yield potential	:	5 t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	90-95
Plant type	:	Semi dwarf
Seed to seed duration	:	120 Days
Grain type	:	Long Slender

Triguna (RP 2542-194-301) - Multiple Resistant variety (BPH, GM and Blast)

Triguna (RP 2542-194-301) was developed from the cross Swarnadhan/RP 1579-38 with 130 days duration, released in 1997 for irrigated ecology in the states of Andhra Pradesh and Maharashtra. It has long slender grain with average yield of 4.5 t/ha. It is moderately resistant to gall midge, BPH and blast. Registered with PPV&FRA with No: 40 of 2013.

Parentage	:	Swarnadhan/RP1579-38
Year of release	:	1997
Ecology	:	Irrigated Medium
CVRC/SVRC	:	CVRC
Yield potential	:	4.5 t/ha
Season	:	Kharif
Plant height (cm)	:	90
Plant type	:	Semi dwarf
Seed to seed duration	:	130 days
Grain type	:	Long Slender

Vasumati

A high yielding medium duration semi dwarf basmati rice variety possesses all basmati quality features with 14% yield advantage over Pusa Basmati 1 and 44% over Taroari Basmati. It is a central release for cultivation in traditional basmati growing areas of Uttar Pradesh, Jammu & Kashmir and Rajasthan. It is moderately resistant to leaf blast, brown spot and WBPH. Registered with PPV&FRA with No: 29 of 2013.

Parentage	:	PR 109/Pakistan Basmati
Year of release	:	2001
Ecology	:	Scented
CVRC/SVRC	:	CVRC
Yield potential	:	4.5 t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	110
Plant type	:	Semi dwarf
Seed to seed duration	:	14-145 days
Grain type	:	Long Slender

Dhanrasi

A late duration, high yielding and high nutrient use efficient variety developed by introgressing yield genes from *O. rufipogon* and released for cultivation under shallow low land conditions in the states of Karnataka, Maharashtra, Tamil Nadu and Andhra Pradesh. It has broad spectrum resistance to blast, neck blast and sheath rot, moderately resistance to bacterial blight, brown spot and rice tungro disease**.** It has tolerance to plant hoppers and leaf folder. Moderately tolerant to salinity and drought. Registered with PPV&FRA with No: 43 of 2013.

Parentage	:	B 32 Sel.4/*O.rufipogon*//B 127
Year of release	:	2002
Ecology	:	Rainfed Shallow Lowland
CVRC/SVRC	:	CVRC
Yield potential	:	6 t/ha
Season	:	Kharif
Plant height (cm)	:	110-120
Plant type	:	Semi dwarf
Seed to seed duration	:	145 days
Grain type	:	Short Bold

Shanti (RP 2633-15-2-5)

Shanti (RP 2633-15-2-5) developed from the cross Ratna/IR 36 is a mid early duration (120-125 days) variety with long slender grains, released for cultivation in Andhra Pradesh. It is resistant to blast, moderately resistant to brown spot and WBPH with 4.5 t/ha yield potential. Registered with PPV&FRA with No: 58 of 2012.

Parentage	:	Ratna/IR-36
Year of release	:	2001
Ecology	:	Irrigated Mid Early
CVRC/SVRC	:	SVRC
Yield potential	:	4. 5 t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	90
Plant type	:	Semi dwarf
Seed to seed duration	:	125 days
Grain type	:	Long slender

Sugandhamati (RP 3644-41-9-5-5) - Semi dwarf aromatic variety with fine grains

A short statured semi dwarf high yielding basmati variety developed in 2004 for traditional Basmati growing areas of Punjab, Jammu & Kashmir and Haryana. It is derived from the cross Pusa Basmati1/IET 12603. Superior in yield and comparable in quality with Pusa basmati-1 with resistance to leaf blast and brown spot diseases. It has long slender scented grains. Registered with PPV&FRA with No: 39 of 2013

Parentage	:	Pusa Basmati1/IET 12603
Year of release	:	2004
Ecology	:	Scented
CVRC/SVRC	:	CVRC
Yield potential	:	4.1 t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	98
Plant type	:	Semi-dwarf
Seed to seed duration	:	145 days
Grain type	:	Long Slender

Jarava

A salt tolerant variety developed by ICAR-IIRR, Hyderabad. Variety Jarava was developed by introgressing salt tolerant genes from *O. rufipogon* and released for cultivation under coastal saline areas in the states of West Bengal, Andhra Pradesh, Puducherry, Tamil Nadu and Andamans. Registered with PPV&FRA with No: 47 of 2013.

The salient features of the variety Jarava

Parentage: B 32-Sel 4 /*O. rufipogon* // B 29-6.

Yield potential under saline condition: 25-30q/ha

Yield potential under normal condition: 55-60 q/ha

Days to maturity: 145-150 days

Grain type: Sort bold

Yield advantage of Jarava:

- 37.3%, 41.5% and 51.3% over CST7-1, CSR 27 and Jaya
- 12.8% over SR26B in West Bengal.
- 10.6% over MTU2607 in Andhra Pradesh.
- 14% over C14-8 in Andamans
- 22% over TRY3 in Puducherry and Tamil Nadu

Grain type and quality:

It has shot bold grains with acceptable cooking quality and 60% head rice recovery.

Biotic stress resistance:

- It has broad spectrum resistance to blast, neck blast and sheath rot, moderate resistance to bacterial blight, brown spot and rice tungro disease**.**
- It has resistance to plant hoppers and leaf folder.

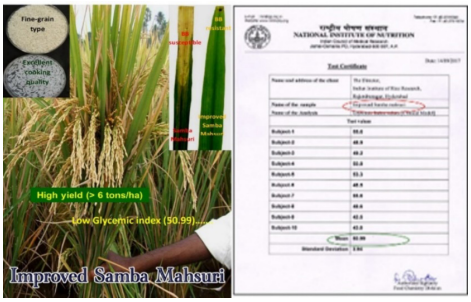
Abiotic stress tolerance: Tolerant to salinity and drought

Improved Samba Mahsuri

Bacterial blight resistant, high yielding, fine grain variety possessing premium grain and cooking quality and low glycaemic index (GI), named as **Improved Samba Mahsuri (RP Bio-226)** was developed by ICAR-IIRR, Hyderabad in collaboration with CSIR-CCMB, Hyderabad through *Marker assisted selection*. **Improved Samba Mahsuri** suitable in areas with assured irrigation, where fine grained rice varieties are preferred and widely cultivated. It possesses three major bacterial blight resistance genes *Xa21, xa13* and *xa5* and exhibited high level of resistance to bacterial blight across the country in multi-location trials of All India Coordinated Rice Improved Project (AICRIP). Registered with PPV&FRA with No: 80 of 2012.

Pedigree: Samba Mahsuri*7/SS1113

Total Duration: 135-140 days



Yield potential: Improved Samba Mahsuri yields 4.75 to 5.0 tonnes/ha. Significantly, under conditions of bacterial blight infestation, Improved Samba Mahsuri gives 15-30% more yield than any other bacterial blight susceptible variety.

Grain and cooking quality: Improved Samba Mahsuri also possesses excellent grain and cooking quality features on par with Samba Mahsuri in terms of hulling percentage (70%), Head rice recovery (65%), Kernel length (5.0 mm), Kernel breadth (1.8 mm), L/B ratio (2.7), Kernel length after cooking (8.7 mm), Elongation ratio (1.7),

Alkali spreading value (4.5) and Amylose content (24.8). Through clinical trials carried out by ICMR-NIN, the variety was identified to possess low glycemic index (GI) value of 50.99. On account of its excellent grain quality and low GI value, it gets premium price as Samba Mahsuri.

Package of practices: Similar to rice varieties of medium and late duration, which are cultivated in irrigated areas.

Improved Samba Mahsuri can replace fine grained varieties like Samba Mahsuri, Sona Mahsuri, HMT Sona, PKV HMT etc. The new variety can also be cultivated across the country in the bacterial blight affected areas.

Improved Samba Mahsuri was determined to have a very low level of glycemic index (50.99) and hence its milled rice can be considered highly suitable for patients suffering from Type II diabetes.

Recommended States: Andhra Pradesh, Chhattisgarh, Orissa, Jharkhand, Bihar, Gujarat and Maharashtra.

Varadhan (RPHR 649-1) - An *indica/japonica* derived variety

Varadhan a derivative of ***indica/japonica*** cross with mid early duration (125 days) released for irrigated areas of Jharkhand, Uttar Pradesh, Uttarakhand, and Haryana in 2008. Possessing long and heavy panicle, erect flag leaf, highly responsive to fertilizers, Vardhan is capable of giving grain yield of 6.5 t/ha. Moderately resistant to blast, RTV and WBPH. Registered with PPV&FRA with No: 204 of 2014.

Parentage	:	9314/BR 827-36
Year of release	:	2008
Ecology	:	Irrigated Mid Early
CVRC/SVRC	:	CVRC
Released for the states	:	Jharkhand, Uttar Pradesh, Uttaranchal and Haryana
Yield potential	:	5.5-6.5 t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	91
Plant type	:	Semi dwarf
Seed to seed duration	:	120-125 days
Grain type	:	Short Bold

Sampada

Sampada a low GI, high yielding, medium slender grain variety. Released for cultivation in Bihar, Chhattisgarh, Maharashtra, Tamil Nadu and Kerala. Vide Notification No. S.O.2458(E) dated 16.10.2008.

The salient features

Parentage : Vijaya / C14-8

Yield potential **:** 65-70 quintals /ha

Days to maturity **:** 135 days

Yield advantage

- 41.5 and 18.4% over IR64 and PR106.
- 22.4% over Rajendra Suwasini and Rajendra Mahsuri in Bihar.
- 11.0% over Chandrahasiny in Chhattisgarh.
- 24.5% over PKV – Ganesh and PKV-HMT in Maharastra
- 14.6% over ADT-43 in Tamil Nadu.
- 11.3% over Jyoti and Neeraja in Kerala.
- 24.0% over BPT 5204 in Andhra Pradesh.

Grain type and quality: It is a low GI variety with 51.166 glycemic index and 14.27 glycemic load and medium slender grains with good cooking quality and 70.1% head rice recovery.

Biotic stress resistance: Resistant to blast and RTD, moderate resistant to BLB, neck blast, sheath rot and WBPH.

Released for the states of Bihar, Chhattisgarh, Maharastra, Tamil Nadu and Kerala.

Akshayadhan (RPHR 650-2-5)

Akshayadhan is a medium duration variety (135 days) with erect plant type, strong culm, synchronous tillering, and lower panicle position with long and heavy panicles. It is derivative of *indica /japonica* cross with yield potential of 6.5 t/ha. It has long bold grain, resistant to blast, moderately resistant to brown spot and whitebacked planthopper. Released in 2008 for the states of Andhra Pradesh, Karnataka, Tamil Nadu and Jharkhand in irrigated ecology. Registered with PPV&FRA with No: 151 of 2014.

Parentage	:	BR 827-35/SC 5 109-2-2
Year of release	:	2008
Ecology	:	Irrigated Medium
CVRC/SVRC	:	CVRC
Yield potential	:	5.6 t/ha
Season	:	Kharif
Plant height (cm)	:	95-100
Plant type	:	Semi dwarf
Seed to seed duration	:	135 days
Grain type	:	Long Bold

DRR Dhan 39 (RP 4631-46-6-5-1-1-1)

A salinity tolerant medium duration variety (130-135 days) developed from the cross CSR3/ Kasturi. Released for coastal saline areas of Odisha, Kerala and Gujarat. It has compact panicle and long slender grains. Resistant to Blast, moderately resistant to RTV, BLB, BPH and WBPH, stem borer, leaf folder bacterial leaf blight is capable of giving grain yield of 4t/ha under stress. Registered with PPV&FRA.

Parentage	:	CSR 3/ Kasturi
Year of release	:	2009
Ecology	:	Irrigated Saline & Alkaline soils
CVRC/SVRC	:	CVRC
Released for the states	:	Odisha, Kerala and Gujarat
Yield potential	:	4t/ha
Season	:	Kharif and rabi
Plant height (cm)	:	105-110
Plant type	:	Semi dwarf
Seed to seed duration	:	133 days
Grain type	:	Long slender

DRR Dhan 40

DRR Dhan 40 is Irrigated medium duration – 106 days to 50% flowering and it is derivative of IC594146 (RP Bio 4918-248 S) BC_2F_8 from Swarna x *O.nivara* IRGC 81848. Released for Maharashtra, Tamil Nadu and West Bengal. Registered with PPV&FRA with No: 216 of 2019

- Mean grain yield: 5.5t/ha (2009: 5.68, 2010: 5.05 and 2011: 5.90 t/ha)
- Highest yield 10.65 t/ha in Coimbatore in 2011
- Non lodging, non-shattering
- Short bold grains, cooking and eating quality similar to Swarna
- Moderately resistant to leaf blast, neck blast, tungro, brown spot, sheath rot, leaf folder and stem borer
- High radiation use efficiency and can withstand Fe toxicity

- Higher N response than all checks at Karjat, ARI Patna and Faizabad. 7 to 37% higher yield over the checks NDR359, KRH2 and Akshayadhan at all N levels in Agronomy trial 2011. At DRR, it yielded 3.97 and 3.48 at zero N application and 6.12 and 6.03 t/h at 100 Kg/ha N in a field experiment during wet and dry season 2011 respectively.
- Responds to SRI with 25% increased yield over transplanted

DRR Dhan 43

A high yielding, early duration, drought tolerant rice variety

Variety DRR Dhan 43 an early duration, high yielding, long bold grain variety released from ICAR-Indian Institute of Rice Research for cultivation in Tamil Nadu, Puducherry, Karnataka and Kerala. Registered with PPV&FRA with No: 209 of 2019.

The salient features

Parentage: IR03L03/IRRI148

Yield Potential: 70-80 quintals /ha

Days to maturity: 110-115 days

Yield advantage

- 23.98 and 32.96% over Sahbhagidhan and Tulasi.
- 20.81% over ADT43 and ADT45 in Tamil Nadu.
- 5.78% over PY3 and PY5 in Puducherry.
- 17.5% over Matta Triveni and Prthyasa in Kerala
- 20.58% over Raksha and KMP ES 18.

Grain type and quality: It has long bold grains, good cooking quality and 60% head rice recovery. **Biotic stress resistance:** It is resistant to blast and moderate resistant to sheath rot and brown spot, neck blast, BPH and field tolerance to stem borer.

Other traits: It has tolerance to drought at reproductive stage and high nutrient use efficiency

Released for the states of: Tamil Nadu, Puducherry, Karnataka and Kerala.

DRR Dhan 45 (IET 23832) - High zinc rice variety

Rice, a major staple food crop, is deficient in micronutrients leading to malnutrition which is widely known as hidden hunger. WHO identified zinc, iron, and vitamin A as the critical micronutrients and their deficiency symptoms (blindness, stunting, etc.,) are generally specific. Biofortification employing traditional breeding methods is the most socially accepted and best strategy to enrich the quantities of some of the nutrients in the edible parts of various crops. Presently, several groups are working in this area across the world.

IIRR contribution

- IRRI is the pioneer in this area and IIRR initiated similar efforts in 2004
- Harvest Plus, international biofortification programme, recognized IIRR as major partner during 2011
- A separate trial for IVT-biofortification was started during kharif 2013
- 168 promising lines were tested in multi-locations and lines having stable high yield and zinc content were nominated to the above trail
- DRR Dhan 45 (IET23832) was identified superior to checks in terms of yield and zinc content (18.6 ppm) during 2013 & 2014 and identified for release in the states of Tamil Nadu, Karnataka and Andhra Pradesh.
- Registered with PPV&FRA with No: 92 of 2019

DRR Dhan 46

A high yielding, early duration rice variety for transplanted conditions

Variety DRR Dhan 46, an early duration, high yielding, long slender grain variety suited to transplanted conditions developed from ICAR- Indian Institute of Rice Research for the states of Bihar, Madhya Pradesh and Maharashtra. Registered with PPV&FRA with No: REG/2016/1256.

The salient features

Parentage: IR72022-46-2-3-3-2/IR57514-PMI-5-B-1-2

Yield potential: 65-70 quintals /ha

Days to maturity: 110-115 days

Yield advantage

- 17.2 and 43.38% over Sahbhagidhan and Narendra 97.
- 22.10% over Rajendra Mahsuri, Susk Samrat and Prabhat in Bihar.
- 22.11% over MTU1010, WGL3210 and IR64 in Madhya Pradesh.
- 7.56% over Karjat7, SKL6 and SYE 1 in Maharashtra

Grain type and quality: It has long slender grains, good cooking quality and 65% head rice recovery.

Biotic stress tolerance: Moderate resistance to leaf blast, neck blast, brown spot, BLB sheath rot, BPH and WBPH

Other traits: It can be grown under boro cultivation.

Released for the states: Bihar, Madhya Pradesh and Maharashtra.

DRRH-2 - A high yielding early hybrid

Based on extensive evaluation during 2002-04, the hybrid DRRH-2 was released for commercial cultivation in the states of Haryana, Uttarakhand, West Bengal and Tamil Nadu. This hybrid which matures in 115 days is one of the earliest among the hybrids released so far. In national evaluation trials, this hybrid registered yield advantage of 33% over the national check Annada, 22% over the local checks and 24% over the hybrid check Pant Sankar Dhan-1. This hybrid has the highest per day productivity of 46kg/ha as against 34-35 kg/ha of Annada and Pant Sankar Dhan-1. Registered with PPV&FRA with No: 375 of 2019.

Pedigree: IR 68897A / DR 714-1-2R

Total Duration: 115-116 days

Yield potential: Average yield under normal conditions 6 - 6.5 t/ha

Grain and cooking quality: DRRH-2 hybrid possesses long slender translucent grains with a head rice recovery of more than 60%. It has intermediate amylose (25.5%) and soft gel consistency (70 mm).

Biotic stress Resistance: DRRH-2 hybrid has shown resistance to leaf blast, neck blast and rice tungro diseases. It possesses moderate tolerance to sheath rot, brown spot and WBPH. This hybrid has also done well in rain fed and alkaline conditions.

With a shorter duration of 115-116 days this hybrid will be highly suitable for rice-wheat and multiple cropping systems.

DRRH-3
The first high yielding rice hybrid with medium slender (MS) grain type

DRRH-3 is a high yielding hybrid with medium slender grain type for irrigated ecology. It can be cultivated in areas with assured irrigation, where fine-grained rice varieties are preferred and widely cultivated. It has strong culm and has superior performance even under lower doses of N (40 kg N/ha) indicating its higher nitrogen use efficiency. This hybrid can give about 23-30 % more yield than BPT 5204 with comparable quality features. Registered with PPV&FRA with No: 374 of 2019

Pedigree: APMS 6A / RPHR 1005

Total Duration: 130 – 135 days

Yield potential: Average yield under normal conditions 6 - 6.5 t/ha

Grain and cooking quality: The hybrid possesses better grain quality characters in respect of physical, chemical and cooking quality. The grain quality traits of the hybrid are similar to that of a popular variety Samba Mahsuri (BPT-5204). It has medium slender grains with higher milling (>71%), head rice recovery (>60%), L/B ratio (2.61), intermediate amylose content (24%) and gel consistency of 63 mm.

Biotic stress Resistance: Resistant to neck blast and moderately resistant to leaf blast, rice tungro, brown spot diseases and tolerance to whitebacked plant hopper.

Recommended States: *Andhra Pradesh, Madhya Pradesh, Orissa, Uttar Pradesh, Gujarat*

DRRH-3 is the most potential hybrid for southern India and other areas where BPT 5204 variety is quite popular

ICAR-IIRR developed genetic stocks registered with NBPGR, New Delhi

Biotic Stress Resistant Lines	Abiotic Stress Tolerant Lines
• **Bacterial blight Resistant Line: 1** - *RPBio-189 (IET 19045)*	• **Low Phosphorus Tolerant Lines: 3** - *IET 9691* - *NH686* - *RP5972-13-1-6-67-129-266*
• **BPH Resistant Lines: 5** - *RP 5448-RIL-501* - *RP 5449-RIL-320* - *RP Bio 4918-228S* - *RP Bio 4918-230S* - *RP 5316-RIL-243*	• **High Zinc & Salt Tolerant Line: 1** - *RP 5866-Agami*
	• **Heat Stress Tolerant Line: 1** - *NH219*
• **Gall Midge Resistant Line: 5** - *RP4639-110 (RPMRE-4)* - *Aganni* - *ARC 15831* - *INRC 3021* - *INRC 202*	• **Drought Stress Tolerant Line: 1** - *NH162*
	Aromatic long slender line: 1
	- *RP-3135-97-1-11-5*
	Biofortification / High Iron and Zinc Line: 1
	- *RPBio5478-185M*
• **Blast Resistant Lines: 2** - *DRR-BL-31* - *DRR-BL-150* -	**Strong culm Line: 1**
	- *DRR-SM-26*
	CMS Lines: 4
• **Sheath blight Resistant Line: 2** - *RP Bio Patho-2* - *DRR-SM-SHB-6 (ShB-1/ SB-5)*	- *DRR 4A & 4B* - *DRR 5A & 5B* - *DRR 9A & 9B* - *DRR 10 A & 10B*
• **Multiple Biotic stress Resistant Lines: 5** - *RP4518-2-6 (RPMRE-1)* - *RP4621-1842 (RPMRE-2)* - *RP4621-1845 (RPMRE-3)* - *RP4642-669 (RPMRE-5)* - *RPMRE 6* -	**Restorers Lines: 7**
	- *RPHR 517* - *RPHR 1096* - *RPHR 619* - *RPHR 2* - *RPHR 12* - *RPHR 1005* - *GQ-25*

Biotic Stress Resistant Lines

RPBio-189 (IET 19045)

a. Field view, b. Whole grain and c. Polished rice

Name of the Line	:	RPBio-189 (IET 19045)
Type	:	Bacterial blight resistant, fine-grain type, high-yielding rice line
National identity	:	IC569676
INGR No.	:	INGR09070
Year of Registration	:	2009
Pedigree	:	Samba Mahsuri*4/SS113
Unique Features	:	• This line has broad spectrum resistance to bacterial blight disease. • It is MAS derived line having *Xa21, xa13* and *xa5* genes in the background of Samba Mahsuri, but it has higher yield than Samba Mahsuri. • Cooking and eating quality are similar to Samba Mahsuri but it has low water uptake.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP 5448-RIL-501

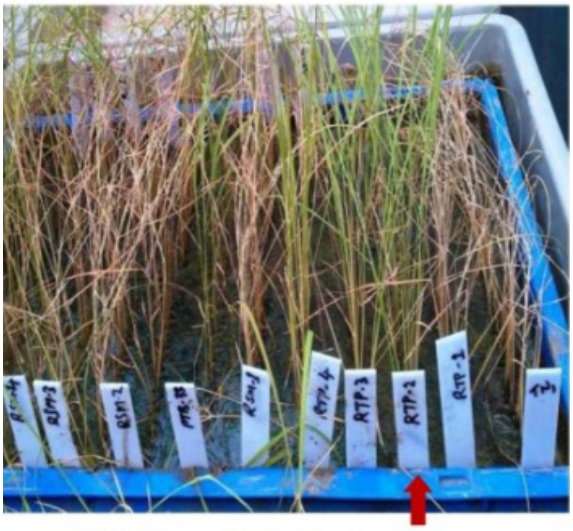


Fig1(a): RP 5448-RIL-501 with resistance reaction in greenhouse against BPH

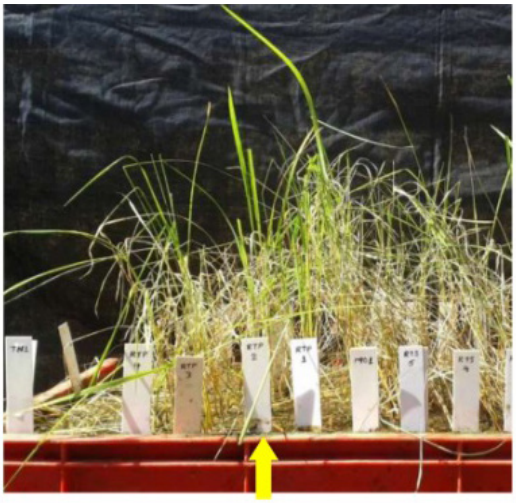


Fig 1(b): RP 5448-RIL-501 with resistance reaction against WBPH in glass house

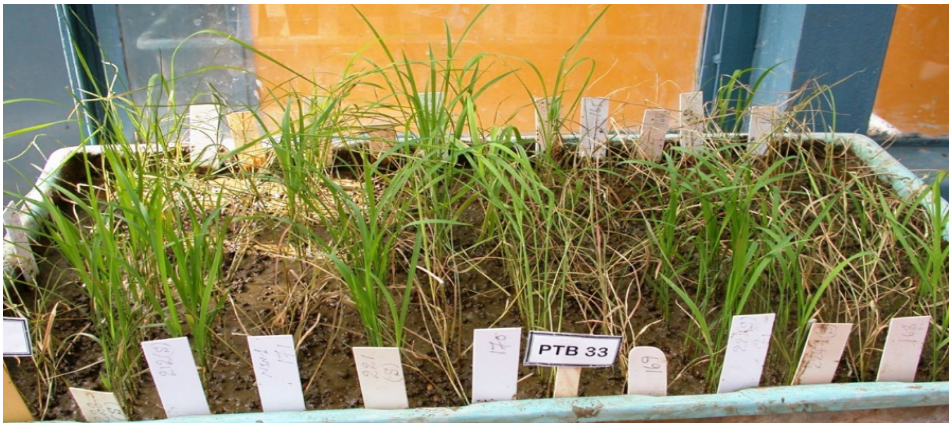
Name of the Line	:	RP 5448-RIL-501
Type	:	Resistant to plant hoppers
National identity	:	IC0617119
INGR No.	:	INGR 16001
Year of Registration	:	2016
Pedigree	:	TN1 \ PTB 33
Unique Features	:	• A promising donor conferring resistance to both Brown planthopper (BPH) and Whitebacked planthopper (WBPH) insects of rice. It could be used as an elite resistant genetic stock to develop new varieties with combined resistance to planthoppers. • Exhibits resistance during vegetative as well as reproductive stages of crop growth • A medium duration line (140 days) with intermediate plant height (120 cm), non-lodging with well exerted panicles bearing medium slender grains. • Recorded good cooking quality traits ie., high milling recovery (61.6%) coupled with medium head rice recovery (53%), desirable alkali spreading value (4), intermediate desirable amylose content (25.1 %) with hard GC (22 mm)
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP 5449-RIL-320

Field screening of RP 5449-RIL-320 at hot spot (APRRI, Maruteru) against planthoppers

Name of the Line	:	RP 5449-RIL-320
Type	:	Recombinant inbred line
National identity	:	IC 0619226
INGR No.	:	INGR 17066
Year of registration	:	2017
Pedigree	:	RP 5449-RIL-320
Unique Features	:	• Novel dual donor for resistance to both Brown planthoppers (BPH) and Whitebacked planthoppers (WBPH) in rice which could be used as a unique genetic source for breeding new rice cultivars with increased resistance to planthoppers. • A late duration culture (145 days) with intermediate plant height (118 cm) possessing semi-erect and partially excreted panicles bearing short bold grains • Recorded good grain quality traits i.e., high milling recovery (67%) coupled with medium head rice recovery (50%) intermediate desirable amylose content (24 %) and desirable alkali spreading value (7).
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

RP Bio 4918-228S



Greenhouse screening RP BIO 4918 228S for BPH reaction

Name of the Line	:	RP Bio 4918-228S
Type	:	BPH Resistant line
National identity	:	IC626001
INGR No.	:	INGR18002
Year of Registration	:	2018
Pedigree	:	*Oryza sativa* L. (Swarnavar) / *Oryza nivara* (accession no. IRGC 81848 S)
Unique Features	:	• Novel donor for resistance to brown planthopper (BPH) Nilaparvata lugens in rice. Possesses high resistance in vegetative and reproductive stages. • It is a medium duration culture (140 days) with intermediate plant height (120 cm), and non-lodging. It possesses compact and well exserted panicles bearing medium grains. • It has shown good cooking quality traits such as high milling recovery (63%) coupled with medium head rice recovery (45%) and desirable alkali spreading value(4). It recorded intermediate desirable amylose content (24.8%) with hard GC (24)
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP Bio 4918-230S

Tolerance of RP BIO 4918-230S in the field at tillering and reproductive stage in IIRR, Hyderabad.

Name of the Line	:	RP Bio 4918-230S
Type	:	BPH Resistant Line
National identity	:	IC632075
INGR No.	:	INGR19041
Year of Registration	:	2019
Pedigree	:	*Oryza sativa* L. (Swarna var) / *Oryza nivara* (accession no. IRGC 81848 S)
Unique Features	:	• Novel donor for resistance to Brown planthopper (BPH) Nilaparvata lugens. Possesses high resistance at vegetative and reproductive stages. • Present in the elite genetic background of popular commercial variety Swarna. • The overall resistance reaction was observed to be stable in field and greenhouse during seedling, vegetative and reproductive stages. Hence this line could further be exploited as a novel donor for developing brown planthopper resistant varieties of rice.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP 5316-RIL-243

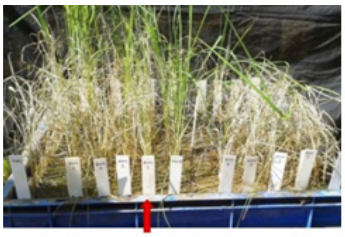


Fig 1. RP 5316-RIL-243 exhibiting resistance against BP in Glass house

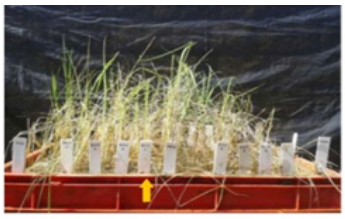


Fig 2: RP 5316-RIL-243 exhibiting resistance agai WBPH in Glass house

Fig 3: Field screening in hotspot location (Maruteru) against mixed population of BPH and WBPH

Name of the Line	:	RP 5316-RIL-243
Type	:	Recombinant inbred line
National identity	:	IC0628571
INGR No.	:	INGR19003
Year of Registration	:	2019
Pedigree	:	RP 5316-RIL-243
Unique Features	:	• Potential donor for resistance to planthoppers (Brown planthoppers and Whitebacked planthoppers) in rice • Exhibits resistance during vegetative and reproductive stages of crop growth under controlled and field conditions. It could be used as a unique genetic source for breeding rice cultivars with enhanced resistance to planthoppers. • A non-lodging late duration culture (148 days) with intermediate plant height (125cm). • It possesses semi-erect and well exerted panicles bearing long bold grains. • It possesses good quality traits namely high milling recovery (65.5 %) coupled with medium head rice recovery (58%), intermediate amylose content (23 %) and desirable alkali spreading value (5 mm).
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

RP4639-110 (RPMRE-4)

Name of the Line	:	RP4639-110 (RPMRE-4)
Type	:	Biotic Stress Resistant Line
National identity	:	IC569652
INGR No.	:	INGR09075
Year of Registration	:	2009
Pedigree	:	TN1 x Abhaya
Unique Features	:	• Broad spectrum resistance against gall midge biotypes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

Aganni

Name of the Line	:	Aganni
Type	:	Biotic Stress Resistant Line
National identity	:	IC567518
INGR No.	:	INGR09004
Year of Registration	:	2009
Pedigree	:	Landrace-Aganni
Unique Features	:	Broad spectrum resistance against Asian rice gall midge biotypes. Resistance to African rice gall midge.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

ARC 15831

Name of the Line	:	ARC 15831
Type	:	Biotic Stress Resistant Line
National identity	:	IC567515
INGR No.	:	INGR09001
Year of Registration	:	2009
Pedigree	:	Landrace-ARC 15831
Unique Features	:	• Broad spectrum resistance against Asian rice gall midge biotypes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

INRC 3021

Name of the Line	:	INRC 3021
Type	:	Biotic Stress Resistant Line
National identity	:	IC567516
INGR No.	:	INGR09002
Year of Registration	:	2009
Pedigree	:	Landrace-INRC 3021
Unique Features	:	• Broad spectrum resistance against Asian rice gall midge biotypes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

INRC 202

Name of the Line	:	INRC 202
Type	:	Biotic Stress Resistant Line
National identity	:	IC567517
INGR No.	:	INGR09003
Year of Registration	:	2009
Pedigree	:	Landrace-INRC 202
Unique Features	:	• Broad spectrum resistance against Asian rice gall midge biotypes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

DRR-BL-31

A) Evaluation for blast disease resistance of IL-1 with susceptible check HR12 on either side
B) leaf area of IL-1 possessing qBL3+qBL7, showing resistance reaction

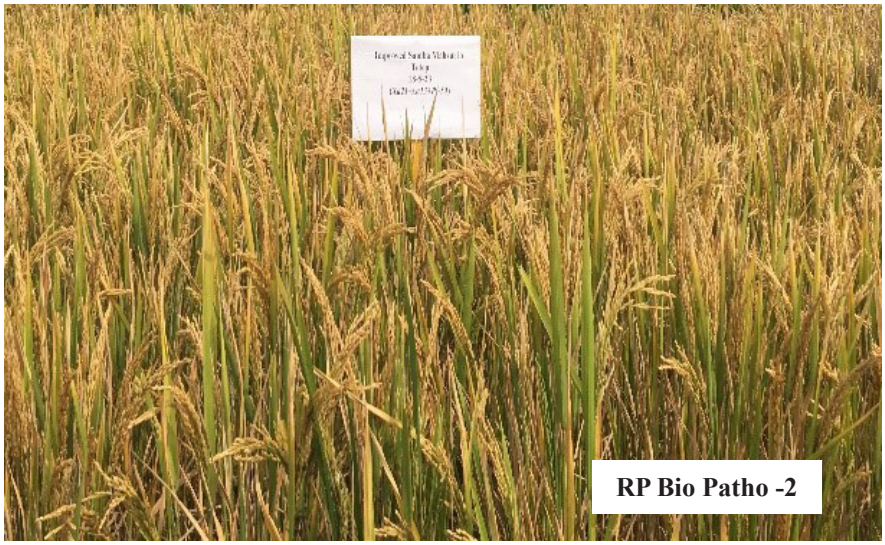
Name of the Line	:	DRR-BL-31
Type	:	Blast Resistant Line
National identity	:	IC0611702
INGR No.	:	INGR15002
Year of Registration	:	2015
Pedigree	:	PR114 / *O. glumaepatula* (104387) // 2*PR114
Unique Features	:	• Improved lines in the background of PR114 with resistance to leaf blast and neck blast and found that it carries novel blast resistance genes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research, Hyderabad and Punjab Agricultural University (PAU), Ludhiana

DRR-BL-150

Evaluation for blast disease resistance of IL-2, showing immune response with susceptible check HR12 on either side

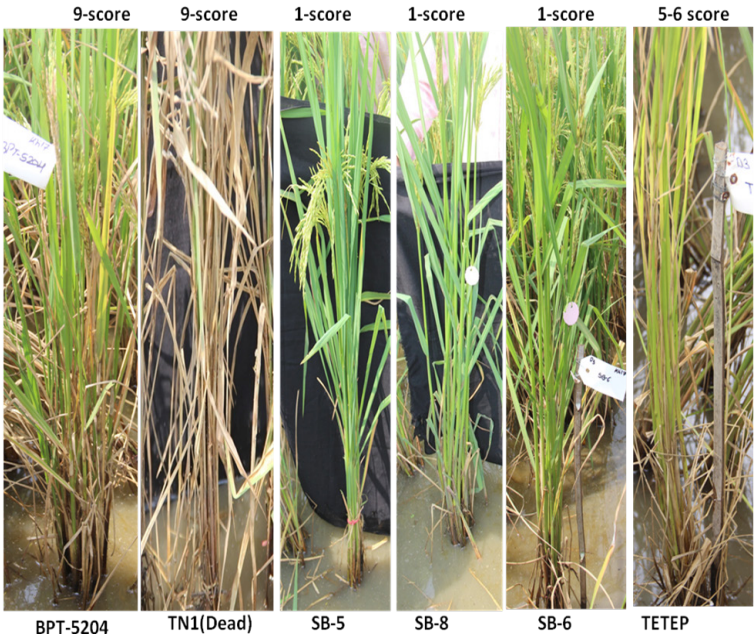
Name of the Line	:	DRR-BL-150
Type	:	Blast Resistant Line
National identity	:	IC0611701
INGR No.	:	INGR15001
Year of Registration	:	2015
Pedigree	:	PR114 / *O.glaberrima* (102526) //*3*PR114
Unique Features	:	• Improved lines in the background of PR114 with resistance to leaf blast and neck blast and found that it carries novel blast resistance genes.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research, Hyderabad and Punjab Agricultural University (PAU), Ludhiana

RP Bio Patho-2



Name of the Line	:	RP Bio Patho-2
Type	:	Blast and Bacterial blight resistance line
National identity	:	IC626002
INGR No.	:	INGR18001
Year of Registration	:	2018
Pedigree	:	Improved Samba Mahsuri x Tetep
Unique Features	:	• Broad-spectrum resistance for leaf blast and bacterial blight. • Present in the elite genetic background of Improved Samba Mahsuri. • Moderate resistance for Neck blast, Sheath blight, Sheath rot and Brown spot besides blast resistance. • It has all agro morphological and grain characters similar to recurrent parent (Improved Samba Mahsuri) (94.9% recurrent parent recovery)
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

DRR-SM-SHB-6



Phenotypic screening for sheath blight tolerance mutant (ShB-1/SB-5) under field conditions

Name of the Line	:	DRR-SM-SHB-6 (ShB-1/ SB-5)
Type	:	Sheath blight Resistant Line
National identity	:	IC635695
INGR No.	:	INGR20080
Year of Registration	:	2020
Pedigree	:	Selection of single EMS induced Samba Mahsuri mutant line in M2 and advanced to M8 through panicle to row method
Unique Features	:	• Samba Mahsuri mutant having higher tolerant to sheath blight. Medium slender grain type. • Possessing genetic background of elite cultivar Samba Mahsuri.
Seed availability (yes / no)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research, Hyderabad and CSIR - Centre for Cellular & Molecular Biology, Hyderabad

RP4518-2-6 (RPMRE-1)

Name of the Line	:	RP4518-2-6 (RPMRE-1)
Type	:	Multiple Biotic Stress Resistant Line
National identity	:	IC569649
INGR No.	:	INGR09072
Year of Registration	:	2009
Pedigree	:	MR 1523 X Abhaya
Unique Features	:	• Broad spectrum resistance against gall midge biotypes. • Multiple resistance to gall midge and brown plant hopper
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP4621-1842 (RPMRE-2)

Name of the Line	:	RP4621-1842 (RPMRE-2)
Type	:	Multiple Biotic Stress Resistant Line
National identity	:	IC569650
INGR No.	:	INGR09073
Year of Registration	:	2009
Pedigree	:	Aganni x Bhumansan
Unique Features	:	• Broad spectrum resistance against gall midge biotypes. • Multiple resistance to gall midge, brown plant hopper, whitebacked plant hopper and green leaf hopper.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP4621-1845 (RPMRE-3)

Name of the Line	:	RP4621-1845 (RPMRE-3)
Type	:	Multiple Biotic Stress Resistant Line
National identity	:	IC569651
INGR No.	:	INGR09074
Year of Registration	:	2009
Pedigree	:	Aganni x Bhumansan
Unique Features	:	• Broad spectrum resistance against gall midge biotypes. • Multiple resistance to gall midge, brown plant hopper, whitebacked planthopper and green leaf hopper.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RP4642-669 (RPMRE-5)

Name of the Line	:	RP4642-669 (RPMRE-5)
Type	:	Multiple Biotic Stress Resistant Line
National identity	:	IC569653
INGR No.	:	INGR09076
Year of Registration	:	2009
Pedigree	:	ARC15831 x W 1263
Unique Features	:	• Broad spectrum resistance against gall midge biotypes. • Multiple resistance to gall midge, brown plant hopper, whitebacked planthopper and green leaf hopper.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

RPMRE 6

Name of the Line	:	RPMRE 6
Type	:	Multiple Biotic Stress Resistant Line
National identity	:	IC0594593
INGR No.	:	INGR13073
Year of Registration	:	2013
Pedigree	:	ARC 15831 x RP 2068-18-3-5
Unique Features	:	Broad spectrum gall midge resistance, multiple resistance to GM+BPH+WBPH
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

Abiotic Stress Tolerant Lines

IET 9691

Name of the Line	:	IET 9691
Type	:	Low Phosphorus Tolerant Line
National identity	:	IC569481
INGR No.	:	INGR09071
Year of Registration	:	2009
Pedigree	:	RP 2235-48-54-6, Cross IR50/Phalguna
Unique Features	:	• Tolerant to phosphorus deficient soil with higher root mass and volume. • High yielder in phosphorus deficient and normal soils.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

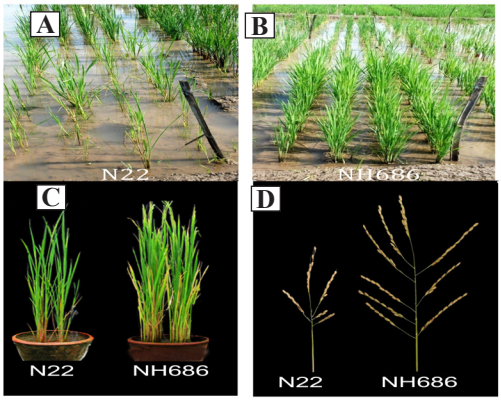
RP 5866-Agami

Fig1 : IET 24784 (RP 5866-Agami)

Fig2 : Polished rice (Zn:25.49 ppm)

Name of the Line	:	RP 5866-Agami
Type	:	High Zinc & Salt Tolerant Line
National identity	:	IC 0619227
INGR No.	:	INGR 17067
Year of Registration	:	2017
Pedigree	:	RP 5449-RIL-320
Unique Features	:	• A Zinc dense source containing 25.49 µg/g Zinc in polished rice with mean grain yield of 2.8t/ha • It also recorded tolerance to high coastal salinity (ECe: 8.3 dSm^{-1}; and pH : 7.4) • It is a mid-early duration line (130 days) with intermediate plant height (120 cm) and short bold grains • It possesses excellent grain quality traits such as high milling recovery (71.5%), high head rice recovery (69.6 %), intermediate desirable amylose content (22.9 %) with soft gel consistency GC (63 mm) and desirable alkali spreading value (4) • This line could be used as a novel genetic source for high zinc content and could be exploited in developing nutritious rice varieties, particularly rich in Zinc micronutrient apart from costal saline tolerance.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

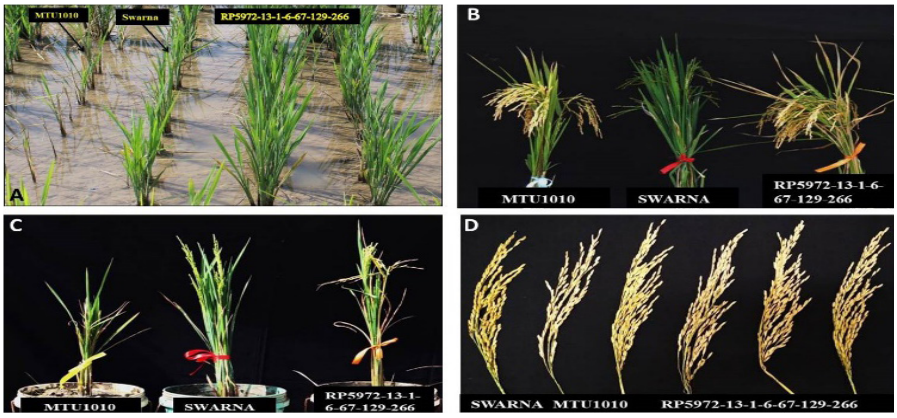
NH686



N22 and NH686 in (A) low phosphorus (P) field.
(B) low P soil in pots. (C) N22 and NH686 panicle architecture in low P condition.

Name of the Line	:	NH686
Type	:	Low Phosphorus Tolerant Line
National identity	:	IC626284
INGR No.	:	INGR18003
Year of Registration	:	2018
Pedigree	:	NAGINA22
Unique Features	:	• NH686 is an Ethyl Methane Sulphonate (EMS) induced mutant of variety Nagina 22. • The mutants was first screened along with wild type N22 and check varieties Rasi and Kasalath in low Phosphorus (P) field conditions (2Kg/ha P) and NH686 was identified as the best low-P tolerant line in terms of tiller number and grain yield under low Phosphorus soil. • NH686 is a stable, elite rice genetic stock tolerant to low P condition in field. It can be used as a donor parent or as a check when screening for rice varieties with tolerance to low P. • Apart from tolerance to low P condition, NH686 is tolerant to multiple abiotic stresses and also has high Zn concentration in polished rice as evaluated under AICRIP biofortification trial for 3 years. • NH686 showed highest grain yield and per day productivity among mid early lines.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

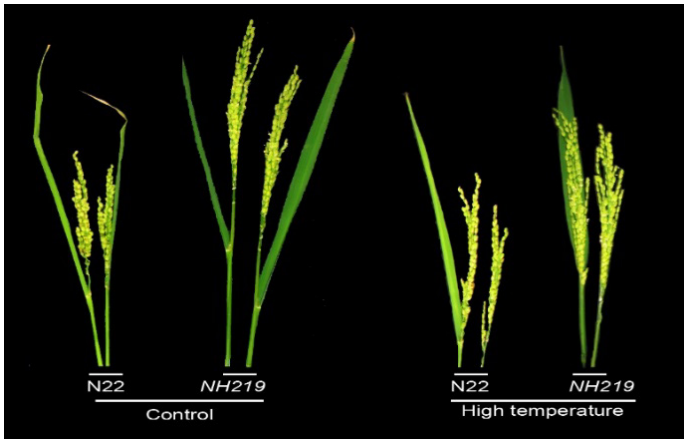
RP5972-13-1-6-67-129-266



A:Comparision of RP5972-13-1-6-67-129-266 w.rt to MTU1010 and Swarna parents in Low soil Phosphorous plot. B: Comparison of growth of RP5972-13-1-6-67-129-266 (NIL of MTU1010) in Normal soil P plot w.r.t to parent MTU1010. C: Comparison of growth of RP5972-13-1-6-67-129-266 (NIL of MTU1010) in Low soil P plot w.r.t to parent MTU1010. D: Panicle characteristics of RP5972-13-1-6-67-129-266 (NIL of MTU1010) in comparison with the Donar parent-Swarna and recurrent parent- MTU1010. There is a considerable increase in the panicle length and number of grains per panicle and the grains obtained the hull colour of the donar parent- Swarna.

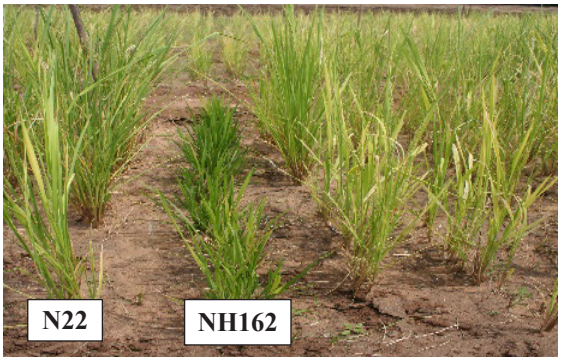
Name of the Line	:	RP5972-13-1-6-67-129-266
Type	:	Low Phosphorus Tolerant Line
National identity	:	IC632071
INGR No.	:	INGR19036
Year of Registration	:	2019
Pedigree	:	Swarna / MTU1010*2
Unique Features	:	• Tolerance to Low soil Phosphorous. • Yields higher to MTU1010 in low and normal phosphorous containing soils with long slender grain type. Early in flowering in comparison to MTU1010 parent both in low and normal phosphorous soil conditions. • The better root system of MTU1010-NIL, RP5972-13-1-6-67-129-266 in comparison with the recurrent parent (MTU1010) in low soil P which helps in better survival and tolerance. • It reduces the application of phosphorous fertilizer to 30%. • It shows promising performance in both in low and Normal Phosphorous conditions in terms of several growth and yield related parameters.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

NH219



Name of the Line	:	NH219
Type	:	Heat Stress Tolerant Line
National identity	:	IC632074
INGR No.	:	INGR19039
Year of Registration	:	2019
Pedigree	:	NAGINA22
Unique Features	:	• NH219 is Ethyl Methane Sulphonate (EMS) induced mutant of rice variety Nagina 22 • The mutant was identified as dark green leaf (*dgl*) mutant which survived under prolonged drought and high temperature stress. • NH219 was better than N22 in heat tolerance parameters such as %germination, chlorophyll stability, leaf senescence index and the ability to keep dry weight same at 30°C and 40°C. • When field evaluated in ICAR-IIRR, the yield decrease under heat stress was 33% in N22 but only 23% in NH219. • NH219 is also tolerant to low Phosphorus in soil, has high Photothermic Index and radiation use efficiency based on AICRIP report 2013. • It has dark green leaves and a high SPAD value of 39-40 compared to 30 of N22.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

NH162



Name of the Line	:	NH162
Type	:	Drought Stress Tolerant Line
National identity	:	IC632599
INGR No.	:	INGR19040
Year of Registration	:	2019
Pedigree	:	Nagina22
Unique Features	:	• NH162 is Ethyl Methane Sulphonate (EMS) induced mutant of rice variety N22. • The mutant was identified as dark green leaf (*dgl*) which survived under prolonged drought and high temperature stress in rabi season upto tillering stage. • Grain yield was 2-fold higher than N22 under normal and water limited conditions in field. • NH162 is the stable and high yielding mutant under both normal and water limited conditions. • The mutant shows stay green, dwarf, with higher tiller number, stem thickness, late duration with higher grain yield when compared with N22 under normal condition. • When field evaluated in IIRR, the yield decrease under water limited condition was 42% in N22 but only 25% in NH162. • During the dark induced senescence with cytokinin 6-benzyl adenine (BA), N22 showed rapid reduction in the Chl a/b ratio, chlorophyll content than NH162. • In N22 plants, leaf rolling appeared on the fifth day after withholding water, and the leaves became wilted on the eighth day, whereas in NH162, leaf rolling appeared on tenth day and wilted on the 14th day.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

Aromatic long slender line

RP-3135-97-1-11-5

Name of the Line	:	RP-3135-97-1-11-5
Type	:	Aromatic long slender line
National identity	:	IC296643
INGR No.	:	INGR04002
Year of Registration	:	2004
Pedigree	:	RP-3135-97-1-11-5, PR 109/Pakistan Basmati (IET 15833)
Unique Features	:	• Semi-dwarf basmati with excellent grain quality and aroma.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

Biofortification / High Iron and Zinc Line

RPBio5478-185M

Name of the Line	:	RPBio5478-185M
Type	:	Biofortification / High Iron and Zinc Line
National identity	:	IC635010
INGR No.	:	INGR20003
Year of Registration	:	2020
Pedigree	:	Madhukar/ Swarna F10 recombinant Inbred line
Unique Features	:	• It is an elite rice line with high grain zinc concentration in both brown (33.5ppm Zn) and polished (31ppm Zn) grain. • 185M showed 102ppm Zn in F_7 unpolished rice using AAS method and 30ppm since then consistently using XRF method. • It showed the highest overall grain zinc concentration of 27.38ppm in brown rice and 31.69ppm in polished rice. • It showed the highest overall grain zinc concentration (30.62mg/Kg) in brown rice among the 68 lines tested in a combined analysis of 15 trials in 3 years and a mean grain yield of 3.08t/ha at 6 other locations with high and low soil zinc. • It has purple basal leaf sheath, leaves and panicles. It is 129cm tall, shows 50% flowering in 98days to 107days and has long bold grains with white pericarp. • In the presence of ascorbic acid, 185M showed higher bioavailability of Fe (2times) and Zn (3times) than in Swarna. • It shows 62% head rice recovery and good cooking quality traits such as alkali spreading value 4, amylose content 24.48% and gel consistency 50 mm. It showed moderate resistance to sheath blight, blast, neck blast, sheath rot and tungro diseases.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

Strong culm Line

DRR-SM-26

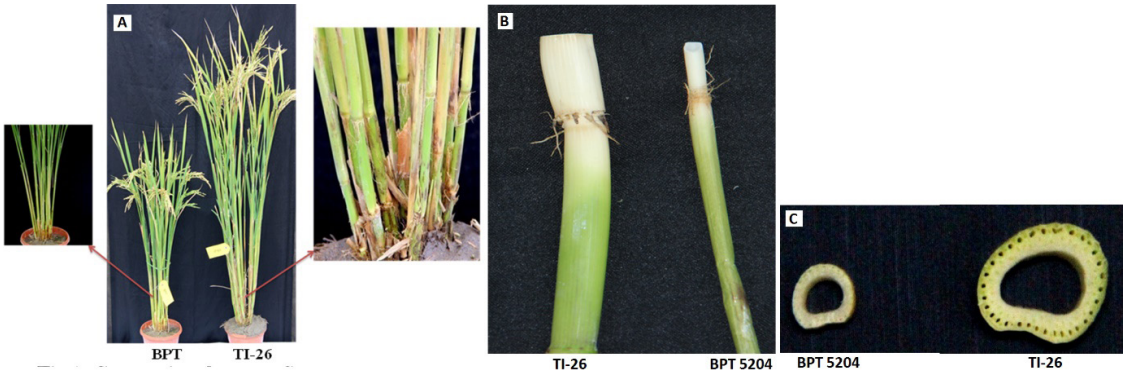


Fig: A: Comparison between Strong Culm Mutant (TI-26) and Wild Type (BPT-5204)
B: Comparison of stems of wild type and mutant (TI-26) & C: Section cutting of mutant and Wild type

Name of the Line	:	DRR-SM-26 (SC-11/ SP70/ TI-26/ SB-8)
Type	:	Strong culm Line
National identity	:	IC635696
INGR No.	:	INGR20079
Year of Registration	:	2020
Pedigree	:	Selection of single EMS induced Samba Mahsuri mutant line in M2 and advanced to M8 through panicle to row method
Unique Features	:	• Samba Mahsuri mutant having higher culm strength, lodging tolerance. • Possessing genetic background of elite cultivar Samba Mahsuri.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research, Hyderabad and CSIR - Centre for Cellular & Molecular Biology, Hyderabad

CMS Lines

DRR 4A & 4B

Name of the Line	:	DRR 4A & 4B
Type	:	CMS Line
National identity	:	IC569482 & IC569483
INGR No.	:	INGR09077
Year of Registration	:	2009
Pedigree	:	A Line (IR 58025A/MI 15-1-8-1-3)*6MI 15-1-8-1-3 and B Line (PMS-2B x 9601) → MI 15-1-8-1-3
Unique Features	:	• Cytoplasmic male sterility with higher rate of stigma exsertion, MS grain type and high head rice recovery • Semi dwarf stature with easily observable morphological traits like purple basal leaf sheath, purple apiculus and purple coloured stigma. • Higher rate of out-crossing on A-line plants and mid early maturity group.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

DRR 5A & 5B

Name of the Line	:	DRR 5A & 5B
Type	:	CMS Line
National identity	:	IC569484 & IC569485
INGR No.	:	INGR09078
Year of Registration	:	2009
Pedigree	:	A Line (IR 68897A/MI 15-4-3-1-1-4)*6MI 15-4-3-1-1-4 and B Line (PMS-2B x 9601)→ MI 15-4-3-1-1-4
Unique Features	:	• Higher rate of stigma exsertion on A and B lines. • Higher out crossing rate and semi dwarf stature. • Medium maturity group and good tillering capacity
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

DRR 9A & 9B

Name of the Line	:	DRR 9A & 9B
Type	:	CMS Line
National identity	:	IC569486 & IC569487
INGR No.	:	INGR09079
Year of Registration	:	2009
Pedigree	:	A Line (IR 68888A/MI-15-1-10-1-1)*6 MI-15-1-10-1-1 and B Line (PMS-2B/9601) → MI -15-1-10-1-1
Unique Features	:	• Higher rate of stigma exsertion on A and B lines. • Higher outcrossing rate and semi dwarf stature. • Medium maturity group and good tillering capacity.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

DRR 10 A & 10B

Name of the Line	:	DRR 10 A & 10B
Type	:	CMS Line
National identity	:	IC569488 & IC569489
INGR No.	:	INGR09080
Year of Registration	:	2009
Pedigree	:	A Line (IR 58025A/MI -15-7-8-4-1-5) and B Line (PMS-2B/9601) → MI -15-7-8-4-1-5
Unique Features	:	• CMS line with stable and complete male sterility. • Medium maturity group. Higher rate of stigma exsertion and out crossing.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR - Indian Institute of Rice Research

Restorer Lines

RPHR 517

Name of the Line	:	RPHR 517
Type	:	Restorer line
National identity	:	IC569492
INGR No.	:	INGR09083
Year of Registration	:	2009
Pedigree	:	(RPHR-1005 x IR 24) → RPHR 517-1-6-8-3-2
Unique Features	:	• Broad spectrum of fertility restoration with good plant type. • High rate of pollen production with medium slender grain type. • Tall stature with high heterotic potential and late maturity duration.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

RPHR 1096

Name of the Line	:	RPHR 1096
Type	:	Restorer line
National identity	:	IC569495
INGR No.	:	INGR09086
Year of Registration	:	2009
Pedigree	:	(BR 827-35 x SC5 21-1-2-1-4) → RPHR-1096
Unique Features	:	• Broad spectrum of fertility restoration and easily observable morphological marker purple basal leaf sheath and purple apiculus. • High rate of pollen production, slow leaf senescence and high head rice recovery. • Tall stature and intermediate plant type with late maturity duration.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

RPHR 619

Name of the Line	:	RPHR 619
Type	:	Restorer line
National identity	:	IC569493
INGR No.	:	INGR09084
Year of Registration	:	2009
Pedigree	:	(BR 827-35 x SC5 23-3-4-2) --> RPHR-619
Unique Features	:	• Strong and broad spectrum of fertility restoration. • Tall stature intermediate plant type with synchronous tillering, • High pollen load and slow leaf senescence with medium maturity
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

RPHR 2

Name of the Line	:	RPHR 2
Type	:	Restorer line
National identity	:	IC569490
INGR No.	:	INGR09081
Year of Registration	:	2009
Pedigree	:	(Swarna x 9314)→ SC_5 2-2-1-2-1-2 (RPHR-2)
Unique Features	:	• Japonica plant type with long and heavy panicles and dark green thick leaves, • Strong and broad spectrum of fertility restoration with medium slender grain type and high head rice recovery. • High pollen load and 36-45 days of grain filling period.
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

RPHR 12

Name of the Line	:	RPHR 12
Type	:	Restorer line
National identity	:	IC569491
INGR No.	:	INGR09082
Year of Registration	:	2009
Pedigree	:	(Swarna x 9314) → SC5 12-3-1-4-5-6 (EPLT-104) → RPHR-12
Unique Features	:	• Strong and broad spectrum of restoration • Tropical japonica plant type, • High rate of pollen production with medium slender grain type • Tall stature with high heterotic potential and late maturity duration
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

RPHR 1005

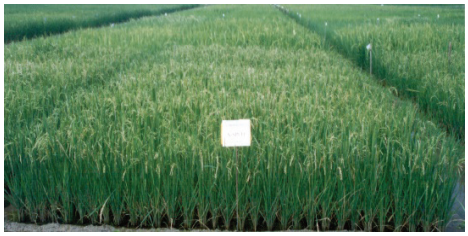
Name of the Line	:	RPHR 1005
Type	:	Restorer line
National identity	:	IC569494
INGR No.	:	INGR09085
Year of Registration	:	2009
Pedigree	:	(BPT 5204 x SC_5 126-3-2-4) → RPHR-1005
Unique Features	:	• Broad spectrum of fertility restoration with good plant type • High rate of pollen production and good combining ability. • BPT5204 derivative with short slender grain, lower panicle position and prominent top leaves
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR – Indian Institute of Rice Research

GQ-25

Name of the Line	:	GQ-25
Type	:	Restorer Line
National identity	:	IC0599273
INGR No.	:	INGR20001
Year of Registration	:	2020
Pedigree	:	SAMBA MAHSURI x SC 5126-3-2-4
Unique Features	:	• High temperature tolerance • High NUE
Seed availability (Yes / No)	:	Yes
Developed by	:	ICAR-Indian Institute of Rice Research

Non-varietal technologies developed by ICAR-IIRR

Customized Leaf Color Chart for Nitrogen Management in Rice for Irrigated Rice

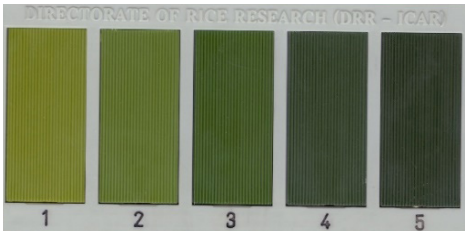


- 'Enhancement of N use efficiency in rice is very important.
- Application of 'N' through leaf colour chart (LCC) and SPAD – N technique gave nearly equal grain yield. These techniques saves about 20 - 30 kg/ha.
- SPAD meter values and colour charts reading recorded at critical growth stages were closely correlated with grain yield.
- Colour charts of different green colour gradient was prepared and made available to farmers.

Leaf color chart (left) is found to be an inexpensive alternative to SPAD chlorophyll meter (right) for effective N top dressing

How to use?

1. Start taking LCC readings from 14th day for Transplanted and 21st day for Direct seeding when basal not applied.
2. If basal 'N' (DAP or NPK) is applied take LCC readings at 21-25 DAT for Transplanted; 28-30 DAS for Direct Seeding.
3. Take 10 readings during (8-10 A.M.) from fully expanded, top most and healthy leaf of the 10 plants. (one reading/plant).
4. If 6 of 10 readings below the critical LCC 3 value apply 'N' as mentioned.
   Kharif: 20-25 kg N/ha; Rabi: 25-28 kg N/ha
5. Repeat LCC readings for every 7 days to judge correct time of 'N' top dressing.



Modified LCC chart

Advantages

- LCC is an easy-to-use and inexpensive diagnostic tool.
- The LCC can be used by the farmer himself to rapidly assess leaf nitrogen status and to decide the amount and time of nitrogen application.
- Helps to maintain optimal leaf nitrogen content of rice crop, which can be vital for achieving higher nitrogen use efficiency and better yield.
- Reduces the insect pest infestation.
- Reduces the cost of cultivation for rice.

Rapid Soil Health Testing Kit

The inadequate availability of soil testing equipment's or laboratories and trained manpower is making the soil testing programme more serious at the individual plot or farm level. The rice soil quality kit developed by IIRR is useful for carrying out soil testing in neutral to alkaline soils. This kit will simplify the soil chemical analysis for ready use by the less skilled personals in the rural areas by the soil testing laboratories and rural service centres.

- Designed for on-farm rice soil testing by a semi-skilled person.
- Portable and is highly suited for irrigated rice soils as well as dried soil samples.
- Most important soil physical parameter such as estimation of bulk density can be performed in two minutes' time.
- Various chemical parameters such as Soil pH, Soil organic carbon / organic matter, essential nutrients such as available N, P, K, S, Ca and Mg can be performed rapidly.
- A very important biological parameter such as soil respiration test can be estimated which takes a little longer time.
- Several quantitative and qualitative visual colour charts have been developed which have been validated against the established scientific principles and methods of estimation.
- The kit is highly user friendly and can be used by anybody with minimal training/ awareness.
- The kit is however, mostly suitable for testing a neutral, saline to alkaline soil.

Rice Riche Moisturizing Lotion

- The product is a skin care product made from rice bran oil and brown rice extract as key ingredients.
- The product is light, non-sticky and smooth, suitable for normal and oily skin.
- The oil and the brown rice extract contain various skin beneficial ingredients contributing to suppleness, tightening, lightening and preventing dryness of the skin.

Due to brown rice, the product also contains Oryzanol, vitamins and other antioxidants like tocopherols, tocotrienols, Phytosterols etc. These antioxidants fight with free radicals and slow down the effect of aging. The product is meant for topical application. It can be applied daily on face and body for moisturizing the skin. Most of the users found this product superior to the products available in the market.

Rice Riche Pain Relieving Gel

The product, Rice Pain Relieving Gel is a herbal formulation containing rice bran oil as a carrier. The product is highly effective for minor aches and pains of muscles and joints associated with simple strains, bruises and sprains. The product is meant for topical application. It should be applied by gently massaging on the affected area until it penetrates the skin. Patent Filed at Indian Patent Office with application no. 202241011157 dated 02/03/2022.

- The product is an herbal formulation containing rice bran oil as a carrier.
- Rice bran oil used in this formulation serves as an excellent base for dissolving natural pain relieving ingredients and making it an efficient pain relief product.
- Rice bran oil absorbs well in the skin, thereby active ingredients get absorbed fast and provide quick relief.
- It is a quick absorbing fast pain relief product as endorsed by users.

Rice Riche Face Scrub

Rice Riche Face Scrub is an exfoliation product which has been designed specifically for use on the face. It removes dead skin cells to give a more polished and healthy look by making skin softer and brighter. The product is mild enough to be approved for daily use by male and female both. Patent Filed at Indian Patent Office with application no. 202241006257 dated 05/02/2022.

Features and Benefits

- Regular use of this product keeps skin smooth and glowing by removing dead skin, and exposing a layer of younger, healthier skin.
- Rice bran oil being an emollient nourishes the skin while removing dead skin.
- Although the product is oil based, it can easily be washed off with water leaving behind the skin smooth, soft and moist.
- Regular use of the product protects from the problem of blemishes and dark spots., and flakes around nose and chin area.

Rice Riche Cream for Cracked Heel and Dry Skin

The product is a rice bran oil base cream useful for therapeutic and cosmetic applications such as cracked heels, dry skin disorder. It softens the heel and the foot skin, preventing the feet and other parts from forming thick and hard skin and enhancing the elasticity.

Features of the Product

- The formulation, apart from healing the cracks on heels, is useful in arresting the bleeding due to cracks and reducing the pain.
- The cream has the excellent effects of softening the heel and the foot skin. It enhances skin elasticity.
- Interestingly, compared to commercially available products, the recurrence of cracks is less severe.
- The composition of the formulation is new, very safe, eco-friendly and does not produce any harmful effects.

Iron Riche Rice

Iron deficiency is one of the major reasons of anemia wherein the level of hemoglobin is insufficient. In infants and young children, it impairs growth, cognitive development and immunity; in pregnant women, it is linked with an increased risk of maternal mortality, as well as an increased risk of pre-term delivery, retarded fetal growth, and low birth weight. This problem can be overcome if the rice which is the staple food of majority of the Indian population, is fortified with iron. Keeping this view in mind, a protocol for production of IRON RICHE RICE was developed.

Effectiveness of the product:

- Iron Riche Rice produced by this protocol is highly effective in alleviating iron deficiency condition. Hemoglobin level measured in moderately subjects increased from 9.25 to 10.83 g/dl while in subjects with severe anemia increased from 6.77 to 10.36 g/dl.

Acceptability of the product

- This product is palatable and is indistinguishable from unfortified rice.
- No significant difference in appearance, odor, tenderness, taste and over all acceptability of the edible products made from Iron Riche Rice and unfortified rice was observed.

Unique selling proposition

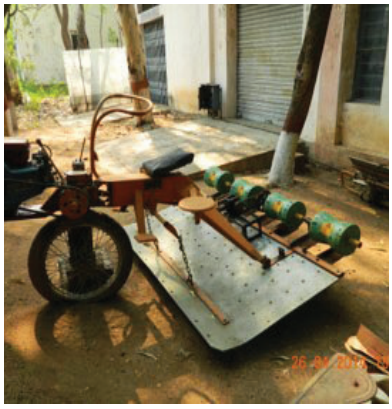
- The process provides uniform absorption of fortificant inside the grain but the developed protocol is cheaper and highly cost effective.
- There is no considerable loss of iron on washing with water or when cooked with excess of water. Loss of iron occur when fortification is done using coating or dusting method.
- Chance of free radical formation is little as fortificant is uniformly absorbed inside the grain. Absorbed iron will have little opportunity to interact with atmospheric oxygen.

How is the product different from other similar products?

- Iron of fortified rice produced by conventional methods like dusting and coating, gets washed away when rinsed or cooked with access of water. These methods require special equipment for spraying and for blending of fortified kernels with unfortified grains.
- Extrusion technique which is used for making reconstituted fortified rice, requires costly equipment which increases the cost of fortification.
- Present Protocol involves uniform absorption of iron into grain and thus there is no considerable loss of iron when rinsed or cooked in excess of water. It does not require any additional equipment except the parboiling unit.
- Therefore, the Iron Riche Rice is an efficient and highly cost effective value added product for preventing and treating iron deficiency.

Power operated 8 row drum seeder

Direct seeded rice is gaining popularity among farmers especially wet DSR. Using the traditional drum seeder takes lot of time as it has to be pulled manually by two persons. In the present Power operated seeder furrow openers have been provided so that the seed will not drift.



Specifications:

No of rows: 8

Row to Row spacing: 20 cm

Field capacity ha/h: 0.25

Power source: 4 hp diesel engine

Cost: Rs.75000

Cost of operation (Rs/ha): 1200

No of Furrow openers: 8

Benefits over conventional drum seeder: Field capacity is increased from 0.040 ha/h to 0.25 ha/h, thereby saving time of sowing

Pot Puddling machine

Rice is grown in pots for different screening purpose. Usually, the puddling of soil is done manually which is labour intensive and time consuming. To puddle the soil a mechanical device using electric motor has been developed

Pot puddling machine with I hp motor

Specification:

Capacity: 250 kg /h

Cost (Rs): Rs.25000

No of persons: One

Power source: 1hp Electrical engine

Benefits over conventional method: Human drudgery is reduced

Services offered at ICAR-IIRR

S.No		Item / Parameter
1.		**Biotechnology**
	a.	Hybrid rice - Hybrid and parental line purity testing / assessment - Seed purity testing (Seed lot of 100 Seeds/Seedlings)
	b.	Screening for genes of Fertility Restoration / WC / Bacterial blight / Blast / Gall midge (Minimum of 25 samples /genotypes)
	c.	Detection / Diagnosis of RTBV and RTSV from rice samples
		1. RTBV/RTSV detection by PCR(Minimum of 5 samples)
		2. RTBV/RTSV quantification by RealTime PCR (Minimum of 5 samples)
	d.	Training for Students (Excluding boarding& lodging): (as per ICAR guidelines) ➢ 6 Months / Students
	e.	Training for Industry (Excluding boarding& lodging): ➢ 1 week
2.		**Plant Breeding**
	a.	Grain quality parameters:
		➢ Non- Basmati rice (14Characters) / Samples
		➢ Basmati rice (15 Characters) /Sample
	b.	Procurement Price of paddy seed cleaned
		Breeder Seed Class
		1. Fine Varieties
		2. Coarse Varieties
		3. Scented Varieties
		Non-Breeder Seed class
		1. Fine Varieties
		2. Coarse Varieties
		3. Scented Varieties
	c.	XRF analyses for iron and zinc in rice grain samples (Minimum of 10 samples)
		➢ Unpolished
		➢ Polished
	d.	DUS Test (One entry for two seasons at two locations)

3.		**Plant Pathology**
	a.	Fungicide formulations / treatment /season / disease (The charges would be collected for thestandard check and untreated check, inthe trial concerned)
	b.	Phytotoxicity observations
	c.	Residue sample collections (Seed, straw & soil)
	d.	Plant health effects (Shoot & root length, No. of tillers, overall crop stand at last reading)
	e.	Repeated inoculations (2nd inoculation onwards / inoculation)
	f.	Screening for Disease resistance / Entry/ Season
		➢ Blast (minimum of 50 lines)
		➢ Sheath blight (minimum of 50 lines)
		➢ Bacterial blight (minimum of 50 lines)
		➢ Rice Tungro Disease (minimum of 50 lines)
	g.	Quarantine testing (For Diseases, insect pests & nematodes / entry)
	h.	One isolate – BLB/BL/FS/SAB (one vial/plate)
	j.	Training (For Industry personnel) /person/ 1 Week (Excluding lodging and boarding)
4.		**Entomology**
	a.	Toxicity of Insect Pest / Natural enemy per formulation / treatment / season / insect (The charges would be collectedfor the standard check and untreated check, in the trial concerned)
	b.	Phytotoxicity observations
	c.	Screening for insect resistance / Entry /Pest / Biotype (minimum of 40 lines)
	d.	One insect culture (SB / GLH BPH / WBPH)
	e.	Training (For Industry personnel) / person / 1 Week (Excluding lodging and boarding)
5.		**Agronomy**
	a	Herbicides / treatment / season (The charges would be collected for the standard check and untreated check, in the trial concerned)
6.		**Soil Science**
	a.	Soil (for one sample)
		➢ pH, EC, Organic carbon, available N, P, K
		➢ Available micronutrients – Zn, Mn, Fe, Cu
		➢ Texture analysis, CEC, Exch. Na, Ca, Mg, K, ESP, SAR
	b.	Plant (Grain, Straw, Plant residues, Green Manure) for one sample.

		➢ Major & Secondary Nutrients – N, P, K, Ca, Mg, S
		➢ Micronutrients – Zn, Fe, Mn, Cu,
7.		**Plant Physiology**
		Testing and field evaluation of growth enhancers and related products.
8.		**CTC:** Training programs / Participant (Includes boarding and lodging):
	a.	➢ Private Agro-input Agencies Executives (at least 5 days)
		➢ Quality control of Rice: Officialsof Export Inspection Council of India (at least 5 days)
		➢ Hybrid Rice Seed Production Technology: Seed Production Personnel from Public & PrivateSector, Seed Companies (at least 5 days)
	b.	➢ Marker Assisted Selection: Private Seed Companies & Universities (Breeders & Bio-technologists) (at least 5 days)
	c.	➢ Hybrid Rice Breeding: Breeders from Public & Private Sector Seed Companies (at least 5 days)
9.		**Coordinated Program**
	a.	Evaluation of transgenic crops/ entry / location / year
	b.	Evaluation of hybrids or varieties /entry / year
	c.	Testing of Molecules and Agro-input Products (Fungicides / Insecticides / Herbicides / IGR's/PGR'S / Micronutrients / Fertilizers / Bio – fertilizers, etc.): Per molecule / location / season (minimum 5 locations)
10.		**General**
	a.	Technology Transfer: (Example: Evaluation of SRI / Creating a Virtual Platform for information & Training Support on SRI, etc.)
	b.	Video Shooting by various agencies (per hour)
	c.	Farm Produce Paddy Straw
	d.	Farm Produce Mixed Paddy

The charges for the above services are available at ICAR - IIRR website https://www.icar-iirr.org

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