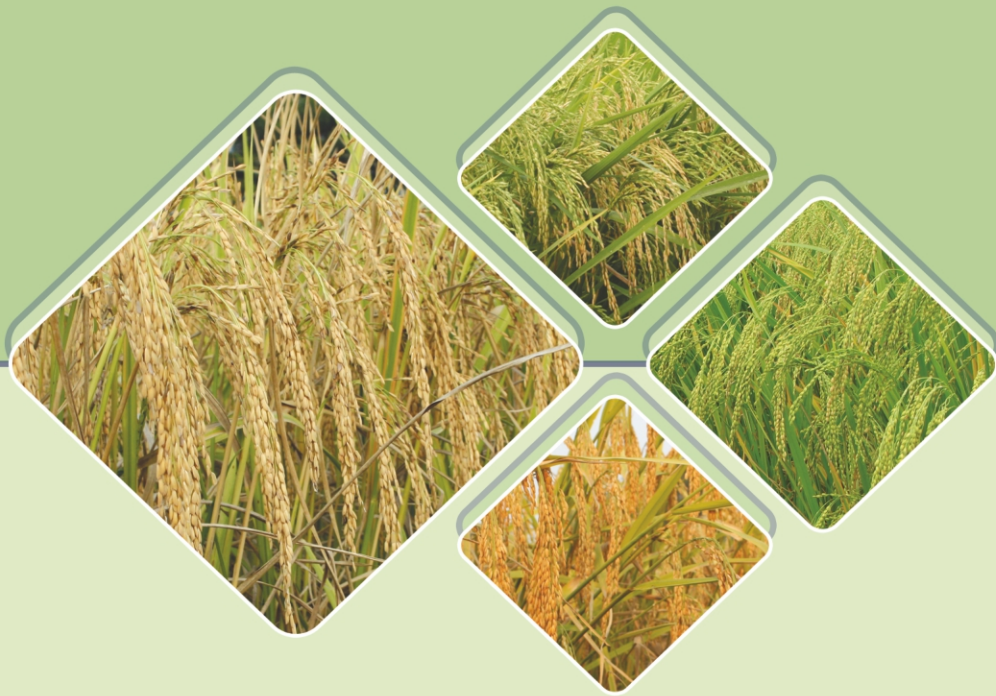


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**ICAR - National Rice Research Institute**  
Cuttack, Odisha 753 006



An ISO 9001 : 2015 Certified Institute

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**Dr. H. Pathak**  
Director

## Foreword

Rice varieties are bred for higher yield and imparting other unique traits for tolerance/resistance to biotic and abiotic stresses and superior grain quality. The grain yield of rice varieties varies in different regions of India. Eastern India shows relatively less yield due to predominant rain-fed cultivation. National Rice Research Institute (ICAR-NRRI), Cuttack, Odisha has released 139 rice varieties including three hybrids. The previous analysis of area covered by NRRI varieties provided insights on the role of NRRI varieties on national food security. The present analysis on the different traits of NRRI varieties namely yield trend, yield index, grain quality including glycemic index, resistant starch, straw quality and response to biotic and abiotic stresses further complements the previous analysis and provides additional insights in the phenotypic diversity of NRRI varieties. For example, NRRI varieties are more popular in the rainfed, shallow lowland and irrigated ecologies. Also, the rate of increase in the yield for NRRI varieties ( $0.022 \text{ t ha}^{-1}\text{year}^{-1}$ ) is similar to the national average. Ecologies such as irrigated, shallow lowlands, deep water showed increasing trend in yield over years. Further, varieties namely Shaktiman, Savitri showed very less glycemic index. The biotic stress response of NRRI varieties indicates presence of resistance for major diseases and pests of rice. Straw quality analysis of NRRI varieties provides valuable information for the utilization of paddy straw for various purposes. Thus, the present bulletin is not only an account on the unique traits of NRRI varieties but also provides insights in the long-term objectives of researchers through which varieties are developed by the institute. Additionally, future needs of rice farmers especially in eastern India are going to be entirely different as compared to the previous few decades. In this regard, integration of the data obtained in the present analysis will greatly assist in fine-tuning the objectives of development of rice varieties to suit the farmers' need.

I sincerely appreciate the scientists of NRRI, Cuttack for bringing out this timely, valuable document on the different traits of NRRI varieties and strongly believe the information available in this research bulletin will inspire and encourage rice scientists for developing highly profitable, climate-smart, consumer demand driven rice varieties catering to the future need of rice farmers in our country.

  
( H. Pathak)



## Preface

ICAR - National Rice Research Institute (ICAR-NRRI), Cuttack, Odisha has released 139 rice varieties including three hybrids. Our previous analysis of total rice area covered by NRRI varieties showed popularity of NRRI varieties especially in Odisha and West Bengal. Further, scientists from different divisions individually analyzed the NRRI varieties for general traits such as yield, ecologies, duration, grain related traits including glycemic index, straw quality, biotic and abiotic stress responses. Therefore, compilation of all the analyzed traits of NRRI varieties was initially conceived for better understanding of the phenotypic diversity of NRRI varieties. In this regard, seven general traits of NRRI varieties, eleven grain related traits including glycemic index and resistant starch, nine biotic stresses, four abiotic stresses, yield trend analysis over years, duration, ecologies, grain type and straw quality were analyzed in this research bulletin. For the analysis, varietal traits data of NRRI varieties were collected from the individual scientists and analyzed for mean values, grouping into different phenotypic classes and tabulation was done for each traits studied. Further, data points for different traits were also verified individually and pictorial representation for all the traits analyzed was made. Further, based on the bar charts for the different traits, preliminary draft was prepared and extreme values of traits were removed from the analysis in preparing final draft. We request the readers to initially go through the charts for different traits in order to understand the general trend of NRRI varieties and annexures can be referred for specific information. We hope that most of the data on the phenotypic diversity of the NRRI varieties provided by the scientists are included in this research bulletin.

We gratefully acknowledge all the scientists of NRRI for providing the data about NRRI varieties, without them the compilation of this research bulletin could not be possible. We sincerely believe this research bulletin provides insights to the rice scientists and could be very useful in designing the breeding program for development of rice varieties in future.

**Authors**



## Summary

ICAR-NRRI, Cuttack has released 139 varieties so far including three hybrids. NRRI varieties are popular among the farmers in eastern India especially in the states of West Bengal and Odisha. Our previous analysis showed that NRRI varieties cover an area of about 7.91Mha in India. However, varietal traits, grain and straw quality and reaction of NRRI varieties to biotic/abiotic stresses are not reported so far. Thus, the present research bulletin highlights seven general traits of NRRI varieties, eleven grain related traits including glycemic index and resistant starch, straw quality, nine biotic stresses, four abiotic stresses and yield trend analysis for duration, ecologies and grain types over the years. The analysis showed ~54.47% of NRRI varieties were released for two ecologies namely irrigated and shallow lowlands. The medium duration varieties (121-135 days) provided higher yield ( $>5 \text{ t ha}^{-1}$ ) as compared to long duration NRRI varieties. However, rate of increase in the yield of NRRI varieties is  $0.022 \text{ t ha}^{-1}\text{year}^{-1}$  over years which are found to be similar to national average. The predominant grain type of NRRI varieties is medium and long slender. The varieties namely Sonamani, Swarna-Sub1, Lunabarial showed greater head rice recovery, HUE and Geetanjali showed higher grain length and kernal length after cooking (KLAC), Shaktiman, Savitri showed low glycemic index ( $<60$ ). Further, response of NRRI varieties to biotic and abiotic stresses is also highlighted in this bulletin. The varieties namely Savitri, Panidhan, and Sumit showed resistance to blast due to presence of nine blast resistance genes. Additionally, varieties namely Sarasa, Neela, Nua Kalajeera, Swarna Sub1, Poorna Bhog showed resistance to bakanae, and varieties Sarala, Hazardhan, Satyakrishna, Reeta were moderately resistant for brown spot diseases. Similarly, Reeta and Lunasampad showed moderate resistance to rice root knot nematode and brown plant hopper, respectively. Variety Samalei showed resistance to gall midge. In particular, popular varieties for shallow lowland ecologies namely Pooja, Sarla, Gayatri were also found to be tolerant to stagnant flooding (30cm water depth). Further, paddy straw quality analysis has identified few varieties most suited for composting because of higher nitrogen content on dry matter basis. Thus, the present bulletin provides comprehensive information related to the characteristics of NRRI varieties along with grain traits, which will be useful for the rice researchers in designing the breeding program for rice improvement.



# 1. Introduction

ICAR-National Rice Research Institute (ICAR-NRRI), formerly known as Central Rice Research Institute (CRRI), initiated the hybridization program for development of high yielding rice varieties from 1960 onwards. The institute has released the first variety fifty years back named as 'Padma'. The institute has so far released 139 rice varieties of different ecologies including three hybrids for cultivation. The high yielding, nitrogen responsive rice varieties made India self-sufficient and varieties released after green revolution resulted in five-fold increase in rice production. However, addressing the challenges of rice farming due to climate change, low profitability, below optimum productivity requires special efforts to sustain the food security in coming decades. Therefore, it is of prime importance to understand the traits, salient features, and farmer's preference of released NRRI varieties in order to structure the breeding program to meet the upcoming challenges.

## 2. Methodology

### 2.1. Traits analysis of NRRI varieties

The traits namely average yield, grain type, ecologies, duration were collected for NRRI released varieties, analyzed for mean and grouped into distinct classes for further analysis. Linear regression model was used for yield trend analysis over the years considering year of release of variety as a function of yield of NRRI varieties by using the linear equation  $y = ax + b$ , where  $y$  is yield of the NRRI variety,  $x$  is year of release and  $b$  is the constant. Similar trend analysis was also performed for different traits such as duration, ecologies, and grain type. Breeder seed indent for NRRI varieties were taken from the annual report of AICRIP-National seed project (crops), Indian Institute of Seed Science, Mau (2017-18). The area covered by NRRI varieties was taken from Pathak et al. (2018).

### 2.2. Biotic stress screening

Rice leaf blast screening was conducted at Uniform Blast Nursery (UBN), NRRI, Cuttack. Each variety (30 plants per test entry) was planted in 50 cm long rows in nursery beds at spacing of 10 x 10 cm. The susceptible checks (HR12 and CO39) were sown in borderlines as spreader rows and as well as after every five test entries for uniform spread of the disease. Disease reaction was recorded twenty five days after sowing and continued up to 40<sup>th</sup> day after sowing or spreader row per checks achieved 85% of the disease symptom (Susan et al, 2018). Sheath blight disease screening was performed by artificial inoculation under field condition by inserting the sclerotia of virulent *Rhizoctonia solani* isolate. Artificial seed inoculation method was used for screening against bakanae disease as described by Fiyaz et al. (2014). The virulent isolate of *Sclerotium oryzae* was mass multiplied in the sand-maize medium, mixed with the sterilized pot soil @ 15 g kg<sup>-1</sup> of soil and utilized for screening against seedling blight disease of rice. Varietal screening of Brown plant hopper (BPH) was carried out as per





the procedure followed by Anonymous et al. (1975) and Jena et al. (2015). NRRI varieties were evaluated against rice root knot nematode by releasing a J2 per g of soil. The test entries were screened against gall midge biotype GMB2 in greenhouse as per the standard protocols (Vijaya et al. 2006).

### 2.3. Resistant starch and glycemic index analysis

Resistant starch and glycemic index of NRRI varieties was analyzed as reported by Kumar et al. (2018).

### 2.4. Straw quality parameters

NRRI varieties have been evaluated for different paddy straw qualities as reported by Subudhi et al. (2020).

## 3. NRRI varieties: Salient features

### 3.1. No. of NRRI varieties

The institute has released so far 139 rice varieties including three varieties were identified for release during 2019 (Fig. 1, Annexure I). In the last nine years, 51 varieties were released and are preferred by the farmers for cultivation. Recently, varieties for high protein rice, high zinc rice, and multiple biotic and abiotic stress tolerant varieties have been released for cultivation through backcross breeding (Table 1). Also, multiple MOUs have been signed with the private companies for marketing of NRRI varieties, in particular for three hybrids developed in the institute. Thus, varieties released from NRRI are being cultivated by the farmers of eastern India in general, and particularly in Odisha and West Bengal.

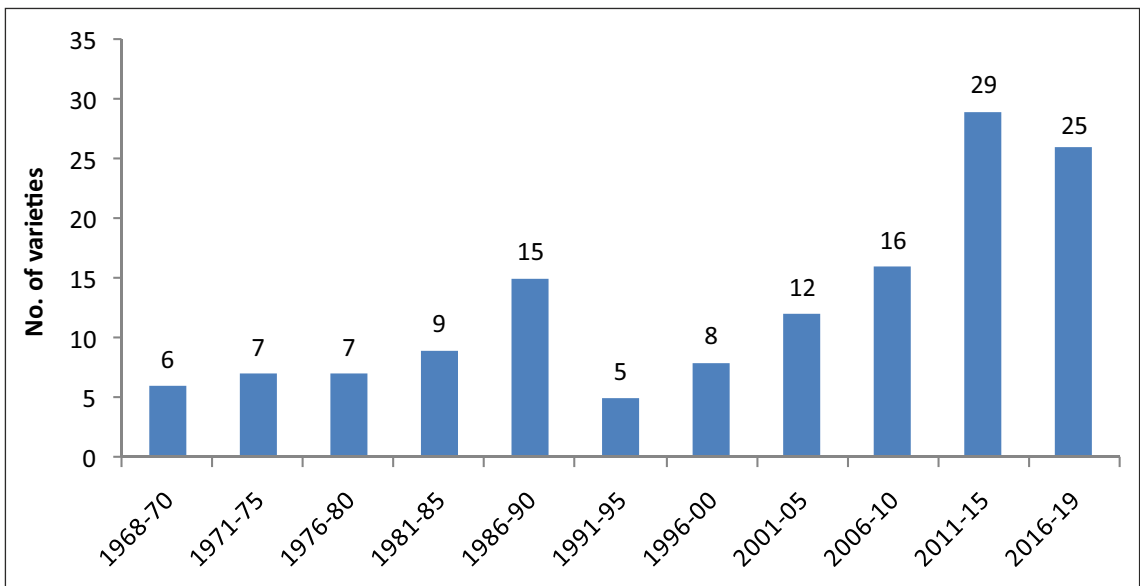


Fig. 1. NRRI varieties released in the last 50 years.

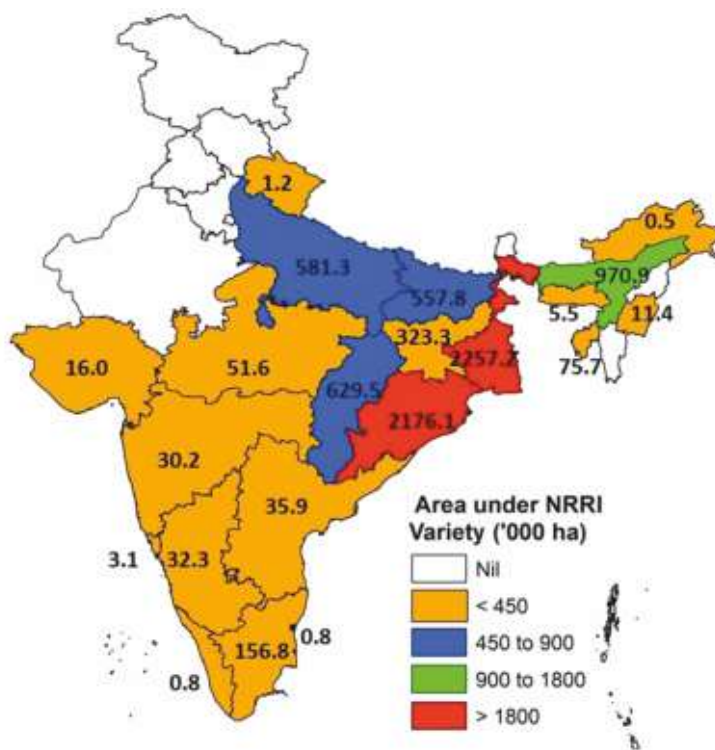


**Table 1.** Varieties of NRRI developed using marker assisted selection.

Variety	Year of release	Ecology	Genes/QTLs introgressed
1. Swarna-Sub1	2009	Flood prone, shallow lowland	<i>Sub1</i>
2. Improved Lalat	2012	Irrigated	<i>xa5, xa13, Xa21</i>
3. Improved Tapaswini	2012	Irrigated	<i>xa5, xa13, Xa21</i>
4. CR Dhan 800	2016	Shallow lowland	<i>Sub1, xa5, xa13, Xa21</i>
5. CR Dhan 801	2018	Shallow lowland	<i>Sub1, qDTY1.1, qDTY2.1, qDTY3.1</i>
6. CR Dhan 802	2018	Shallow lowland	<i>Sub1, qDTY1.1, qDTY2.1</i>

### 3.2. Area covered by NRRI varieties in India

NRRI varieties are widely grown in different states of India (Fig. 2) (Pathak et al. 2018). The major states growing NRRI varieties are West Bengal, Odisha, Chhattisgarh, Uttar Pradesh, Bihar, Jharkhand, and Tamil Nadu including few other states. The total area covered by NRRI varieties is 7.91 Mha in India. The two states namely West Bengal and Odisha cover nearly 50% area of NRRI varieties in India.



**Fig. 2.** Area of NRRI varieties grown in different states of India.



### 3.3. Popular NRRI varieties in formal seed chain

The breeder seed indent of NRRI varieties shows ~54 varieties are in breeder seed chain. During 2017-18, major varieties namely Sahbhagidhan, Swarna-Sub1, Pooja, CR Dhan 201, Abhishek, Sarala, Naveen were indented through breeder seed indent (Fig. 3). These varieties were grown in ecologies such as rainfed upland, flood prone shallow lowland, shallow lowland, aerobic, medium deep, irrigated, boro, deep water and irrigated conditions. Moreover, variety Maudamani is spreading through informal seed chain especially by farmers to farmers transfer in Odisha.

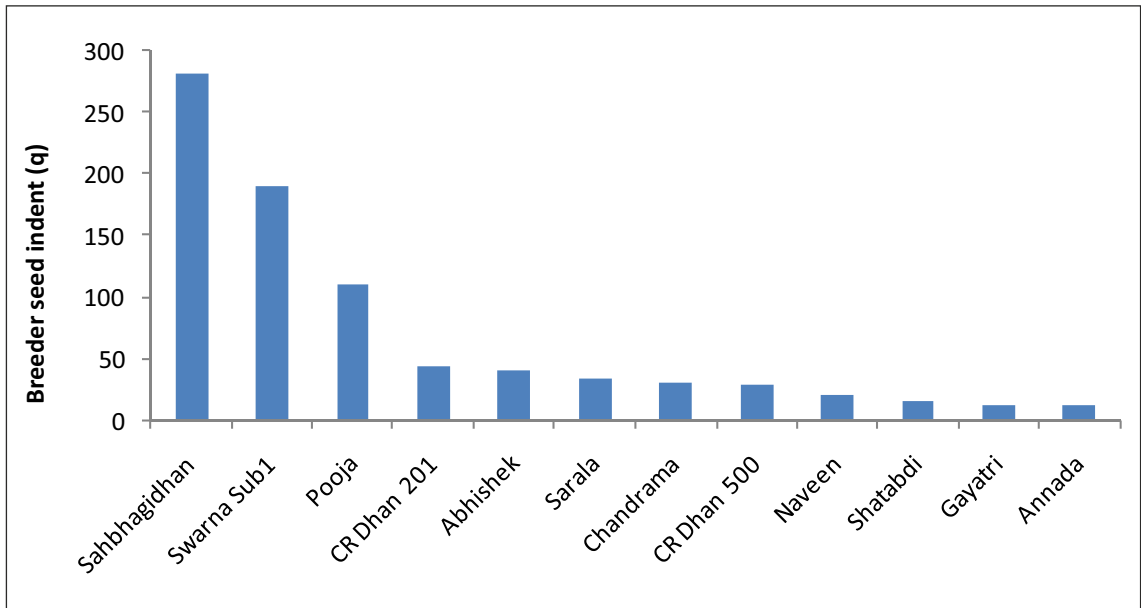
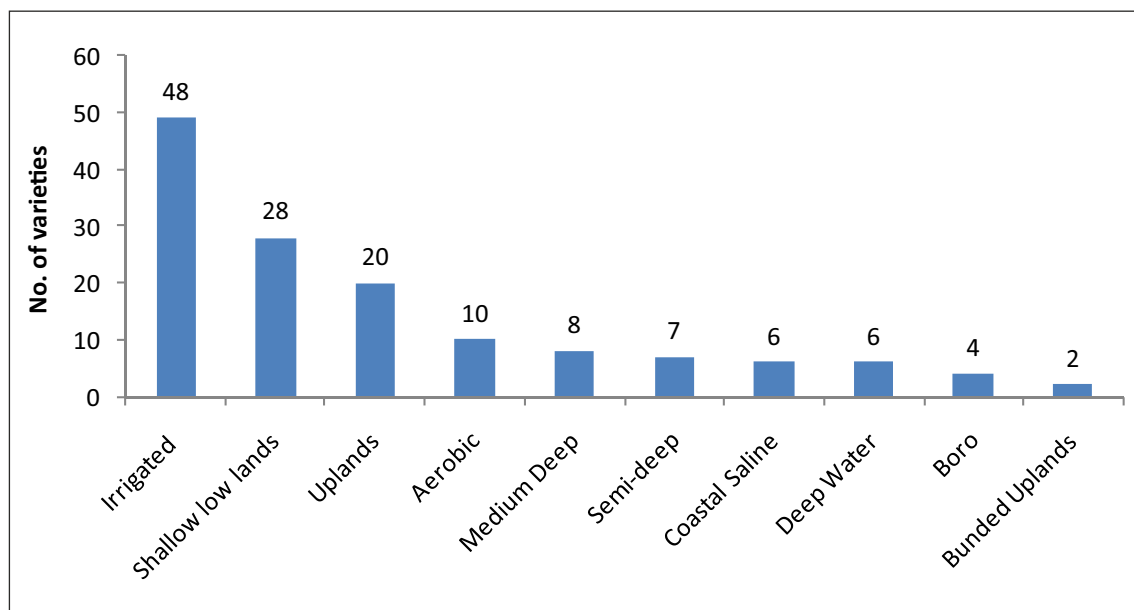


Fig. 3. Demand of breeder seed of popular NRRI varieties.

### 3.4. Ecology-wise NRRI varieties

The NRRI varieties are very popular among the farmers of different states in India. Among the 139 rice varieties released by NRRI, Cuttack, 20 varieties were released for upland, 49 varieties were released for irrigated ecology, 28 varieties for shallow lowlands, 21 varieties for deep, semi-deep and medium deep ecologies, 6 varieties for coastal salinity ecology, 10 varieties for aerobic ecology and few varieties have been released for bunded-uplands, rainfed, and boro ecologies in India (Fig. 4). Varieties such as Sahbhagidhan, Pooja, Naveen, Shatabdi, and Savitri are very popular among the farmers in India. Also, it is estimated that NRRI varieties are grown in an area of 7.9 Mha and generates a gross annual returns of Rs. 48, 643 crores in India.



**Fig. 4.** Ecology-wise suitability of NRRI varieties.

### 3.5. Yield trend of NRRI varieties

The average yield of NRRI varieties recorded in AICRIP trials were analyzed for understanding the long-term trend in the yield of NRRI varieties. The linear regression curve for yield over years has showed that mean yield of the varieties has increased from  $3.5 \text{ t ha}^{-1}$  in 1968 to  $4.6 \text{ t ha}^{-1}$  in 2018 (Fig. 5a). Even though, yield of NRRI varieties has improved by over  $1 \text{ t ha}^{-1}$ , but the rate of increase of mean yield of NRRI rice varieties was only  $0.022 \text{ t ha}^{-1}\text{year}^{-1}$ . The release of varieties in different ecologies especially rainfed upland and lowlands could be one of the major reasons for very less yield increase per year during the last 50 years. Further, ecosystem-wise yield trend analysis showed that varieties released for deep and medium-deep ecologies have the highest yield increase over the years as compared to other ecologies. Additionally, varieties of shallow lowlands, irrigated and upland ecologies showed similar trend of yield increase and remaining ecologies showed more or less stable yield increase over years (Fig. 5b). Similarly, yield trend was also analyzed for the duration of varieties over years in different ecologies. In the analysis, long duration varieties of deep and semi-deep water showed increase in the yield. Similarly, irrigated, aerobic, upland varieties also showed increased yield trends for increase in the duration of the varieties. However, coastal salinity, shallow lowlands and medium-deep varieties showed reduced yield trends for increase in the duration of the varieties (Fig. 5c). Additionally, grain type of NRRI varieties were also analyzed for yield trend over the years. In the analysis, except for long bold varieties, long slender, medium slender, and short bold showed increasing yield trend over years (Fig. 5d). Thus, yield trend analysis indicates different breeding efforts are required to increase the average yield of varieties for various ecologies.

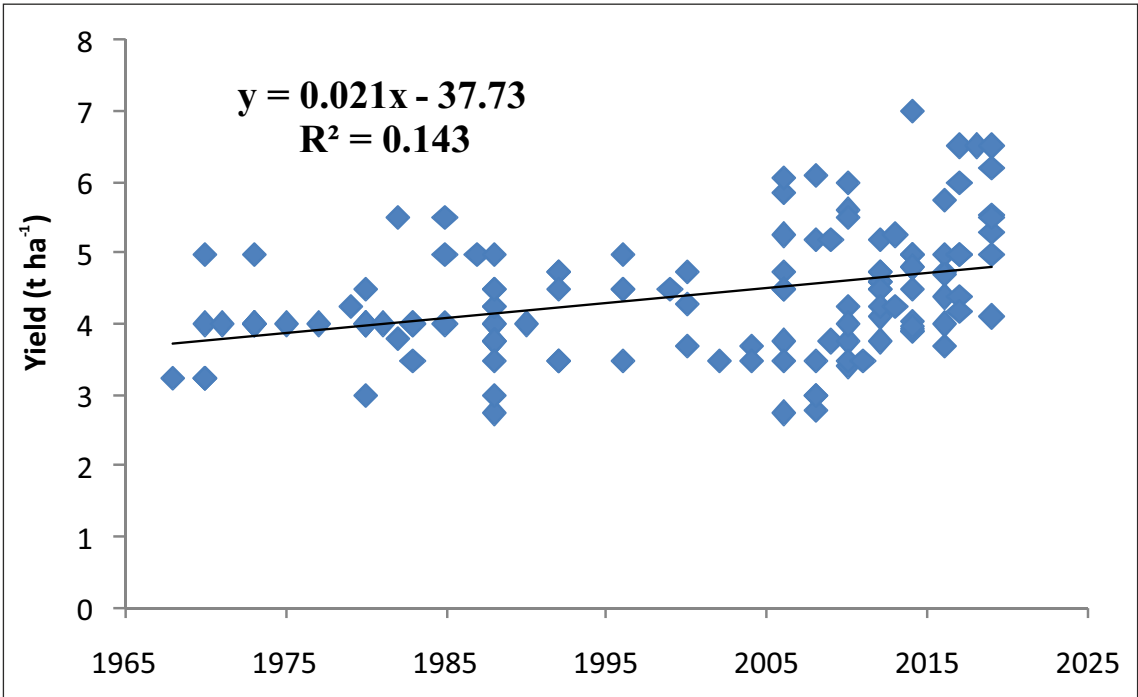


Fig. 5a. Yield trend of NRRI varieties.

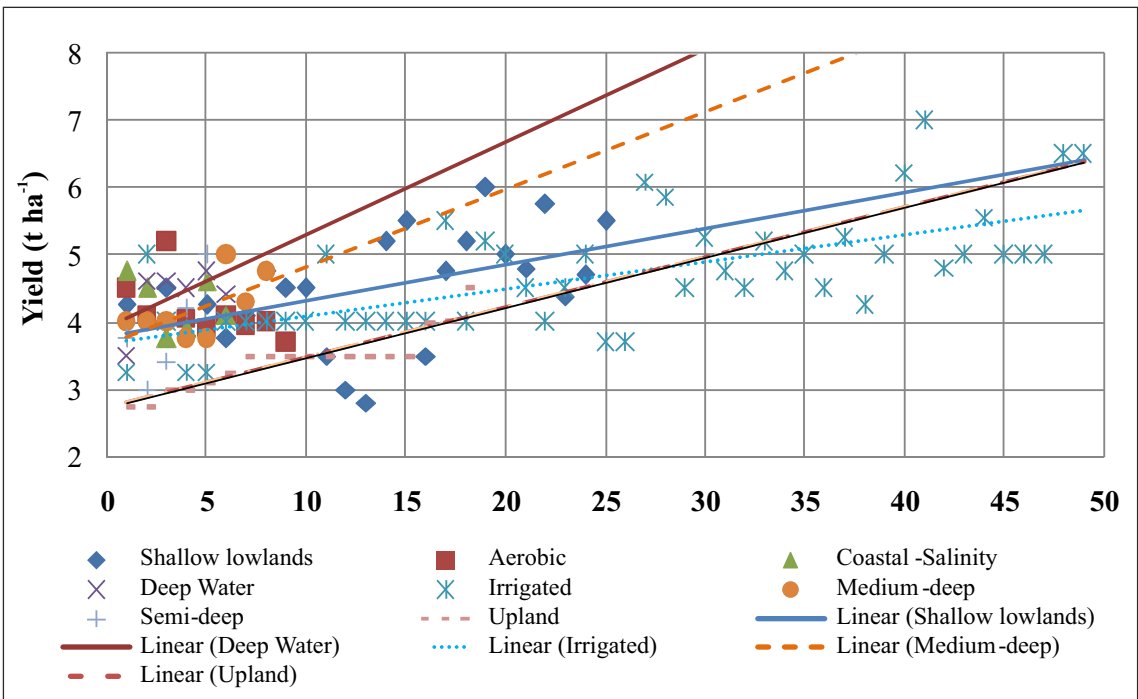


Fig. 5b. Ecology-wise yield trend of NRRI varieties.

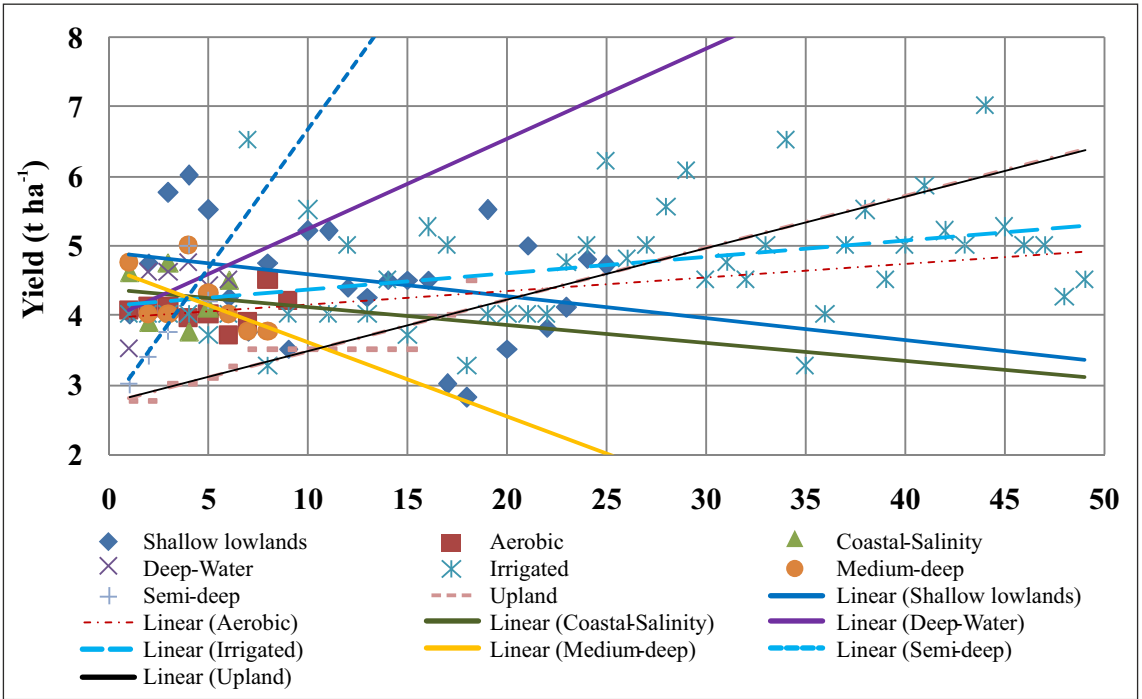


Fig. 5c. Duration-wise yield trend of NRRI varieties.

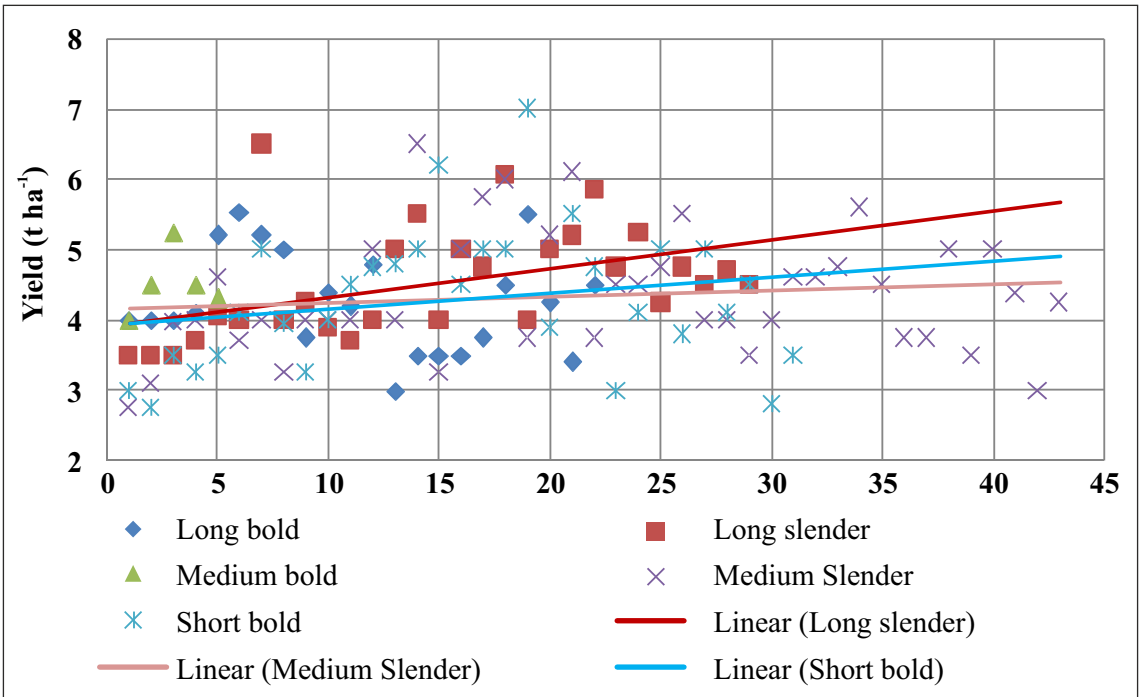


Fig. 5d. Grain type and yield trend of NRRI varieties.



### 3.6. Relationship between yield and duration

Yield is a function of multiple traits. Crop duration is one of the important traits which determine the yield of the varieties. The analysis in NRRI varieties showed increase in duration from 60 to 135 days also increased the mean yield of the varieties (Fig.6a). However, mean yield reduced for varieties with duration of 136-170 days. The decrease in the yield of long duration varieties might be due to release in adverse ecologies namely shallow lowland, coastal saline, deep water ecologies. The highest mean yield of 4.78 t ha<sup>-1</sup> was achieved for varieties of irrigated ecology (121-135 days). Further, linear regression for yield and duration of NRRI varieties was found to be,  $Y = 0.011x + 2.824$ , where Y is the yield of the variety, x is the duration of the variety and 2.824 is the regression constant (Fig.6b). The linear equation was used to calculate the difference between the expected yield and observed yield for a duration of a variety. The varieties showing highest yield index was selected for each ecologies and given in Table 2. The highest index value indicates varieties showing greater yield for the respective duration.

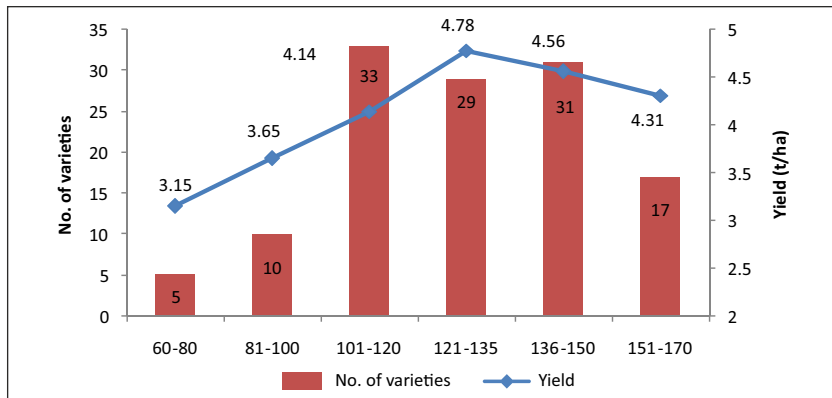


Fig. 6a. Duration and yield of NRRI varieties.

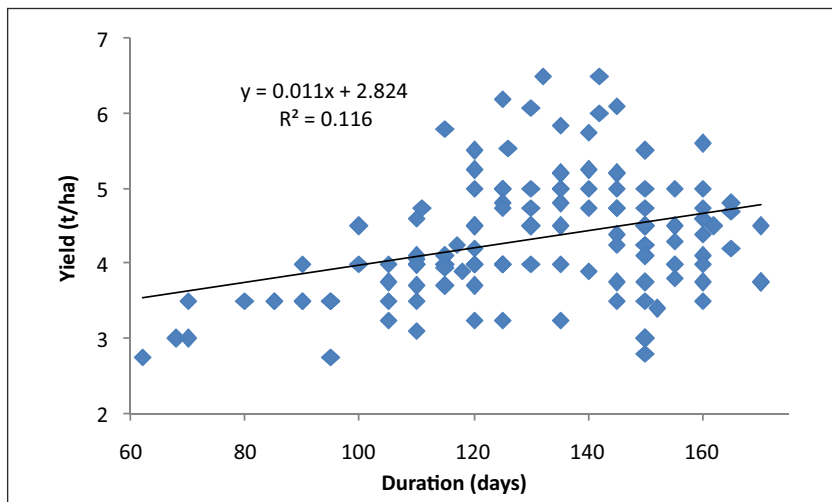


Fig. 6b. Duration and yield relationship of NRRI varieties.



**Table 2.** Ecology-wise yield index of NRRI varieties.

Sl. No.	Variety	Ecology	Yield (t ha <sup>-1</sup> )	Duration	Expected Yield	Yield index
1	Pyari (CR Dhan 200)	Aerobic	4.5	120	4.1	0.3
2	CR Dhan 205 (IET 22737)	Aerobic	4.1	110	4.0	0.1
3	Chandan (CR Boro Dhan 2)	Boro	6.1	145	4.4	1.6
4	CR Dhan 601	Boro	5.6	160	4.5	1.0
5	Phalguni	Bunded uplands and irrigated	4.2	117	4.1	0.1
6	Luna Shankhi (CR Dhan 405)	Coastal Saline	4.6	110	4.0	0.5
7	Lunishree	Coastal Saline	4.7	145	4.4	0.3
8	CR Dhan 507* (Prasant)	Deep Water	4.7	160	4.5	0.1
9	Swarna Sub1	Flood prone shallow lowlands	5.2	145	4.4	0.7
10	CR Dhan 306 (IET 22084)	Irrigated	6.2	125	4.1	2.0
11	Ajay (Hybrid)	Irrigated	6.0	130	4.2	1.8
12	CR Dhan 309	Irrigated	5.8	115	4.0	1.7
13	Rajalaxmi (Hybrid)	Irrigated	5.8	135	4.3	1.5
14	Khitish	Irrigated	5.5	120	4.1	1.3
15	CR Dhan 311 (Mukul)	Irrigated	5.5	126	4.2	1.3
16	Naveen	Irrigated	5.2	120	4.1	1.1
17	Gayatri	Medium Deep	5.0	155	4.5	0.4
18	Sarala	Medium Deep	4.7	150	4.4	0.2
19	CR Dhan 407	Rainfed shallow lowland	5.0	150	4.4	0.5
20	CR Dhan 511	Semi-deep	5.0	160	4.5	0.4
21	CR Dhan 701 (Hybrid)	Shallow lowland	6.0	142	4.3	1.6
22	Reeta (CR Dhan 401)	Shallow lowland	5.5	150	4.4	1.0
23	CR Dhan 802 (Subhas)	Shallow lowland	6.5	142	4.3	2.1
24	CR Dhan 800	Shallow lowland	5.7	140	4.3	1.3
25	Annada	Upland	4.7	111	4.0	0.7
26	Tara	Upland	4.5	100	3.9	0.5
27	Neela	Upland	4.0	90	3.8	0.1

\* All the varieties in deep water has the duration between 160-162, thus any NRRI variety can be recommended





### 3.7. Grain type, hulling, milling and head rice recovery of NRRI varieties

Rice grain morphology is an important criterion for the preference of variety by the consumers. The specific requirements of the consumers change from place to place. The majority of the NRRI varieties are medium slender, followed by short bold and long slender (Fig. 7, Annexure II). The least number of varieties has medium bold gain type. Moreover, more than 50% of NRRI varieties comprise of medium and long slender grains.

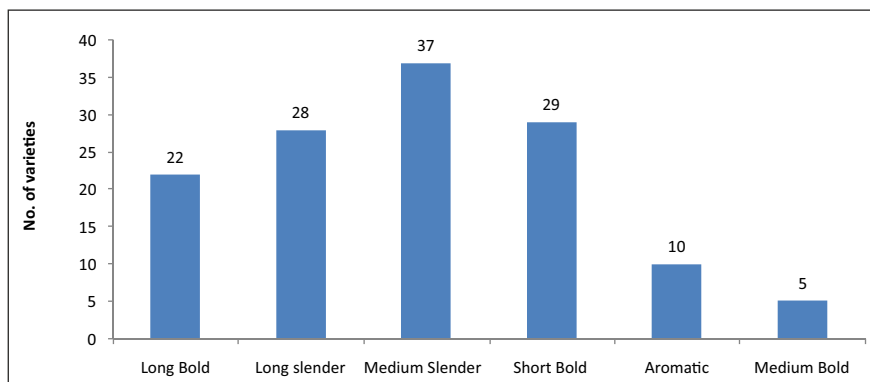


Fig. 7. Grain type of NRRI varieties.

The varieties are bred considering the yield and tolerance to stresses. However, grain quality is an important trait for millers and consumers. Accordingly, NRRI varieties are analyzed for different quality parameters such as hulling, milling and head rice recovery (Fig. 8). The mean hulling, milling and head rice recovery for NRRI varieties are 78.6%, 66.75% and 56.06%, respectively. The varieties namely Sonamani, Lunabari and Tapaswini showed HRR of > 66%, Dharitri, Radhi and Gayatri showed milling percentage of >70%. However, varieties namely Kalyani-II, Kalinga-II and Dhala Heera showed very less head rice recovery.

### 3.8. Kernel length, width and its ratio

The consumer preference of rice mostly depends on the grain quality, especially grain length and width. The analysis of NRRI varieties for kernel length showed ~21 varieties has grain length of > 6mm, whereas the mean grain length of NRRI varieties is 5.53mm. Similarly, the mean grain width of NRRI varieties is 2.08mm and 60 varieties showing grain width of more than 2mm (Fig. 9). The varieties namely HUE, Geetanjali, Poorna bhog, Satyakrishna showed higher grain length to width ratio of > 3.4.

### 3.9. Alkali spread value and water uptake/100g

The alkali spread value of NRRI varieties varied between three to seven. 30 varieties showed ASV of three, 41 varieties showed ASV of 4, four varieties showed ASV of 5, seven varieties showed ASV of 6 and four varieties namely Tara, Chandan, Poorna Bhog and Sudabaha showed ASV of 7 (Fig. 10). Similarly, the mean value of water uptake for NRRI varieties was found to be 122.15 ml/100 g of grain. The varieties namely, Tara, CRDhan 201, Shaktiman, CRDhan 205, Sneha, and Chandan showed higher water uptake of >200 ml/100g.

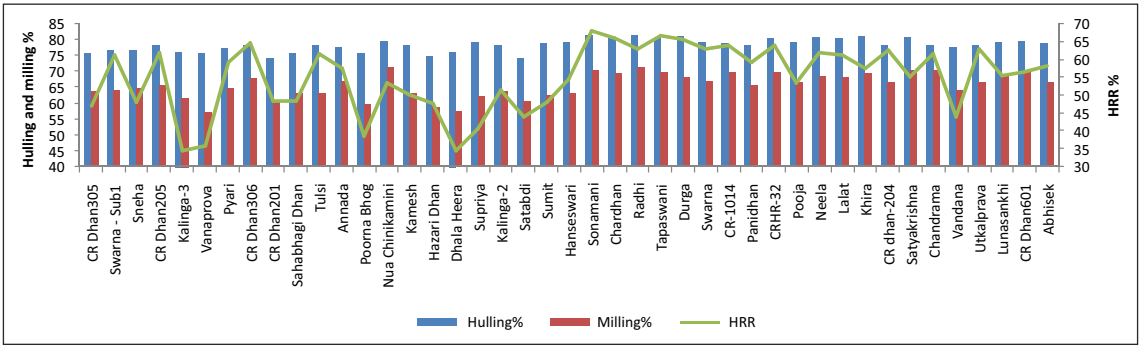


Fig. 8. Hulling, milling and head rice recovery of NRRI varieties

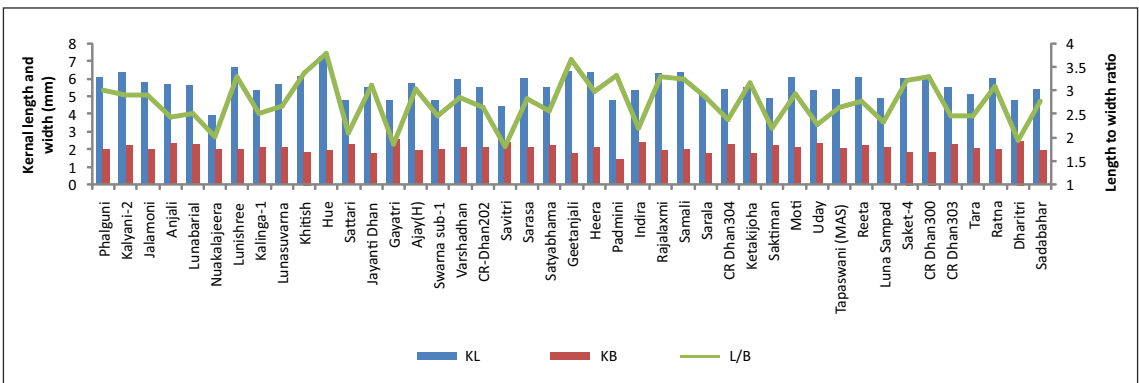
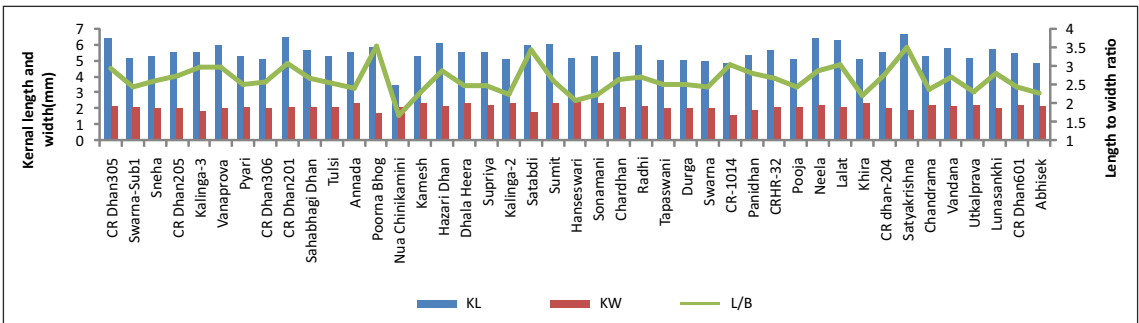


Fig. 9. Kernel length, kernel width and its ratio of NRRI varieties.

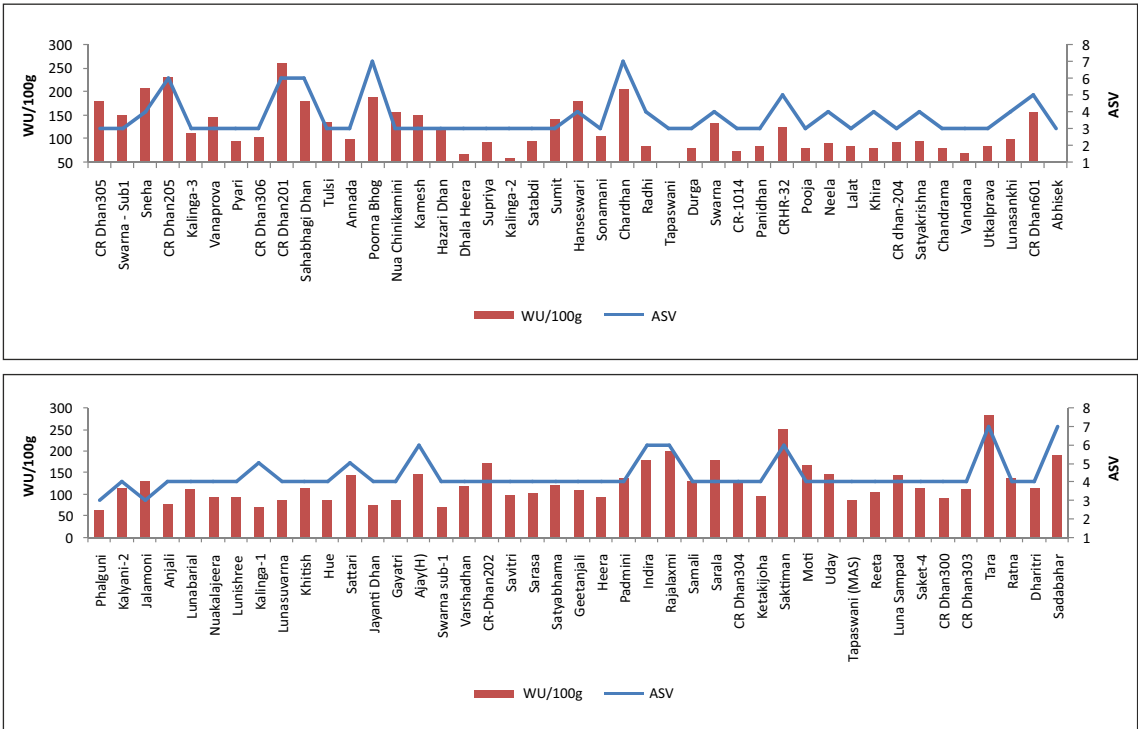


Fig. 10. Alkali spread value and water uptake of NRRI varieties

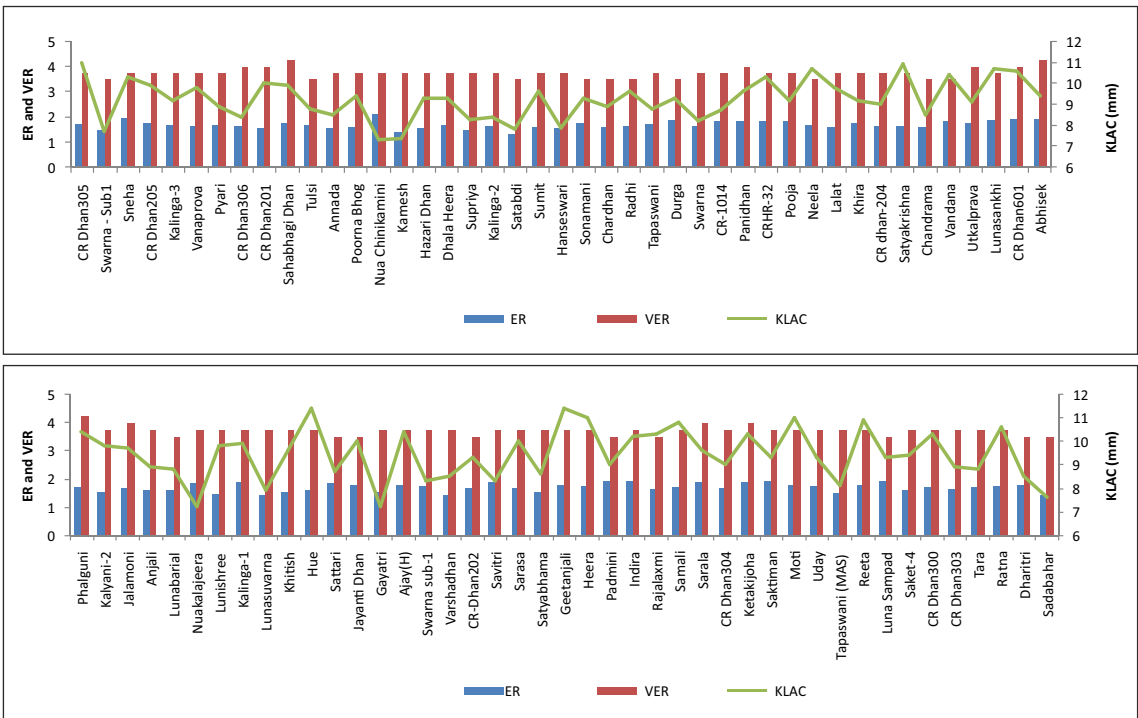


Fig. 11. Elongation ratio (ER), Volume expansion ratio (VER) and kernel length after cooking (KLAC) of NRRI varieties



### 3.10. Elongation ratio (ER), Volume expansion ratio (VER) and kernel length after cooking (KLAC)

The mean ER, VER, and KLAC of NRRI varieties are 1.69, 3.73, and 9.34, respectively (Fig.11). Elongation ratio of 17 varieties was found to be >1.8. Volume expansion ratio of 11 varieties were found to be  $\geq 4$  and KLAC is >10 in 21 varieties. The varieties namely, Geetanjali, HUE, Heera, CR Dhan 305, Reeta, Lunashanki showed higher KLAC values as compared to other varieties. Similarly, varieties namely Sneha, CRDhan 601, Indira, Abhishek showed higher ER as compared to other varieties. Phalguni, Sahbhagidhan, Abishek, CRDhan 601, Ketekijoha and CRDhan 201 showed higher volume expansion ratio as compared to other varieties.

## 4. Response of NRRI varieties to biotic stresses

### 4.1. Blast

Eighty NRRI varieties were evaluated for leaf blast in Uniform Blast Nursery (UBN) at NRRI, Cuttack. The disease reaction was scored visually on a 0-9 scale following the Standard Evaluation System (SES), IRRI (2013). Based on the screening scores against leaf blast, nineteen varieties (23.75%) were found highly resistant (Score 0-3), twenty-one varieties (26.25%) were moderately resistant (score 4-5), and forty varieties (50%) were found susceptible (score 6-9) (Fig. 12, Annexure III).

### 4.2. Brown spot

A set of 102 NRRI varieties were evaluated against brown spot disease of rice. Based on the screening scores, seventeen varieties (16.67%) were found moderately resistant; forty nine varieties (48.04%) were moderately susceptible, and thirty six varieties (35.29%) were found highly susceptible (Fig. 13, Annexure IV).

### 4.3. Sheath blight

Ninety eight NRRI varieties were artificially screened against sheath blight disease. The results showed that 9 varieties are moderately resistant, 7 varieties are tolerant, 9 varieties are moderately tolerant, 41 varieties are susceptible and 32 varieties are highly susceptible. However, none of the varieties was found to be resistant to sheath blight disease (Fig. 14, Annexure V).

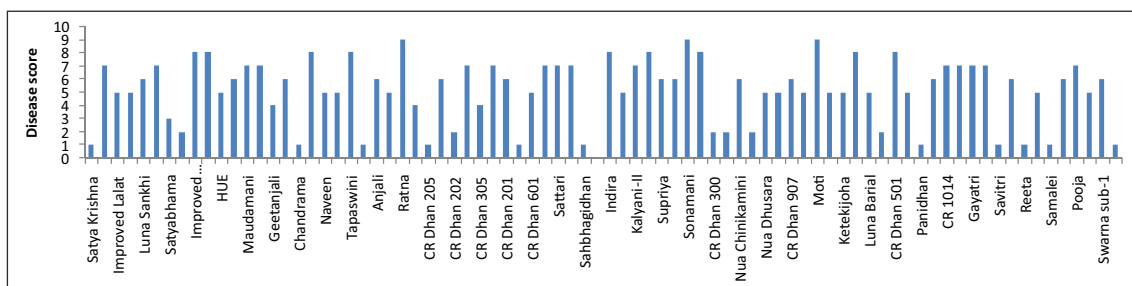
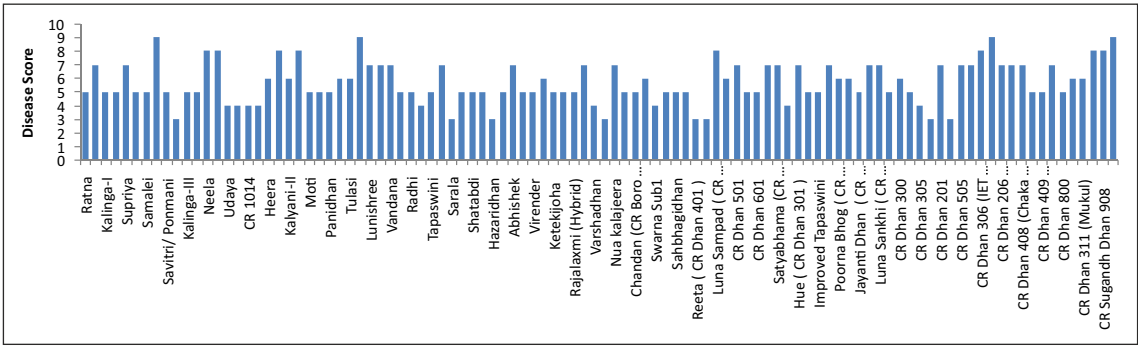
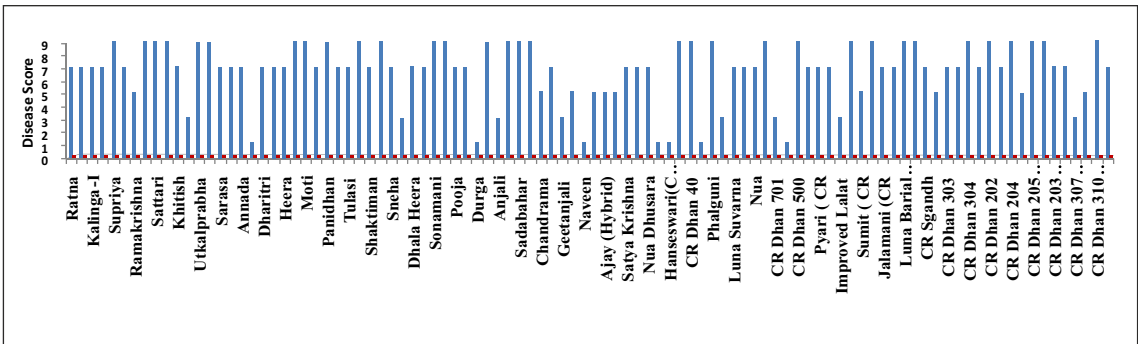


Fig. 12. Response of NRRI varieties to leaf blast.



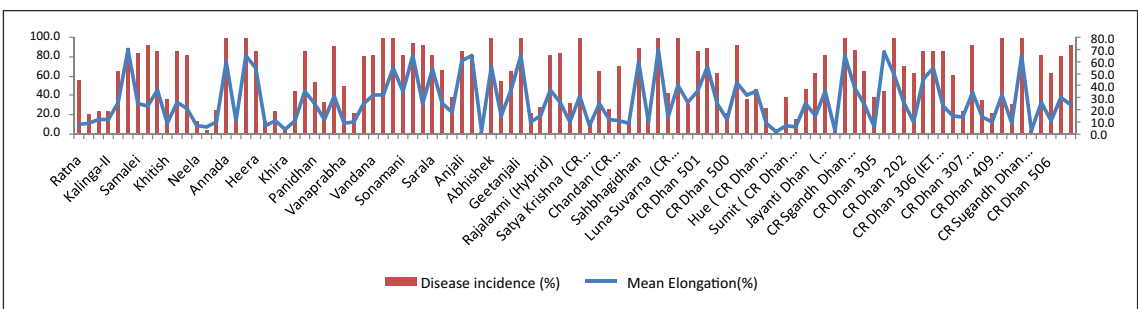
**Fig. 13.** Response of NRRI varieties to brown spot.



**Fig. 14.** Response of NRRI varieties for sheath blight.

#### 4.4. Bakanae

One hundred and two NRRI released varieties were screened against bakanae disease of rice. Based on the screening results, the varieties were categorized into highly resistant (6); resistant (5); moderately resistant (25); moderately susceptible (10); susceptible (11) and highly susceptible (45). The disease incidence was recorded between 1.50 to 100%. Sadabahar recorded minimum level of disease incidence (1.50%) followed by Sarasa and CR Dhan 311 (3.5%) disease incidence (Fig. 15, Annexure VI).



**Fig. 15.** Response of NRRI varieties to bakanae disease.



## 4.5. Seedling blight

A total of 98 varieties were evaluated against seedling blight of rice caused by *Sclerotium oryzae* (Fig. 16, Annexure VII). Based on the screening score, 98 NRRI varieties were divided into highly resistant (6), resistant (17), moderately resistant (10), susceptible (27) and highly susceptible (38).

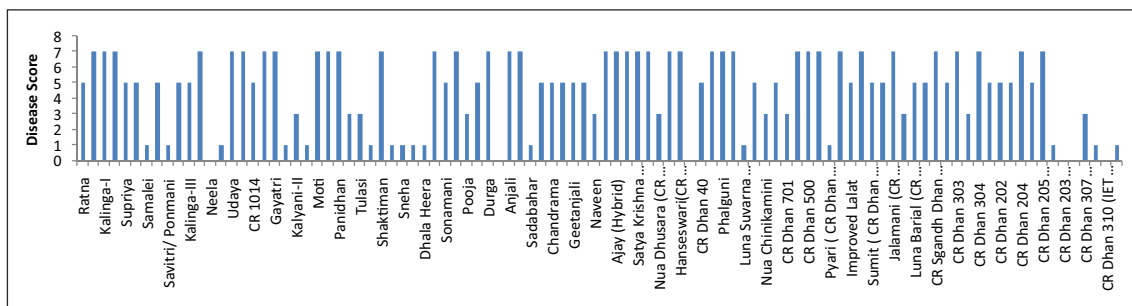


Fig. 16. Response of NRRI varieties for seedling blight.

## 4.6. Brown plant hopper (BPH)

Eighty nine NRRI varieties were screened against brown plant hopper in rice. Among them, 81 varieties were found to be highly susceptible; 5 varieties have shown susceptible reaction; one variety (Kalashree) was moderately susceptible and two varieties were found (Luna Sampad and Lunishree) to be moderately resistant. The minimum dead plant percentage was recorded in variety Lunishree (29.09%). Moreover, twenty nine varieties showed 100% dead plants (Fig. 17, Annexure VIII).

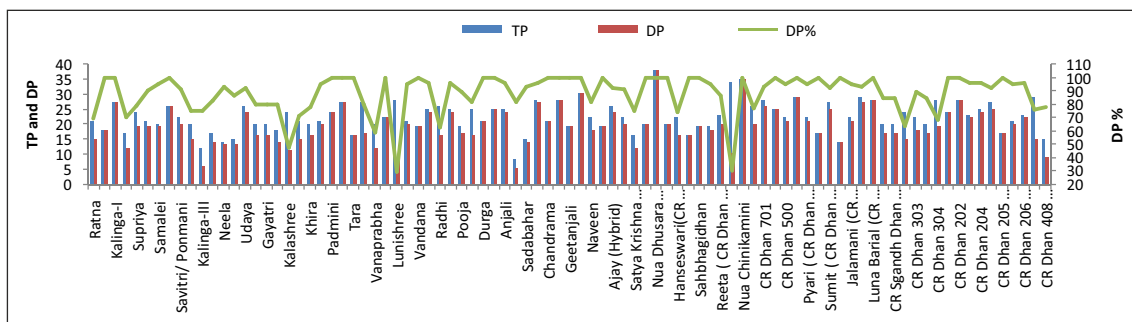
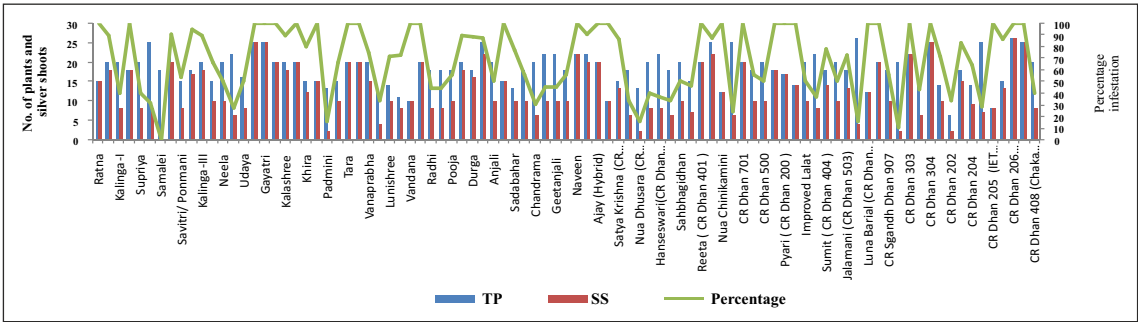


Fig. 17. Response of NRRI varieties to brown plant hopper.

## 4.7. Gall midge

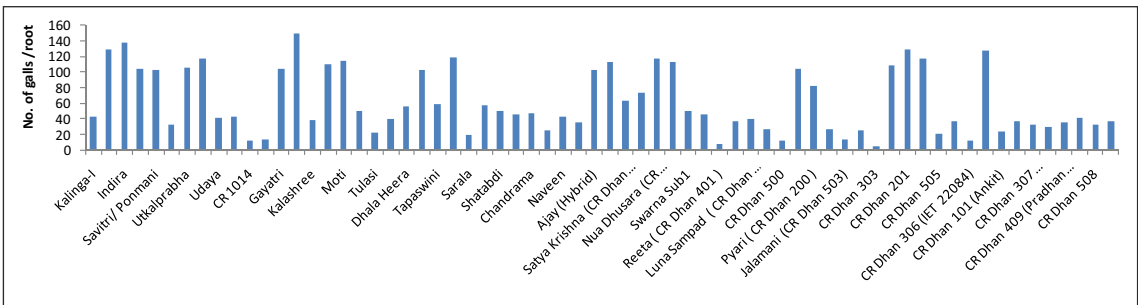
A total of 91 NRRI released varieties were evaluated against rice gall midge in glass house condition. Among the varieties, 87 were highly susceptible, three varieties were found to be susceptible and only one variety (Samalei) was found to be highly resistant. There was no infestation in Samalei and twenty six varieties recorded 100% silver shoots (Fig. 18, Annexure IX).



**Fig. 18.** Response of NRRI varieties to gall midge.

#### 4.8. Rootknot Nematode

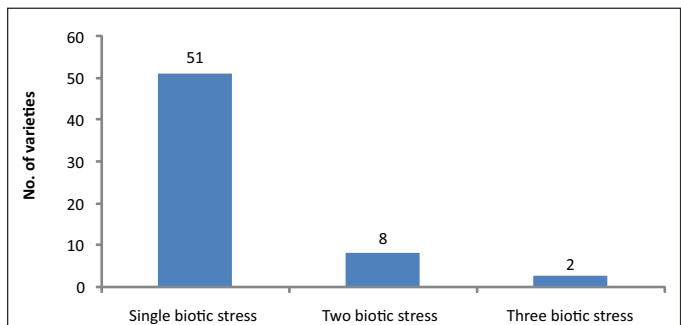
Sixty six NRRI varieties were evaluated against rice root knot nematode (*Meloidogyne graminicola*). Based on the gall index rating, two varieties were found to be moderately resistant (Scale-2), fourteen varieties were moderately susceptible (Scale-3), twenty eight varieties were susceptible (Scale-4) and twenty two varieties were found to be highly susceptible (Scale-5). The maximum gall per roots was found in variety Heera (148.33) and the minimum was recorded in CR Dhan 303 (4.5) (Fig. 19, Annexure X).



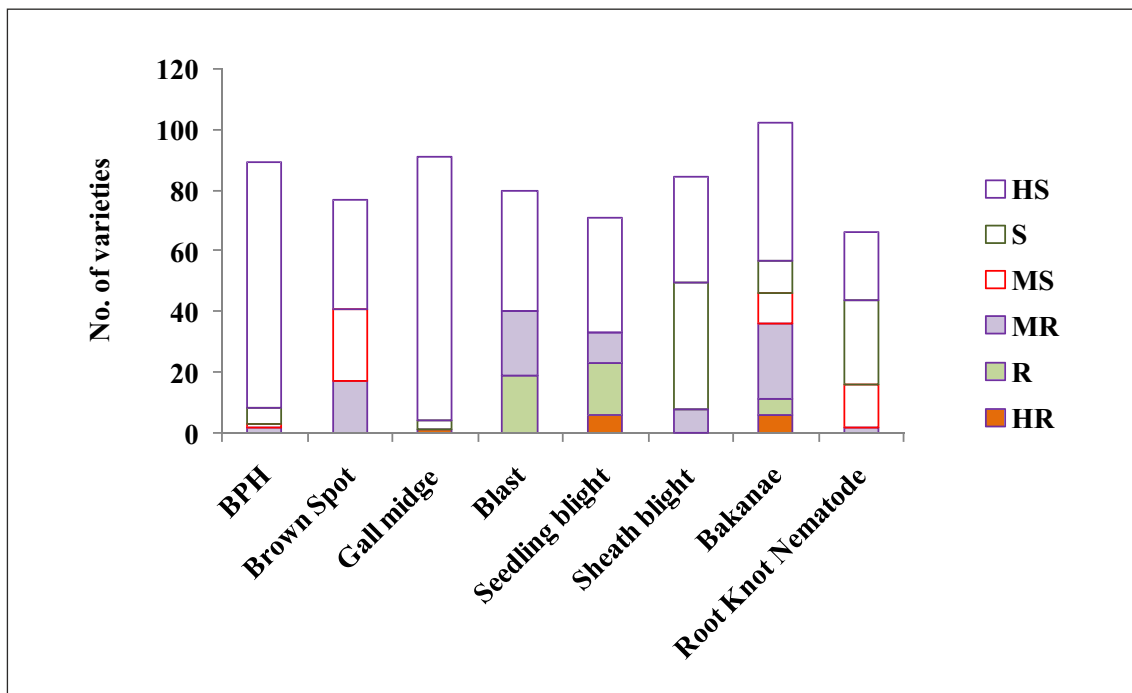
**Fig. 19.** Response of NRRI varieties to nematodes.

#### 4.9. Multiple biotic stress tolerant NRRI varieties

The response of NRRI varieties to eight biotic stresses was compared to identify the multiple biotic stress resistant varieties. The analysis showed 51 varieties were found to be resistant to one biotic stress. Eight and two varieties were found to be resistant to two and three biotic stresses, respectively (Table 3, Fig. 20). Further, susceptible response was identified in the most of the NRRI varieties (Fig.21). The identified multiple biotic stress tolerant rice varieties could be used for the crop improvement program.



**Fig. 20.** No. of multiple biotic stress resistant NRRI varieties



**Fig. 21.** Response of NRRI varieties to eight different biotic stresses

**Table 3.** NRRI varieties resistant to multiple biotic stresses.

Sl.No.	Varieties	Resistance for biotic stresses
1	Chandrama	Blast, Seedling blight
2	CR Dhan 311 (Mukul)	Seedling blight and Bakanae
3	Khira	Seedling blight and Bakanae
4	Lunishree	Blast, Seedling blight
5	Neela	False smut, Seedling blight, Bakanae
6	Sadabahr	Seedling blight and Bakanae
7	Samalei	Gall midge, Blast, Seedling blight
8	Sarasa	Blast, Seedling blight, Bakanae
9	Savitri	Blast, Seedling blight
10	Swarna Sub1	False smut, Bakanae, Seedling blight





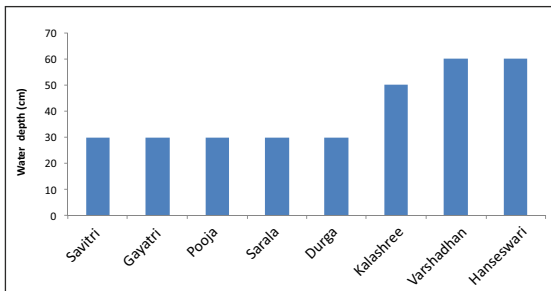
## 5. Response of NRRI varieties to abiotic stress

### 5.1. Submergence

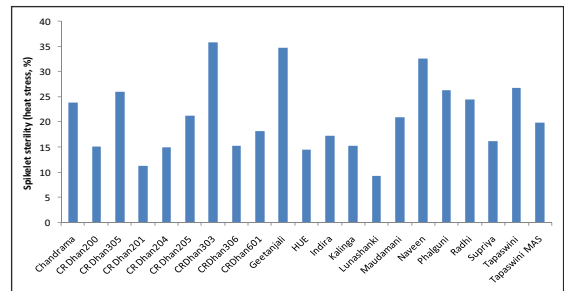
Submergence is one of the major abiotic stresses in eastern India. The selected (40 nos.) NRRI varieties were evaluated for the tolerance to the submergence stress. The analysis showed except the Swarna-Sub1, remaining varieties was found to be susceptible to submergence stress. In recent times, varietal improvement program in NRRI gives special emphasis to the submergence tolerance and varieties CR Dhan 801, CR Dhan 802 have been developed. Accordingly, several improved lines particularly in popular cultivars namely Pooja-Sub1, Maudamani-Sub1, Pratikshya-Sub1, and LalatMAS-Sub1 for submergence tolerance have been developed and in advanced stage of testing.

### 5.2. Stagnant flooding

Stagnant flooding also significantly reduces the yield of the varieties. The NRRI varieties were evaluated for stagnant flooding tolerance. Eight varieties were found to be tolerant to stagnant flooding. Interestingly, popular NRRI varieties such as Pooja, Sarala, and Gayatri were found to have stagnant flooding tolerance of up to 30cm water depth (Fig. 22). Further varieties namely Kalashree, Varshadhan, and Hansheswari showed stagnant flooding tolerance of up to 50-60cm of water depth. Thus, new breeding lines for shallow low lands can also be screened for stagnant flooding to increase the yield stability, especially for cultivation in Odisha.



**Fig. 22.** Stagnant flooding tolerance of NRRI varieties.



**Fig. 23.** Spikelet sterility of selected NRRI varieties for high temperature stress in field condition.

### 5.3. High temperature

The mean temperature is increasing due to climate change in different parts of the world. In Odisha, dry season rice crop is highly susceptible to high temperature stress during the reproductive stage. The NRRI varieties were evaluated for spikelet sterility under high temperature stress through staggered sowing (Fig. 23). Twenty one varieties showed average spikelet sterility of ~20%. Varieties namely Geetanjali, Tapaswinin, CR Dhan 303 showed sterility of more than 25%. Further, the variety Lunasanki was found to be moderately tolerant to high temperature stress in field condition.



## 5.4. Root traits

The varieties released for the aerobic condition are specifically adapted for better root growth. Thus, nine aerobic NRRI varieties were evaluated for the root length, total number of roots and number of roots at the base during seedling stage (Fig. 24). The analysis showed that mean root length at seedling stage was found to be ~29cm with maximum in CR Dhan 202. Similarly, maximum number of roots was recorded in CR Dhan 203 (60 roots per seedling). Additionally, CR Dhan 206 showed highest number of roots at the base per hill as compared to other aerobic varieties.

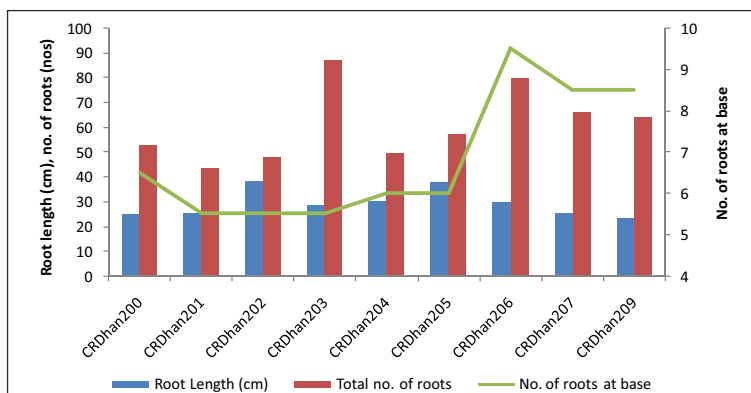


Fig. 24. Root characters of aerobic NRRI varieties.

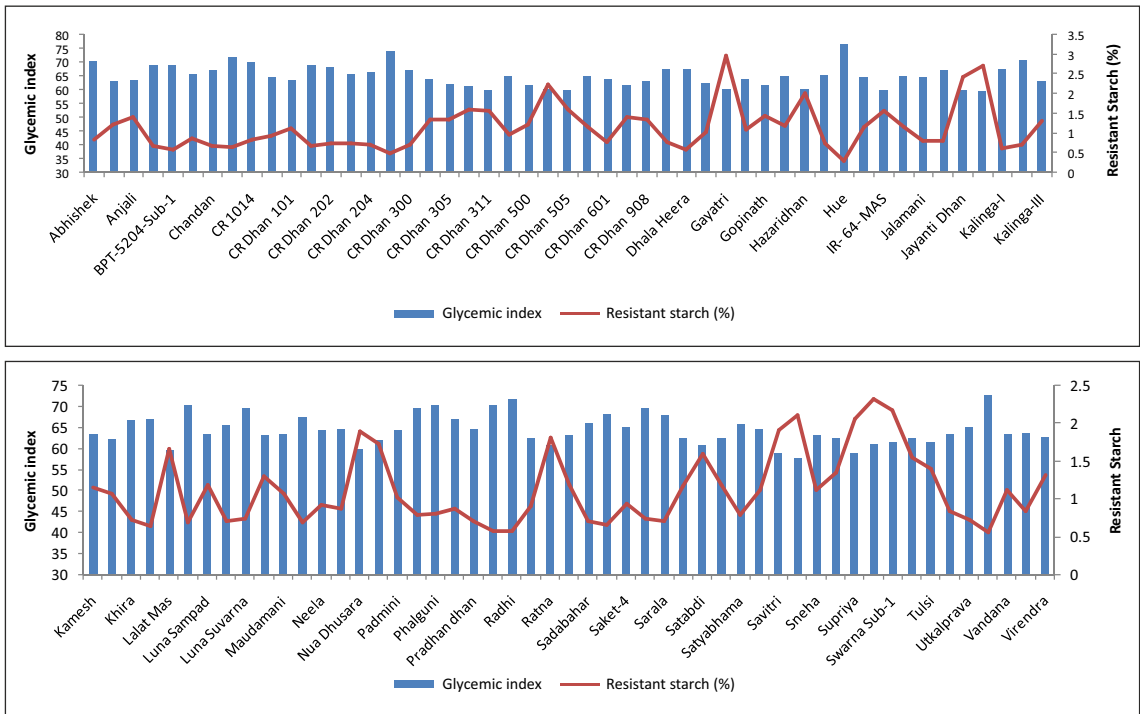
## 6. Grain quality of NRRI varieties

### 6.1. Resistant starch and glycemic index analysis

The glycemic index of NRRI varieties were found to be in the range of 57.5 to 76.39. Varieties namely Shaktiman, Savitri, Supriya, and improved Lalat showed glycemic index of < 60 with mean glycemic index (64.59) (Fig. 25, Annexure XI). Similarly, ten varieties showed higher amount of resistant starch ( $\leq 2$ ) as compared to other varieties. The mean value of resistant starch for NRRI varieties is 1.12. Varieties namely Gayatri, Kalashree, Jayanti Dhan, Swarna MAS are having higher resistant starch.

### 6.2. Aromatic rice varieties

NRRI has released so far ten aromatic rice varieties namely, Nuakalajeera, NuaDhusara, NuaChinikamini, Ketekijoha, Geetanjali, Poorna Bhog, CR Sugandh Dhan 907, CR Sugandh Dhan 908, CR Sugandh Dhan 909, and CR Sugandh Dhan 910. The aromatic varieties have been released for different ecologies such as irrigated late, shallow lowlands, and shallow favorable lowlands. Further, duration of the aromatic varieties ranged between 130-150 days according to the different ecologies. The yield of the aromatic varieties ranged from 3.0–5.0 t ha<sup>-1</sup> and recently released varieties (CR Sugandh Dhan 907, CR Sugandh Dhan 908, CR Sugandh Dhan 909, and CR Sugandh Dhan 910) showed relatively higher yield as compared to earlier released varieties.



**Fig. 25.** Resistant starch and glycemic index of NRRI varieties.

## 7. Straw quality of NRRI rice varieties

Nowadays, rice straw utilization is becoming one of the essential research areas due stubble burning in Northern India. There are several properties of paddy straw namely dry matter, nitrogen dry matter, ash, silica, fibre content, metabolizable energy determines the utility of the straw for different purposes such as mushroom cultivation, in-situ and ex-situ decomposition. NRRI varieties have been evaluated for nine different parameters related to straw quality (Table 4). The analysis showed that dry matter of the straw was found to be positively correlated with lignin content (Fig. 26). Similarly, in-vitro organic matter digestability was found to be positively correlated with total metabolizable energy of the straw. Nitrogen content in the dry matter of the straw was found to be positively correlated with silica content but negatively correlated with the neutral detergent fibre content in the NRRI varieties. Variety Abhishek and Ajay was found to have higher in-vitro organic matter digestability, nitrogen dry matter content, and least neutral detergent fibre content. Therefore, these varieties can be considered for in-situ and ex-situ decomposition.

### 7.1. Neutral and acid detergent fibre content of NRRI varieties

Fibre content of the straw determines the organic decomposition rate of paddy straw. Average neutral fibre (NDFDM), acid detergent (ADFDM) and lignin content (ADLDM) was found to be 66.18%, 51.67% and 4.53%, respectively (Fig. 27). Varieties namely Panidhan,

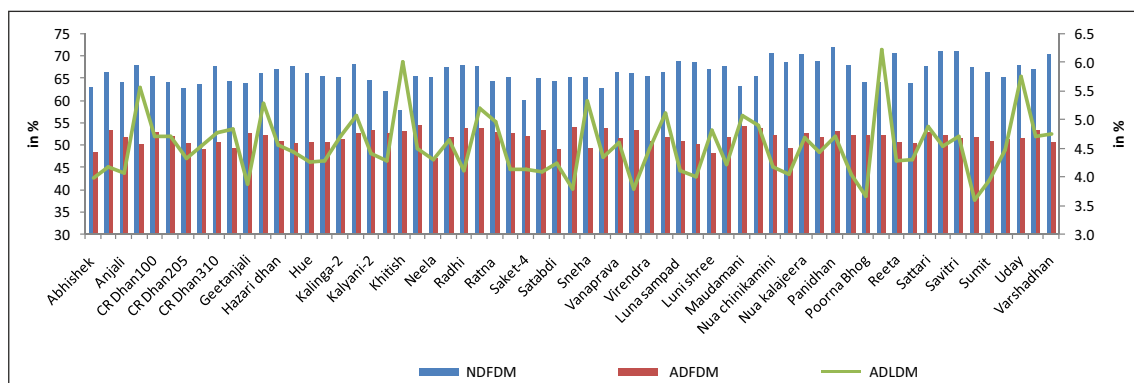


Satyakrishna, Savitri and Reeta has higher neutral detergent fibre content, Lunasanki, Maudamani has higher acid detergent fibre content and Pyari and Khitish has higher lignin content. The fibre content of paddy straw will be highly useful for identification of genotypes suitable for different methods of decomposition.

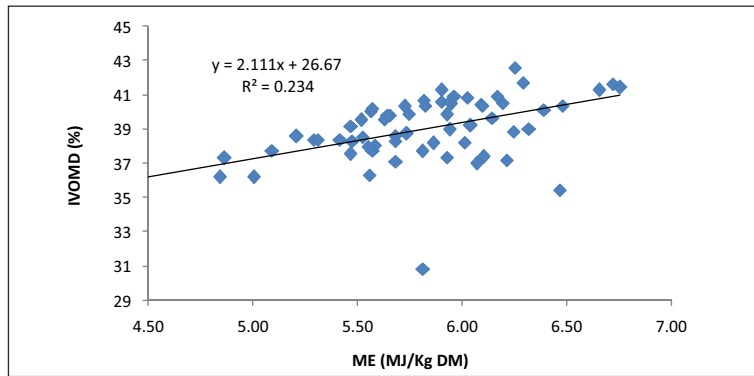
**Table 4.** Correlation of different straw related traits of NRRI varieties.

	DM	Ash	NDM	NDFDM	ADFDM	ADLDM	Silica	ME	IVOMD
DM	1								
Ash	0.0019385	1							
NDM	0.1055189	0.5801693	1						
NDFDM	0.0887412	-0.8030155	-0.6797367	1					
ADFDM	-0.1954939	0.351951	-0.123685	-0.0217486	1				
ADLDM	0.7623904	0.0835959	0.292741	-0.0661183	0.0589385	1			
Silica	-0.2212919	0.811149	0.508814	-0.8064402	0.5661085	0.102609	1		
ME	0.7026031	-0.3908603	-0.237553	0.3424616	-0.5820246	0.3549767	-0.6403228	1	
IVOMD	-0.1350044	-0.2419463	-0.2206995	0.2562043	-0.5847606	-0.4659074	-0.5837476	0.484338	1

DM-Dry matter, NDM-Nitrogen content in dry matter basis, NDFDM-Neutral detergent fibre on dry matter basis, ADFDM-Acid detergent fibre on dry matter basis, ADLDM-Acid detergent lignin on dry matter basis, ME-Metabolizable energy, IVOMD-In-vitro organic matter digestability



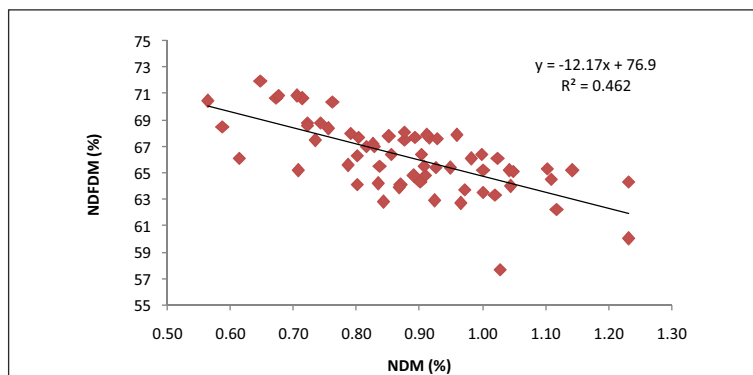
**Fig. 26.** Different dry matter fraction of rice straws of NRRI varieties. (NDFDM-Neutral detergent fibre on dry matter basis, ADFDM-Acid detergent fibre on dry matter basis, ADLDM-Acid detergent lignin on dry matter basis).



**Fig. 27.** Relationship between metabolizable energy (ME) and in-vitro organic matter digestibility (IVOMD) of rice straw in NRRI varieties.

### 7.2. In-vitro organic matter digestibility and metabolizable energy

In-vitro organic matter digestibility is the best indicator for paddy straw decomposition. The relationship between the metabolizable energy and in-vitro organic matter digestibility was found to be positively correlated (Fig. 28) and showed increasing trend in linear regression ( $Y = 2.11x + 26.67$ ), where Y is the organic matter digestibility and x is the metabolizable energy in the straw. The varieties namely Neela, Reeta, Varshadhan, Lunishree, and Shatabdi showed higher in-vitro organic matter digestibility as compared to other NRRI varieties.



**Fig. 28.** Relationship between neutral detergent fibre content (NDFDM) and nitrogen in dry matter (NDM) of rice straw in NRRI varieties.

### 7.3. Nitrogen in dry matter and neutral detergent fibre content of paddy straw

The nitrogen dry matter (NDM) and neutral detergent fibre content (NDFDM) was negatively correlated and regression trend was also found to be negative with R<sup>2</sup> value of 0.462. Varieties namely Kalinga-II, Ajay, Neela, Anjali and Radhi showed higher nitrogen content but lower neutral detergent fibre content. Similarly, varieties namely Varshadhan, Utkalprava, Udaya and Supriya showed higher fibre content as compared to other varieties. Thus, the analysis provides vital information for selection of paddy straw of NRRI released varieties for different purposes.



## 8. Research priorities

ICAR-NRRI has released around 139 rice varieties during the last 50 years. The present analysis showed different varietal traits including grain quality and biotic/abiotic stress response. This analysis provides several research insights which could be considered for the development of the new varieties in future. The research insights and future priorities are given below.

Sl. No	NRRI Achievements	Research insights	Suggestions
1	NRRI has released 139 rice varieties. MAS varieties for submergence, drought, and bacterial leaf blight have been successfully developed	~10% of NRRI varieties released after 2009 were developed through marker assisted backcross breeding	Efforts needs to be taken to increase MAS varieties up to 25%. Trait improvement through introgression of brown plant hopper resistance genes into high yielding varieties could be considered
2	In total, 54 NRRI varieties are in formal seed chain	~20% of NRRI varieties in seed chain are having 5 qt/year breeder seed indent	Efforts should be made to promote at least 20% of newly released NRRI varieties in seed chain
3	NRRI varieties are released for 10 different ecologies. Varieties such as Swarna-Sub1 and Shabhagidhan are very popular for flood prone shallow lowlands, and rainfed upland ecologies	Only 20% of varieties are released for shallow lowlands	Since large area in eastern India comes under shallow low lands, more emphasis needs to be given for varietal development in shallow lowlands
4	Yield trend analysis showed that higher yield increase over years was observed for deep and medium-deep, followed by irrigated, shallow lowland and upland ecologies	Coastal-salinity, aerobic ecosystem showed stagnant yield over years	Yield QTLs/genes can be introgressed specifically for shallow lowlands, coastal-salinity, aerobic ecologies for yield improvement of NRRI varieties
5	Increase in duration of NRRI varieties increased yield for ecologies namely semi-deep, deep-water, aerobic, irrigated and upland varieties	Shallow lowland, coastal salinity and medium-deep ecologies showed opposite trend for increase in the duration	
6	37% of NRRI varieties are resistant to at least one biotic stress	~12% of NRRI varieties showed resistance to more than one biotic stresses	The identified varieties can be utilized as donors in crop improvement program



## 9. Future challenges

The varieties of NRRI have contributed significantly to the national food security. However, there is a need to revise the priorities of rice improvement program due to climate change, fluctuating market price, reduced income gain for the farmers. The immediate requirement is to replace the popular rice cultivars with new cultivars having multiple tolerances to biotic and abiotic stresses. Additionally, rate of increase in the yield of the NRRI varieties is very small and follows the similar trend of national average. Thus, greater emphasis needs to be given in increasing the farm yield of the rice varieties by combination of conventional and molecular approaches. Moreover, increasing the profitability of rice cultivation requires multi-pronged strategy for enhancing the input use efficiency, and grain quality.

## 10. Conclusion

ICAR-NRRI has released 139 rice varieties including three hybrids. Response of varieties to biotic/abiotic stresses and grain quality provide first hand information in structuring the rice improvement program. Additionally, analysis of different traits of NRRI varieties provides an important link in understanding the popularity of NRRI varieties among the farmers. Further, integration of all these varietal information will provide vital clues about the major bottlenecks in-terms of yield, quality and response to biotic/abiotic stresses. Thus, the present research bulletin on the various traits of NRRI varieties could be highly useful in structuring the breeding program for the future need of the nation, especially for the rice farmers in eastern India.



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## ANNEXURE I. Ecology, parentage, yield, reaction to pest and special characters of rice varieties released by ICAR-NRRI, Cuttack, Odisha.

Sl. No.	Variety	Ecology	Designation	Parentage	Year of release	Released for State	Durat ion	Grain Type	Yield (t ha <sup>-1</sup> )	Reaction to diseases and pests and special characters
1	Padma	Irrigated	CR 28-25 (IET 953)	T 141/TN 1	1968	All India	120	Short Bold	3-3.5	Moderately resistant to all major diseases and pests
2	Bala	Upland	CR 42-38-173 (IET 1916)	N 22/TN 1	1970	Assam, Bihar, Odisha, Uttar Pradesh, West Bengal	105	Short Bold	3-3.5	Moderately resistant to bacterial leaf blight, stem borer, and hard to thresh
3	Kiron	Irrigated	CR 141-2-192 (IET 3226)	CR 42/CR 10	1970	West Bengal	110	Medium Slender	4	Field tolerance to all major diseases and pests.
4	Krishna	Irrigated	CR 1-6 (IET 1417)	GEB 24/IR 8	1970	Odisha	125	Medium Slender	3-3.5	Resistant to bacterial leaf blight and moderately resistant to stem borer; susceptible to gall midge
5	Ratna	Irrigated	CR 44-11 (IET 1411)	TMK 6/IR 8	1970	Odisha, Punjab, Haryana	125	Long Slender	5	Moderately resistant to bacterial leaf blight and stem borer
6	Vijaya	Irrigated	CR 10-5437 (IET 1879)	T 90/IR 8	1970	Andhra Pradesh, Bihar, Gujarat, Karnataka, Kerala, Madhya Pradesh, Maharashtra, Odisha, West Bengal	135	Medium Slender	3-3.5	Resistant to bacterial leaf blight and moderately resistant to stem borer; susceptible to gall midge
7	Saket-4	Irrigated	CR 44-35 (IET 1410)	TKM 6/IR 8	1971	Uttar Pradesh	115	Long Slender	4	Moderately resistant to bacterial blight, green leaf hopper and stem borer
8	Jayanti	Irrigated	CR 10-4103 (IET 1039)	T 90/IR 8	1973	Assam, Bihar, Odisha, Uttar Pradesh, West Bengal	135	Long Slender	4	Tolerant to blast
9	Kalinga-I	Irrigated	CR 126-33-11 (IET 2969)	Dunghansali/IR 8	1973	Odisha	105	Long Bold	4	Susceptible to all diseases
10	Kalinga-II	Irrigated	CR 126-42-2 (IET 3279)	Dunghansali/IR 8	1973	Odisha	100	Long Bold	4	Susceptible to all diseases
11	Shakti	Irrigated	CR 93-4-2 IET 3232)	CR 55-13/IR 8	1973	Odisha	135	Short Bold	5	Resistant to rice tungro virus, moderately resistant to sheath blight, green leaf hopper and gall midge
12	Supriya	Irrigated	CR 36-148 (IET 1530)	IR 8/CR 1	1973	Odisha	125	Medium Slender	4	Moderately resistant to bacterial blight and stem borer
13	Vani	Irrigated	CR 12-178 (IET 2255)	IR 8/CR 1014	1975	Odisha	125	Long Slender	4	Moderately resistant to bacterial blight, blast and resistant to rice tungro virus
14	Naikichili	Irrigated	CR 146-7027-274 (IET 7848)	CR 10-114/CR 115	1977	Tamil Nadu	120	Long Slender	4	Resistance to blast
15	Anamika	Shallow lowlands	CR 149-3244-198 (IET 3257)	MNP 36/CR 12/ Pankaj	1979	West Bengal, Bihar, Odisha and Assam	145-150	Long Bold;	4.25	Moderately resistant to bacterial blight, blast, stem borer; and rice leaf hopper



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16	Indira	Irrigated	CR MUT 587-4 (IET 2412)	Tainan 3 mutant	1980	Odisha	125	Medium Slender	4	Moderately resistant to bacterial blight, blast and stem borer
17	Pallavi	Irrigated	CR 214-52-102 (IET 11708)	Jikkoku/Serup kichel	1980	Odisha	125	Medium Slender	4	Resistant to bacterial blight
18	Ramakrishna	Shallow lowlands	CR 44-122-1 (IET 4155)	TKM 6/ IR 8	1980	Odisha	130	Medium Slender	4	Resistant to bacterial blight and tolerance to gall midge.
19	Samalei	Shallow lowlands	CR 95-ORS-952-1 (IET 3350)	Leaug 152/ IR 8	1980	Odisha	150	Long Slender	4.0-5.0	Resistant to gall midge and blast
20	Sattari	Upland	CRM 23-3241 (IET 5750)	NSJ 200/Padmamainradiate	1980	Odisha and West Bengal	70	Short Bold	3	Dwarf, escapes diseases and pests
21	Narendra-1	Irrigated	CR 110-173 (IET 2233)	Belle Patna/ IR 8	1981	Uttar Pradesh	110	Long Bold	4	Tolerance to bacterial blight
22	Savitri/Ponmani	Shallow lowlands	CR 210-1009 (IET 5897)	Pankaj/Jagannath	1982	Odisha and Tamil Nadu	150-155	Short Bold	3.8	Semi-dwarf, moderately resistant to bacterial blight and sheath blight
23	Khitish	Irrigated	CR 156-5021-207 (IET 4094)	Bulk 1/CR 115	1982	West Bengal	120	Long Slender	5.5	Suitable for dry season
24	CR 138-928	Irrigated	CR 138-928 (IET 4078)	Jaya/TKM 6	1983	Gujarat	120	Medium Slender	4	Semi dwarf, moderately resistant to bacterial blight, stem borer and gall midge.
25	Kalinga-III	Upland	CR 237-1 (IET 6802)	AC 540/Ratna	1983	Odisha	80	Long Slender	3.5	Cold tolerance and resistant to brown spot
26	Utkalprabha	Medium Deep	CR 221-1030 (IET 11184)	Waikyaku/ CR 1014	1983	Odisha	155	Medium Slender	4	Field tolerance to major pest and diseases.
27	Neela	Upland	CR 404-56-1 (IET 7317)	CR 94-1512-6/ Ratna	1985	Odisha	90	Medium Bold	4	Dwarf, resistant to rice tungro virus, gall midge, moderately resistant to brown plant hopper, white back plant hopper
28	Sarasa	Irrigated	CR 407-19 (IET 7315)	CR 94-1512-6/ Ratna	1985	Odisha	120	Long Slender	5	Resistant to gall midge, moderately resistant to brown plant hopper, rice tungro virus, and white back plant hopper
29	Udaya	Irrigated	CR 190-103 (IET 6703)	CR 129-118/ CR 57-49-2	1985	Odisha	135	Long Bold;	5.2	Semi dwarf, resistant to bacterial blight, brown plant hopper, white back plant hopper, gall midge, green leaf hopper, and moderately resistant to rice tungro virus.
30	Annada	Upland	CR 222-MW 10 (IET 6223)	MTU 15/ Waikyaku	1987	Odisha, Madhya Pradesh, Manipur, Meghalaya, Nagaland, Goa	110-112	Short Bold	4.75	Moderately resistant to blast and stem borer

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31	CR 1014	Medium Deep	CR 563-1014	T 90/Urang Urangan	1988	Odisha	155	Medium Slender	4	Tall, moderately resistant to sheath blight, field tolerance to all other pest and diseases
32	Dharitri	Shallow lowlands	CR 210-1017-607 (IET 6272)	Pankaj/Jagannath	1988	West Bengal, Odisha, Assam, Tripura and Madhya Pradesh	145-160	Short Bold	3.75-4.5	Semi dwarf, moderately resistant to blast, bacterial blight, stem borer and gall midge
33	Gayatri	Medium Deep	CR 210-1018 (IET 8022)	Pankaj/Jagannath	1988	Odisha	155	Short Bold	4.0-6.0	Semi dwarf, moderately resistant to bacterial blight, blast, and gall midge
34	Kalashree	Medium Deep	CR 260-292 (IET 9043)	CR 151-79/CR 1014	1988	Odisha	160	Medium Slender	4	Moderately tolerant to blast and gall midge
35	Kalyani-II	Upland	CR 66-36-4 (IET 10970)	TN 1/CH 45/Rikku 132/N22	1988	Odisha	62	Medium Slender	2.5-3	Resistant to blast
36	Kshira	Irrigated	CR 401-7 (IET 7328)	Vijaya/CR 94-1512-6	1988	Odisha	135	Medium Bold	4.5	Dwarf, resistant to blast, rice tungro virus, brown plant hopper, gall midge and white back plant hopper
37	Moti	Shallow lowlands	CR 260-136-321 (IET 9170)	CR 151-79/CR 1014	1988	Odisha	145	Long Slender	4.0-4.5	Tall, resistant to blast, rice tungro virus, green leaf hopper
38	Padmini	Shallow lowlands	CRM 25 (IET 10561)	CR 1014 mutant	1988	Odisha	145	Medium Slender	3.5-4.0	Moderately tolerant to lodging, resistant to bacterial blight
39	Panidhan	Medium Deep	CR 260-30 (IET 10222)	CR 151-79/CR 1014	1988	Odisha	170	Medium Slender	3.5-4.0	Field tolerance to major pests and diseases
40	Tara	Upland	CR 404-48 (IET 9215)	CR 94-1512-6/CR 1014	1988	Odisha	100	Medium Bold	4.5	Dwarf, resistant to blast, rice tungro virus, green leaf hopper, and gall midge
41	Tulasi	Medium Deep	CR 260-171 (IET 8548)	CR 151-79/CR 1014	1988	Odisha	170	Medium Slender	3.5-4.0	Submergence tolerance and field tolerance to major pests and diseases
42	Vanaprabha	Upland	CR 289-1045-16 (IET 9804)	ARC 12422/ARC 12751	1988	Odisha	90	Long Slender	3.5	Resistant to blast and rice tungro virus
43	Heera	Upland	CR 544-1-2 (IET 10973)	CR 408-48/CR 289-1208	1988	Odisha	68	Long Bold;	3	Dwarf, resistant to gall midge
44	Shaktima	Irrigated	CR 404-24 (IET 7316)	CR 94-1512-6/Pusa-2-21	1990	Odisha	120	Short Bold	4	Resistant to bacterial leaf blight, green leaf hopper and gall midge
45	CR 1002	Shallow lowlands	CR 213-1002 (IET 5890)	CR 70-80-2/Pankaj	1992	Odisha, Madhya Pradesh, West Benagl, Bihar	145	Short Bold	4.75	Moderately resistant to sheath blight and green leaf hopper
46	Lunishree	Coastal Saline	CRM 30 (IET 10678)	Nonasail Gamma irradiated mutant	1992	Odisha	145	Long Slender	4.75	Field tolerance to major pests and diseases and tolerance to salinity



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47	Seema	Shallow lowlands	CR 211-1016 (IET 8036)	Jagannath Natural Crops	1992	Odisha	150	Medium Slender	4.5	Resistance to blast
48	Sneha	Upland	RR 19-2 (IET 1148)	Annada/CR-143-2-2	1992	Odisha	70	Long Slender	3.5	Resistance to blast and gundhi bug
49	Vandana	Upland	CR 357/RR167-982 (IET 12304)	C 22/Kalakeri	1992	Bihar, Odisha	95	Long Bold;	3.5	Moderately resistant to blast
50	Dhala Heera	Upland	CR 544-1-3-4 (IET 11411)	CR 404-48/CR 289-1208	1996	Odisha	85	Long Bold;	3.5	Resistance to rice tungro virus, gall midge, green leaf hopper, white back plant hopper and blast
51	Radhi	Irrigated	CRM 40 (IET 12413)	Swarnaprabha mutant	1996	Odisha	120	Long Bold;	4.5	Field tolerance to major pests and diseases
52	Sonamani	Coastal saline	CR 644 (IET 11365)	Velki mutant/Mahsuri	1996	Odisha	155	Long Bold;	4.5	Susceptible to yellow stem borer
53	Tapaswini	Irrigated	CR 333-6-1 (IET 12168)	Jagannath/Mahsuri	1996	Odisha	135	Medium Slender	5	Moderately resistant to bacterial leaf blight and white back plant hopper
54	Pooja	Shallow lowlands	CR 629-256 (IET 12241)	Vijaya/T 141	1999	Odisha, Madhya Pradesh, Assam, Tripura, West Bengal	150	Medium Slender	4.5	Resistant to blast and field tolerance to major pests and diseases
55	Sarala	Medium Deep	CR 260-77 (IET-10279)	CR 151/CR 104	2000	Odisha	150	Medium Slender	4.75	Non-lodging and photosensitive
56	Durga	Medium Deep	CR 683-123 (IET 112383)	Pankaj/CR 1014	2000	Odisha	155	Medium Bold	4.3	Resistant to rice tungro virus, and suitable or late planting
57	Shatabdi	Irrigated	CR 146-7027-224 (IET 4786)	CR 10-114/CR 10-115	2000	West Bengal	110	Long Slender	3.7	Moderately resistant to bacterial blight, sheath blight, sheath rot and suitable for dry season
58	Anjali	Upland	RR 347-166 (IET 16430)	Sneha/RR 149-1129	2002	Uttar Pradesh, Bihar, Jharkhand, Assam, Tripura	95	Short Bold	3.5	Moderately resistant to blast, white back plant hopper, gall midge and leaf folder
59	Hazaridhan	Irrigated	CR 314-5-10 (IET 8707)	IR-42/IR 5853-118-5	2004	Jharkhand	120	Long Slender	3.7	Resistant to blast and moderately resistant to bacterial leaf blight
60	Sadabahr	Upland	CR 306-37-13 (IET 10919)	BRRI SAIL/IR 10181-58-3-1	2004	Jharkhand	105	Long Bold;	3.5	Moderately resistant to sheath blight
61	Abhishek	Irrigated	RR 272-89 (IET 17868)	CR314-5-10 Natural Cross	2006	Uttar Pradesh, Bihar, Jharkhand, Assam	125	Short Bold	4.5-5.0	Semi dwarf, resistant to blast and moderately resistant to brown spot and gall midge

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62	Chandrama	Irrigated Boro	CR 386-2-10(IET 10419)	ARC 6650/CR 94-721	2006	Assam	130, 170 (Boro)	Short Bold	4.5	Resistant to blast, moderately resistant to bacterial leaf blight, rice tungro virus, sheath blight, brown plant hopper, white back plant hopper, gall midge and 15 days of dormancy
63	Virender	Upland	RR 347-2(IET 17901)	Sneha/RR 149-1129	2006	Odisha, Gujarat	95	Short Bold	2.75	Resistant to brown spot, gall midge and moderately resistant to blast
64	Geetanjali	Irrigated	CRM 2007-1(IET 18987)	Basmati 370 Mutant	2006	Odisha	130	Long Slender (aromatic)	4.5	Semi-dwarf, resistance to gall midge
65	Ketekijoha	Shallow lowlands	IET 18669	Savitri/Badshahog	2006	Odisha	145	Medium Slender (aromatic)	3.5	Moderately resistant to bacterial leaf blight, sheath blight, stem borer and gall midge
66	Naveen	Irrigated	CR 749-20-2(IET 1446)	Sattari/Jaya	2006	Odisha, Tripura, West Bengal	120	Medium Bold	5-5.5	Resistance to blast
67	Rajalaxmi (Hybrid)	Irrigated	CRHR-5(IET 19600)	CRMS 32A /IR 42266-29-3R	2006	Odisha, Assam	135	Long Slender	5.85	Moderately resistant to sheath blight
68	Ajay (Hybrid)	Irrigated	CRHR-7 (IET 18166)	CRMS 31 A/IR 42266-29-3 R	2006	Odisha	130	Long Slender	6.07	Moderately resistant to blast, bacterial leaf blight, sheath blight, brown plant hopper, white back plant hopper and gall midge
69	Varshadhan	Semi-deep	CRILC 899 (IET 16481)	IR 31432-8-3-2/IR 31406-3-3-3-1//IR 26940-3-3-3-1	2006	Odisha	160	Long Bold	3.5-4.0	Stiff straw for water logging situation, moderately resistance to neck blast bacterial leaf blight and sheath rot
70	Satyakrishna (CR Dhan 10)	Irrigated	CRAC 2221-43 (IET 18312)	D H from PHB 71	2008	Odisha	135	Long Slender	5.2	Resistant to neck blast, sheath rot and moderately resistant to sheath blight, gall midge.
71	Nua kalajeera	Shallow lowlands	Kalajeera(IET 18393)	Pureline selection for Kalajeera	2008	Odisha	150	Short Bold (aromatic)	2.8	Black husk, aromatic; photosensitive, resistant to yellow stem borer and moderately resistant to blast and sheath rot



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72	Nua Dhusara (CR Sugandh Dhan 3)	Shallow lowlands	CR 2579-1Dhusara (IET 18395)	Pureline selection for Dhusara	2008	Odisha	150	Medium Slender (aromatic)	3	Aromatic, resistant to neck blast, sheath rot, rice tungro virus and moderately resistant to gall midge, and photosensitive
73	Chandan (CR Boro dhan 2)	Boro	CRM 898 (IET 17612)	Gamma ray mutant from China 45	2008	Odisha, Assam	125 Irrig, 145 Boro	Medium Slender	6.1	Moderately resistant to sheath blight, brown plant hopper, blast and bacterial leaf blight
74	Hanswari (CR Dhan 70)	Semideep	MTC 4 (IET 11904)	Pure line selection in composite cross	2008	Odisha	150	Short Bold	3	Moderately resistant to blast
75	CR Dhan 40	Bunded Upland	CRR 383-22 (IET 19253)	N 22/RR 20-5	2008	Jharkhand and Maharashtra	110	Short Bold	3.5	Drought tolerant, moderately resistant to blast, brown spot, white back plant hopper, sheath blight, leaf folder and resistant to gall midge
76	Swarna Sub1	Flood prone shallow lowlands	CR 2539-1 (IET 20266)	Swarna 3/IR 49830-7-1-2-3	2009	Odisha	145	Medium Slender	5.2	Tolerant to complete submergence up to 15 days
77	Sahbhagi dhan	Rainfed upland	IR 74371-70-1-1-CRR-1 (ET 19576)	IR 55419-04*2/Way Rarem	2009	Odisha and Jharkhand	105	Long Bold;	3.5-4.0	Tolerant to drought, resistance to leaf blast, moderately resistant to brown spot, sheath rot, sheath blight and leaf folder
78	Phalguni	Bunded uplands and irrigated	CRAC 2224-1041 (IET 18720)	DH of KRH 2	2010	Odisha	117	Long Slender	4.0-4.5	Resistance to blast, moderately resistant to sheath rot, rice tungro virus, brown spot, sheath blight, yellow stem borer, white back plant hopper, brown plant hopper, green leaf hopper and resistant to gall midge
79	Reeta (CR Dhan 401)	Shallow low land	CR 780-1937-1-3 (IET 19969)	Savitri/IR44	2010	Odisha	150	Medium Slender	5.5	Resistant to leaf blast, moderately resistant to neck blast, brown spot, sheath blight, leaf blast and leaf folder
80	Luna Suvarna (CR Dhan 403)	Coastal Saline	CR 2096-71-2 (IET 18697)	Mahsuri / Ourmundakan	2010	Odisha	150	Medium Slender	3.5-4.0	Resistant to blast, sheath blight, brown plant hopper and leaf folder

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81	Luna Sampad (CR Dhan 402)	Coastal Saline	CR 2095-181-1 (JET 19470)	Mahsuri / Chakrakanda	2010	Odisha	140	Short Bold	3.6-4.2	Resistant to blast, tolerant to sheath blight, brown plant hopper, and leaf folder
82	Nua Chimikamini	Shallow low land	CR 2580 (JET 18394)	Chinikamini	2010	Odisha	145-150	Short Bold (aromatic)	3.5	Resistant to sheath rot, rice tungro virus, neck blast gall midge, and moderately resistant to sheath blight
83	CR Dhan 501	Semi-deep	CR 2008-111 (JET 19189)	Savitri/ Padmini	2010	Uttar Pradesh, Assam	152	Long Bold;	3.4	Resistant to neck blast
84	CR Dhan 601	Boro	CRG 1190-1 (JET 18558)	Jaya / IR64	2010	Odisha, West Bengal and Assam	160	Medium Slender	5.6	Resistant to blast, rice tungro virus, moderately resistant to brown spot, sheath rot, sheath blight, green leaf hopper, leaf folder and cold tolerance
85	CR Dhan 701	Shallow low land	CRHR 32 (JET 20852)	CRMS 31 A/ CRL-22 R	2010	Bihar, Gujarat, Odisha	142	Medium Slender	6	Moderately resistant to rice tungro virus, sheath blight and brown spot
86	CR Dhan 500	Deep Water	CR 2285-6-6-31 (JET 20220)	Ravana / Mahsuri	2011	Odisha, Uttar Pradesh	160	Medium Slender	3.5	Moderately resistant to blast, neck blast, brown spot, gall midge and sheath blight and resistant to leaf folder
87	Satyabha ma (CR Dhan 100)	Upland	CR 2340-11 (JET 20148)	IR 31238-350-3-2-1/IR 41054-102-2-3-2	2012	Odisha	110	Medium Slender	2.3-4.7	Resistant to leaf blight, rice tungro virus, sheath blight, leaf folder, moderately resistant to white back plant hopper and gall midge
88	Pyari (CR Dhan 200)	Aerobic	CR 2624-IR 55423-01 (JET 21214)	UPLRI 5/IR 12979-24-1 (Brown)	2012	Odisha	115-120	Short Bold	4.5	Moderately resistant to blast, neck blast, brown spot, sheath blight, leaf folder and gall midge
89	Hue (CR Dhan 301)	Irrigated	CRK 26-1-2-1 (JET 19351)	IR 42/ Rahaspanjar	2012	Odisha	135	Long Slender	4.5-5.5	Resistant to gall midge and moderately resistant to sheath rot
90	Improved Lalat	Irrigated	CRMAS 2621-7-1 (JET 21066)	Lalat and IRBB 60	2012	Odisha	130	Long Slender	4.5-5.0	Resistant to bacterial leaf blight, gall midge and moderately resistant to stem borer
91	Improved Tapaswini	Irrigated	CRMAS 2622-7-6 (JET 21070)	Tapaswini with IRBB 60	2012	Odisha	130	Short Bold	4.0-5.0	Resistant to bacterial leaf blight, brown plant hopper, yellow stem borer, white back plant hopper
92	Sumit (CR Dhan 404)	Shallow lowlands	CR 662-22-1-1-1 (JET 19913)	IR-32/IR 13246	2012	Odisha	145	Long Bold	5.2	Resistant to leaf folder and sheath blight



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93	Poorna Bhog (CR Basna Dhan 902)	Shallow lowlands	CRM 2203-4 (IET 18008)	Pusa Basmati-1 mutant	2012	Odisha	140	Long Slender	4.5-5	Resistant to neck blast, gall midge and moderately resistant to sheath rot and sheath blight
94	Jalamani (CR Dhan 503)	Deep Water	CR 2080-169-3-2-5-2 (IET 20706)	Panikoko/Am bika	2012	Odisha	160	Medium Slender	4.6	Moderately resistant to leaf folder, green leaf hopper, blast, neck blast, brown spot, gall midge and sheath blight
95	Jayanti Dhan (CR Dhan 502)	Deep Water	CR 2282-1-2-5-1 (IET 20214)	Samson Polo/Jalanidhi	2012	Odisha	160	Medium Slender	4.6	Moderately resistant to blast, neck blast, sheath blight, sheath rot, rice tungro virus and resistant to leaf folder
96	Luna Barial (CR Dhan 406)	Coastal Saline	CR 2092-158-3, (IET 19472)	Jaya/Lunishree	2012	Odisha	150	Short Bold	4.1	Moderately resistant to blast, leaf folder and sheath blight
97	Luna Sankhi (CR Dhan 405)	Coastal Saline	CR 2577-1 (IET 21237)	IR 31142-14-1-1-3-2/IR 71350	2012	Odisha	110	Medium Slender	4.6	Moderately resistant to blast and sheath blight
98	CR Sgandh Dhan 907	Irrigated Late (Aromatic)	CR 2616-3-3-3-1 (IET 21044)	Dubraj/ Pusa 44	2013	Chhattisgarh, Odisha, Andhra Pradesh, Gujarat	150	Medium Slender (aromatic)	4.0-4.5	Resistant to neck blast, gall midge and moderately resistant to sheath rot and sheath blight
99	CR Dhan 300	Irrigated	CR 2301-5 (IET 19816)	NDR 9370018/ KDML 05// PSBRC 60	2013	Maharashtra, Gujarat, Odisha, Bihar	140	Long Slender	5.0-5.5	Resistant to leaf folder, leaf blast, neck blast, sheath rot and sheath blight
100	CR Dhan 303	Irrigated	CR 2649-7 (IET 21589)	Udaya/IET 16611	2014	Madhya Pradesh, Uttar Pradesh, Odisha	125	Short Bold	5	Moderately resistant to blast, neck blast, sheath rot and rice tungro virus
101	CR Dhan 305	Irrigated	CR 2706 (IET 21287)	IR 77080-B-34-3/IRRI 123	2014	Jharkhand, Maharashtra and Andhra Pradesh	125	Short Bold	4.8	Moderately resistant to leaf blast, brown plant hopper, and white back plant hopper
102	CR Dhan 304	Irrigated	CR 2644-2-6-4-3-2 (IET 22117)	Tapaswini / IET 16611	2014	Odisha and West Bengal	130	Short Bold	5	Resistant to gall midge
103	CR Dhan 201	Aerobic	CR 2721-81-3 (IET 21924)	IR 72022-46-2-3-2/IRRI 105	2014	Chhattisgarh and Bihar	118	Long Slender	3.8-4.0	Moderately resistant to blast, sheath rot, sheath blight, and leaf folder
104	CR Dhan 202	Aerobic	CR 2715-13 (IET 21917)	IRRI 148/IR 78877-208-B-1-1	2014	Jharkhand and Odisha	115	Long Bold	3.7-4.5	Moderately resistant to brown spot, sheath rot, sheath blight, leaf folder and pigmented base
105	CR Dhan 407	Rainfed shallow lowland	CR 2459-12-8 (IET 21974)	Swarna/IR 64	2014	Odisha and West Bengal	150	Long Bold	5	Moderately resistant to neck blast



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106	CR Dhan 505	Deep water	CR 2682-4-2-2-2-1 (JET 21719)	CRLC 899 / Ac. 38606	2014	Odisha and Assam	162	Medium Slender	4.5	Moderately resistant to blast, neck blast, sheath rot, sheath blight, rice tungro virus, stem borer (both dead heart and white ear heads), leaf folder, whorl maggot, submergence tolerance, and elongation ability
107	CR Dhan 101 (Ankit)	Upland	CR 2702 (JET 21627)	IR 78875/IR 78877	2014	Odisha	110	Medium Slender	3.98	Moderately resistant to leaf blast, neck blast, brown spot, sheath rot, sheath blight, leaf folder, and green leafhopper
108	CR Dhan 203 (Sachala)	Aerobic	CR 2717-10-IR84899-B-185 (JET)	IR 78877/IRRI 132	2014	Odisha	110	Long Slender	4.05	Moderately resistant to leaf blight, brown spot, sheath rot, sheath blight and leaf folder
109	CR Dhan 206 (Gopinath)	Aerobic	CR 2996-1-14-29-3-1	Brahmanakhi/NDR 9930077	2014	Odisha	115	Short Bold	3.95	Moderately resistant to leaf blight, brown spot, sheath rot, sheath blight, and leaf folder
110	CR Dhan 307 (Maudam ani)	Irrigated	CR 2599 (JET 20925)	Dandi / Naveen // Dandi,	2014	Odisha	135	Short Bold	7	Moderately resistant to blast, neck blast, brown spot sheath blight, leaf folder, gall midge, white back plant hopper, hispa and thrips
111	CR Dhan 408 (Chaka Akhi)	Shallow lowland	CR 491-1590-330-2-1	CR 149-5010-228/ T1242	2014	Odisha	165 PS	Long Bold	4.8	Moderately resistant to neck blast, bacterial leaf blight, sheath rot, sheath blight, leaf folder and white back plant hopper
112	CR Dhan 306 (JET 22084)	Irrigated	CRK 27	CRK 27 FR 42 B Pankaj	2014	Madhya Pradesh, Bihar, Puducherry	120-125	Short Bold	6.0-6.4	Moderately resistant to brown spot, stem borer, leaf folder, and white back plant hopper
113	CR Dhan 310 (JET 24780)	Irrigated	CR 2829-PLN-37	ARC 10075/ Naveen	2016	Odisha, Madhya Pradesh and Uttar Pradesh	125	Medium Slender	5	High grain protein (10.5%)
114	CR Dhan 207 (Srimati)	Aerobic	CR 3629-1-5 (JET 23448)	IR 71700-247-1-1-1-2/ IR 57514- 5-B-1-2	2016	Odisha	110-115	Medium Slender	3.7	Moderately resistant to blast, neck blast, brown spot, sheath rot, sheath blight, leaf folder, green leaf hopper, and gall midge



Sl. No.	Variety	Ecology	Designation	Parentage	Year of release	Released for State	Duration	Grain Type	Yield (t ha <sup>-1</sup> )	Reaction to diseases and pests and special characters
115	CR Dhan 209 (Priya)	Aerobic	CR 3695-1-1 (IET 23467)	IR 72022-46-2-3-2/IRRI 105	2016	Odisha	112-115	Long Slender	4	Moderately resistant to blast, neck blast, brown spot, rice tungro virus, sheath blight, rice tungro virus, leaf folder and white back plant hopper
116	CR Dhan 409 (Pradhan Dhan)	Shallow lowland	CR2690-2-2-1-1-1 (IET 23110)	Chakaakhhi/AC 38687	2016	Odisha	160-165	Long Slender	4.7	Moderately resistant to blast, neck blast, sheath blight, sheath rot, sheath blight and leaf folder
117	CR Dhan 507 (Prasant)	Deep Water	CR 3836-1-7-4-1-1 (IET 22986)	Gayatri/Sudhir//Varshadhan	2016	Odisha	160	Medium Slender	4.75	Moderately resistant to neck blast, brown spot, sheath blight, sheath rot, and leaf folder
118	CR Dhan 800	Shallow lowland	CRMAS 2232-85 (IET 20672)	Swarna*4/IRBB-60	2016	Odisha	140	Medium Slender	5.75	Moderately resistant to bacterial leaf blight and sheath rot
119	CR Sugandh Dhan 910	Shallow favorable lowlands and Irrigated Late	CR 2713-180 (IET 22649)	Swarna/Geetanjali	2016	Odisha	142-145	Medium Slender (aromatic)	4.38	Moderately tolerant to blast, neck blast, sheath rot, rice tungro virus, sheath blight, leaf folder, white back plant hopper
120	CR Dhan 508	Deep Water	CR 3835-1-7-2-1-1 (IET 23601)	CRLC 899/Warda 2	2017	Odisha, West Bengal, Assam	160	Long Bold	4.4	Moderately resistant to sheath blight, brown spot and sheath rot
121	CR Dhan 506	Semi-deep	CR 2687-2-3-1-1-1 (IET 23053)	CRLC 899/Warda 2	2017	Assam, Andhra Pradesh and Karnataka	165	Long Bold	4.2	Moderately resistant to leaf blast, neck blast, brown spot, sheath blight, sheath rot, tungo virus, stem borer (both dead heart and white ear heads), leaf folder and whorl maggot.
122	CR Sugandh Dhan 908	Irrigated Late	CR 2713-35 (IET 23189)	Swarna/Geetanjali	2017	Odisha, West Bengal and Uttar Pradesh	145	Medium Slender (aromatic)	5	Moderately resistant to leaf blast, neck blast, bacterial leaf blight, brown spot, stem borer, leaf folder and WBPH
123	CR Sugandh Dhan 909	Irrigated Late	CR 74-89-2-4-1 (IET 23193)	Pankaj/Podumoni	2017	Assam, Bihar, Uttar Pradesh, Maharashtra	140	Medium Slender (aromatic)	5	Moderately tolerant to leaf blast, neck blast, bacterial leaf blight, brown spot, stem borer, leaf folder and white back plant hopper

Sl. No.	Variety	Ecology	Designation	Parentage	Year of release	Released for State	Durati on	Grain Type	Yield (t ha <sup>-1</sup> )	Reaction to diseases and pests and special characters
124	Gangavati Ageti	Upland	CRR 363-36 (IET 19251)	Gaurav x Kalinga III	2017	Karnataka	85	Long Slender (aromatic)	3.5	Resistant to brown spot, gall midge (biotype-1), stem borer and moderately resistant to leaf blast, moderately resistant to gall midge (biotype-4,5) and leaf folder.
125	Puma	Upland	CRR 356-29 (IET 18654)	Annada x RR 151-3	2017	Gujarat	90	Short Bold	3.5	Moderately resistant to leaf blast, brown spot, stem borer and leaf folder. Tolerant to drought.
126	CR Dhan 204	Aerobic	CR 2696-IR 83920	IRRI 76569-259-1-2-1/CT 6510-24-1-2.	2019	Jharkhand and Tamil Nadu	120	Long Bold	4.2	Moderately resistant to neck blast, brown spot, sheath rot, leaf folder, leaf blast and good grain quality
127	CR Dhan 205 (IET 22737)	Aerobic	CR 3001-IR-86931-B-578-CR-5-5-2	N22/Swarna	2019	Tamil Nadu, Gujarat, Odisha, Madhya Pradesh, Punjab	110	Short Bold	3.7-4.5	Moderately resistant to leaf blast, brown spot, sheath rot, stem borer, and leaf folder
128	CR Dhan 311 (Mukul)	Irrigated	CR 2829-PLN-100 (IET 24772)	HP-2/ Naveen	2019	Odisha	120-126	Long Bold	5.54	Tolerant to blast, brown spot, rice tungro virus, bacterial leaf blight, moderately resistant to gall midge, sheath blight and high protein (10.1%), high Zn (20ppm)
129	CR Dhan 309	Irrigated	IR95797-CR3847-2-1-1-1-1, IET 25345	IR77080-B-34-3/IRRI 132	2019	Assam, Chhattisgarh, Uttar Pradesh	115	Long Slender	6.5	Resistant to stem borer (dead heart and white ear head), leaf folder and whorl maggot
130	CR Dhan 802 (Subhas)	Shallow lowland	CR3925-22-7, IET 25673	Swarna-Sub1*4 / IR81896-B-B-195	2019	Bihar, Madhya Pradesh	142	Short Bold	5.5	Submergence and drought tolerant. Resistant to stem borer (both dead heart and white ear heads), leaf folder, plant hopper and case worm, moderately resistant to bacterial blight, sheath rot and rice tungro virus.
131	CR Dhan 511	Semi-deep	CR 2789-9-2, IET 213906	Gayatri / Mahsuri//CR 997.	2019	West Bengal, Andhra Pradesh	160	Short Bold	5	Moderately resistant to leaf blast, neck blast and bacterial blight diseases, stem borer (both dead heart and white ear heads), white backed plant hopper and leaf folder
132	CR Dhan 801	Shallow IET 25667 Lowland	IR81896-B-B-195 / 2* SwarnaSub1 /// IR91659-54-35		2019	AP, Telengana, Odisha, UP and WB	140	Short Bold	6.3	Moderately resistant to leaf blast, neck blast, bacterial blight, stem borer (both dead heart and white ear heads) and leaf folder.



Sl. No.	Variety	Ecology	Designation	Parentage	Year of release	Released for State	Durati on	Grain Type	Yield (t ha <sup>-1</sup> )	Reaction to diseases and pests and special characters
133	CRDhan 510	Semi-deep	IET23895 (CR2593-1-1-1-1)	Sarala/Varsha Dhan//CRMS 2232-85	2019	West Bengal, Odisha	160	Short Bold	4.6	Moderately resistant to blast, leaf folder.
134	Santha Bhima (CR Dhan 102)	Upland	CR3951-3-2-2-1-1	IR64/PSB RC 52.	2019	Odisha	105-110	Short Bold	3.9	Moderately resistant to leaf blast, rice tungro virus, stem borer (dead heart), leaf folder and whorl maggot.
135	Sarumina (CR Dhan 210)	Aerobic	IET25121	IR717002-247-1-1-2/IR77080-B-34-1-1	2019	Odisha	110-115	Long slender	4.75	Moderately resistant to leaf blast, neck blast, brown spot and sheath rot, stem borer (both dead heart and white ear heads), leaf folder and green leaf hopper.
136	CR Dhan 410 (Mahamani)	Shallow lowland	IET24471	CRLC899/AC 38700	2019	Odisha	160-165	Long slender (Balami type)	6.5	Resistant to stem borer (both dead heart and white ear heads) and leaf folder while moderately resistant to neck blast, bacterial blight, sheath rot and brown spot diseases.
137	CR Dhan 312* (IET 25997)	Irrigated	CR 3808-13	IR36 male sterile lines crossed with 13 parents	2019	Chhattisgarh and Maharashtra	105-110	Medium Slender	6.4	Moderately resistant to leaf blast, neck blast and rice tungro virus. The genotype has high response to fertilizer application.
138	CR Dhan 313* (IET 25489)	Irrigated	IET 25489 (CR 3511 -2-2-5-1-1)	IR36/Surendra	2019	Chhattisgarh and Maharashtra	135-140	Medium Slender	4.7-4.9	Resistant to false smut, moderately resistant to bacterial blight, neck blast, and leaf blast
139	CR Dhan 602* (IET 25692)	Boro	CR 3724-1 (IET25692)	IR72967-12-2-3/PR 31090-33-2-1	2019	Assam and Tripura	165-170	Long Slender	5.79	Resistant to blast

\* Identified for release

## ANNEXURE II. Quality characters of rice varieties released by ICAR-NRRI, Cuttack, Odisha.

Sl.No.	Varieties	Hulling (%)	Milling (%)	HRR (%)	KL	KB	L/B	ASV	WU (100g)	ER	VER	KLAC	Amylose
1	CR Dhan305	75.5	63.5	47.0	6.4	2.1	2.9	3.0	180.0	1.7	3.7	11.0	20.4
2	Swarna Sub1	76.5	64.0	61.0	5.1	2.1	2.4	3.0	150.0	1.4	3.5	7.7	20.3
3	Sneha	76.5	64.5	48.0	5.2	2.0	2.6	4.0	207.5	1.9	3.7	10.3	22.0
4	CR Dhan205	78.0	65.5	62.0	5.5	2.0	2.7	6.0	230.0	1.7	3.7	9.9	21.2
5	Kalinga-3	76.0	61.5	34.5	5.5	1.8	2.9	3.0	112.5	1.6	3.7	9.2	22.6
6	Vanaprabha	75.5	57.0	36.0	5.9	2.0	2.9	3.0	145.0	1.6	3.7	9.8	22.2
7	Pyari	77.0	64.5	59.0	5.2	2.0	2.5	3.0	95.0	1.7	3.7	8.9	22.3
8	CR Dhan306	78.0	67.5	64.5	5.0	1.9	2.5	3.0	102.5	1.6	4.0	8.4	20.1
9	CR Dhan201	74.0	60.0	48.5	6.4	2.1	3.0	6.0	260.0	1.5	4.0	10.0	24.4
10	Sahbhagi Dhan	75.5	63.0	48.5	5.6	2.1	2.6	6.0	180.0	1.7	4.2	9.9	27.4
11	Tulsi	78.0	63.0	61.5	5.2	2.0	2.5	3.0	135.0	1.6	3.5	8.8	24.1
12	Annada	77.5	67.0	57.5	5.5	2.3	2.4	3.0	100.0	1.5	3.7	8.5	23.8
13	Poorna Bhog	75.5	59.5	38.5	5.8	1.6	3.5	7.0	190.0	1.6	3.7	9.4	21.8
14	Nua Chimikamini	79.5	71.0	53.5	3.5	2.0	1.6	3.0	155.0	2.0	3.7	7.3	21.8
15	Kamesh	78.0	63.0	50.0	5.2	2.3	2.2	3.0	150.0	1.4	3.7	7.4	24.1
16	Hazari Dhan	74.5	58.5	47.5	6.0	2.1	2.8	3.0	125.0	1.5	3.7	9.3	26.2
17	Dhala Heera	76.0	57.5	34.5	5.5	2.2	2.4	3.0	67.5	1.6	3.7	9.3	24.1
18	Supriya	79.0	62.0	40.5	5.5	2.2	2.4	3.0	92.5	1.4	3.7	8.3	25.1
19	Kalinga-II	78.0	63.5	51.5	5.1	2.2	2.2	3.0	60.0	1.6	3.7	8.4	26.3
20	Satabdi	74.0	60.5	44.0	5.9	1.7	3.4	3.0	95.0	1.3	3.5	7.8	23.8
21	Sumit	78.5	62.5	48.0	6.0	2.3	2.6	3.0	140.0	1.6	3.7	9.6	24.0
22	Hanseswari	79.0	63.0	54.5	5.1	2.4	2.0	4.0	180.0	1.5	3.7	7.9	26.7
23	Sonamani	81.5	70.5	68.0	5.2	2.3	2.2	3.0	105.0	1.7	3.5	9.3	20.9
24	Chandhan	80.0	69.0	66.0	5.5	2.1	2.6	7.0	205.0	1.6	3.5	8.9	22.9
25	Radhi	81.5	71.0	63.0	5.9	2.1	2.7	4.0	85.0	1.6	3.5	9.6	24.2
26	Tapaswani	80.0	69.5	66.5	5.0	2.0	2.5	3.0	45.0	1.7	3.7	8.8	21.0
27	Durga	81.0	68.0	65.5	4.9	2.0	2.5	3.0	80.0	1.8	3.5	9.3	23.8
28	CR-1014	78.5	69.5	64.0	4.8	1.6	3.0	3.0	75.0	1.8	3.7	8.7	20.8
29	Panidhan	78.0	65.5	59.0	5.3	1.9	2.8	3.0	85.0	1.8	4.0	9.6	21.6



Sl.No.	Varieties	Hulling (%)	Milling (%)	HRR (%)	KL	KB	L/B	ASV	WU (100g)	ER	VER	KLAC	Amylose
30	CRHR-32	80.0	69.5	64.0	5.6	2.1	2.6	5.0	125.0	1.8	3.7	10.3	25.7
31	Pooja	79.0	66.5	53.5	5.1	2.0	2.4	3.0	80.0	1.8	3.7	9.2	22.0
32	Neela	80.5	68.5	62.0	6.4	2.2	2.8	4.0	90.0	1.6	3.5	10.7	21.4
33	Lalat	80.0	68.0	61.0	6.2	2.0	3.0	3.0	85.0	1.5	3.7	9.8	23.5
34	Khira	81.0	69.0	57.5	5.1	2.3	2.2	4.0	80.0	1.8	3.7	9.2	23.5
35	CR Dhan 204	78.0	66.5	62.5	5.5	2.0	2.7	3.0	92.5	1.6	3.7	9.0	22.2
36	Satyakrishna	80.5	70.5	55.0	6.6	1.8	3.5	4.0	95.0	1.6	3.7	10.9	21.3
37	Chandrama	78.0	70.5	61.5	5.2	2.2	2.3	3.0	80.0	1.6	3.5	8.5	20.9
38	Vandana	77.5	64.0	44.0	5.7	2.1	2.7	3.0	70.0	1.8	3.5	10.4	20.9
39	Utkalprava	78.0	66.5	63.0	5.1	2.2	2.3	3.0	85.0	1.7	4.0	9.1	21.4
40	Lumasankhi	79.0	68.5	55.5	5.7	2.0	2.8	4.0	100.0	1.8	3.7	10.7	22.3
41	CR Dhan 601	79.5	69.5	56.5	5.4	2.2	2.4	5.0	155.0	1.9	4.0	10.6	22.5
42	Abhishek	78.5	66.5	58.0	4.8	2.1	2.2	3.0	50.0	1.9	4.2	9.4	24.2
43	Phalguni	80.0	67.5	52.5	6.0	2.0	3.0	3.0	62.5	1.7	4.2	10.4	21.4
44	Kalyani-II	81.0	67.5	33.5	6.3	2.1	2.9	4.0	115.0	1.5	3.7	9.8	24.8
45	Jalamani	77.5	69.0	48.5	5.8	2.0	2.9	3.0	130.0	1.6	4.0	9.7	23.1
46	Anjali	80.0	70.0	60.5	5.6	2.3	2.4	4.0	77.5	1.5	3.7	8.9	20.2
47	Lunabari	79.5	70.0	67.0	5.6	2.2	2.5	4.0	112.5	1.5	3.5	8.8	21.6
48	Nuakalajeera	79.5	70.0	58.5	3.9	1.9	2.0	4.0	92.5	1.8	3.7	7.2	20.5
49	Lumishree	78.5	67.5	59.5	6.6	2.0	3.3	4.0	92.5	1.4	3.7	9.8	22.8
50	Kalinga-I	79.5	70.0	58.5	5.3	2.1	2.5	5.0	70.0	1.8	3.7	9.9	21.0
51	Lunasuvarna	79.5	69.5	53.0	5.6	2.1	2.6	4.0	85.0	1.4	3.7	7.9	21.3
52	Khitish	79.5	70.0	61.0	6.1	1.8	3.3	4.0	115.0	1.5	3.7	9.6	23.7
53	Hue	79.5	68.0	58.5	7.2	1.9	3.8	4.0	85.0	1.5	3.7	11.4	21.9
54	Sattari	80.0	67.5	62.0	4.7	2.2	2.1	5.0	145.0	1.8	3.5	8.7	24.6
55	Jayanti Dhan	76.5	69.0	65.0	5.5	1.7	3.1	4.0	75.0	1.8	3.5	10.0	20.1
56	Gayatri	80.0	71.0	66.0	4.7	2.5	1.8	4.0	85.0	1.5	3.7	7.2	22.2
57	Ajay (Hybrid)	80.5	67.0	51.0	5.7	1.9	3.0	6.0	147.5	1.8	3.7	10.4	23.3

Sl.No.	Varieties	Hulling (%)	Milling (%)	HRR (%)	KL	KB	L/B	ASV	WU (100g)	ER	VER	KLAC	Amylose
58	Swarna Sub1	77.5	68.0	66.5	4.7	1.9	2.4	4.0	70.0	1.7	3.7	8.3	20.8
59	Varshadhan	78.5	66.0	64.5	5.9	2.0	2.8	4.0	117.5	1.4	3.7	8.5	22.7
60	CR Dhan202	78.5	68.5	61.0	5.5	2.0	2.6	4.0	172.5	1.6	3.5	9.3	20.9
61	Savitri	78.5	68.5	65.5	4.4	2.4	1.8	4.0	97.5	1.8	3.7	8.3	22.1
62	Sarasa	81.0	68.0	46.5	6.0	2.1	2.8	4.0	100.0	1.6	3.7	10.0	22.6
63	Satyabhama	78.0	68.0	62.5	5.5	2.1	2.5	4.0	120.0	1.5	3.7	8.6	21.1
64	Geetanjali	80.5	68.0	60.0	6.4	1.7	3.6	4.0	110.0	1.7	3.7	11.4	21.0
65	Heera	79.5	65.5	54.5	6.3	2.1	2.9	4.0	92.5	1.7	3.7	11.0	22.6
66	Padmini	77.5	67.5	63.5	4.7	1.4	3.3	4.0	135.0	1.9	3.5	9.0	20.5
67	Indira	79.5	69.5	63.0	5.2	2.4	2.2	6.0	180.0	1.9	3.7	10.2	21.1
68	Rajalaxmi (Hybrid)	79.5	67.0	54.0	6.3	1.9	3.3	6.0	197.5	1.6	3.5	10.3	21.2
69	Samalei	78.5	69.0	64.0	6.3	1.9	3.2	4.0	130.0	1.7	3.7	10.8	20.7
70	Sarala	79.5	64.0	59.5	5.1	1.8	2.8	4.0	180.0	1.8	4.0	9.6	21.6
71	CR Dhan304	80.5	67.5	55.5	5.3	2.2	2.3	4.0	127.5	1.6	3.7	9.0	22.3
72	Ketekijoha	79.5	69.0	63.0	5.5	1.7	3.1	4.0	95.0	1.8	4.0	10.3	20.8
73	Shaktiman	78.5	68.5	48.0	4.8	2.2	2.2	6.0	250.0	1.9	3.7	9.3	20.6
74	Moti	78.5	67.0	58.5	6.1	2.1	2.9	4.0	165.0	1.8	3.7	11.0	21.8
75	Uday	79.5	68.0	65.5	5.3	2.3	2.2	4.0	147.5	1.7	3.7	9.3	20.5
76	Tapaswani (MAS)	78.5	70.0	67.0	5.3	2.0	2.6	4.0	85.0	1.5	3.7	8.1	20.3
77	Reeta	78.5	67.0	55.5	6.0	2.2	2.7	4.0	105.0	1.8	3.7	10.9	21.8
78	Luna Sampad	81.5	70.5	51.5	4.9	2.1	2.3	4.0	145.0	1.9	3.5	9.3	22.7
79	Saket-4	78.5	68.5	65.5	6.0	1.8	3.2	4.0	115.0	1.5	3.7	9.4	21.7
80	CR Dhan 300	75.5	63.0	52.5	6.0	1.8	3.3	4.0	90.0	1.7	3.7	10.3	21.4
81	CR Dhan 303	79.5	66.5	41.5	5.5	2.2	2.4	4.0	112.5	1.6	3.7	8.9	22.0
82	Tara	79.5	62.5	28.0	5.1	2.0	2.4	7.0	282.5	1.7	3.7	8.8	21.4
83	Ratna	78.5	65.5	55.5	6.0	1.9	3.0	4.0	135.0	1.7	3.7	10.6	20.7
84	Dharitri	81.0	72.0	65.5	4.7	2.4	1.9	4.0	115.0	1.7	3.5	8.5	22.6
85	Sadabahar	79.0	68.0	49.5	5.3	1.9	2.7	7.0	190.0	1.4	3.5	7.6	20.9

HRR - Head rice recovery, KL - Kernel length, KB - Kernel breadth, L/B - Length to breadth ratio, ASV - Alkali spread value, WU - Water uptake, ER - Elongation ratio, VER - Vertical Elongation ratio, KLAC - Kernel length after cooking



### ANNEXURE III. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to blast disease.

Sl. No.	Variety	Disease score	Disease Reaction	No. of R genes
1	Ratna	9	S	
2	Saket-4	8	S	
3	Kalinga-I	5	MR	
4	Kalinga-II	8	S	
5	Supriya	6	S	
6	Indira	8	S	
7	Samalei	1	R	7
8	Sattari	7	S	
9	Savitri	1	R	9
10	Khitish	7	S	
11	Utkalprabha	6	S	
12	Sarasa	0	R	6
13	Udaya	8	S	
14	Annada	6	S	
15	CR 1014	7	S	
16	Dharitri	8	S	
17	Gayatri	7	S	
18	Heera	7	S	
19	Kalyani-II	7	S	
20	Moti	9	S	
21	Padmini	6	S	
22	Panidhan	1	R	9
23	Shaktiman	5	MR	
24	Lunishree	1	R	7
25	Radhi	5	MR	
26	Sonamani	9	S	
27	Tapaswini	8	S	
28	Pooja	7	S	
29	Sarala	7	S	
30	Durga	6	S	
31	Anjali	6	S	
32	Hazaridhan	5	MR	
33	Abhishek	1	R	8
34	Chandrama	1	R	6
35	Virender	6	S	
36	Geetanjali	4	MR	
37	Ketekijoha	5	MR	
38	Naveen	5	MR	
39	Rajalaxmi (Hybrid)	5	MR	





Sl. No.	Variety	Disease score	Disease Reaction	No. of R genes
40	Ajay (Hybrid)	5	MR	
41	Varshadhan	7	S	
42	Satya Krishna (CR Dhan 10)	1	R	4
43	Nua kalajeera	5	MR	
44	Nua Dhusara (CR Sugandh Dhan 3)	5	MR	
45	Chandan (CR Boro dhan 2)	2	R	4
46	Hanseswari (CR Dhan 70)	8	S	
47	Swarna Sub1	6	S	
48	CR Dhan 40	6	S	
49	Sahbhagidhan	1	R	9
50	Phalguni	7	S	
51	Reeta (CR Dhan 401)	1	R	9
52	Luna Suvarna (CR Dhan 403)	5	MR	
53	Luna Sampad (CR Dhan 402)	6	MR	
54	Nua Chinikamini	6	S	
55	CR Dhan 501	8	S	
56	CR Dhan 701	5	MR	
57	CR Dhan 601	5	MR	
58	CR Dhan 500	5	MR	
59	Satyabhama (CR Dhan 100)	3	R	7
60	Pyari (CR Dhan 200)	4	MR	
61	Hue (CR Dhan 301)	5	MR	
62	Improved Lalat	5	MR	
63	Improved Tapaswini	8	S	
64	Sumit (CR Dhan 404)	2	R	9
65	Poorna Bhog (CR Basna Dhan 902)	7	S	
66	Jalamani (CR Dhan 503)	2	R	4
67	Jayantanti Dhan (CR Dhan 502)	2	R	9
68	Luna Barial (CR Dhan 406)	5	MR	
69	Luna Sankhi (CR Dhan 405)	6	S	
70	CR Sugandh Dhan 907	6	S	
71	CR Dhan 300	2	R	6
72	CR Dhan 303	6	S	
73	CR Dhan 305	4	MR	
74	CR Dhan 304	7	S	
75	CR Dhan 201	6	S	
76	CR Dhan 202	2	R	7
77	CR Dhan 204	1	R	7
78	CR Dhan 306 (IET 22084)	7	S	
79	CR Dhan 205 (IET 22737)	1	R	9
80	CR Dhan 307 (Maudamani)	7	S	

R - Resistant, MR - Moderately Resistant, S - Susceptible



#### ANNEXURE IV. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to brown spot disease.

Sl. No.	Variety	Disease score	Reaction
1	Ratna	5	MS
2	Saket-4	7	HS
3	Kalinga-I	5	MS
4	Kalinga-II	5	MS
5	Supriya	7	HS
6	Indira	5	MS
7	Samalei	5	MS
8	Sattari	9	HS
9	Savitri	5	MS
10	Khitish	3	MR
11	Kalinga-III	5	MS
12	Utkalprabha	5	MS
13	Neela	8	HS
14	Sarasa	8	HS
15	Udaya	4	MR
16	Annada	4	MR
17	CR 1014	4	MR
18	Dharitri	4	MR
19	Heera	6	MS
20	Kalashree	8	HS
21	Kalyani-II	6	MS
22	Khira	8	HS
23	Moti	5	MS
24	Padmini	5	MS
25	Panidhan	5	MS
26	Tara	6	MS
27	Tulasi	6	MS
28	Vanaprabha	9	HS
29	Lunishree	7	HS
30	Sneha	7	HS
31	Vandana	7	HS
32	Dhala Heera	5	MS
33	Radhi	5	MS



Sl. No.	Variety	Disease score	Reaction
34	Sonamani	4	MR
35	Tapaswini	5	MS
36	Pooja	7	HS
37	Sarala	3	MR
38	Durga	5	MS
39	Shatabdi	5	MS
40	Anjali	5	MS
41	Hazaridhan	3	MR
42	Sadabahr	5	MS
43	Abhishek	7	HS
44	Chandrama	5	MS
45	Virender	5	MS
46	Geetanjali	6	MS
47	Ketekijoha	5	MS
48	Naveen	5	MS
49	Rajalaxmi (Hybrid)	5	MS
50	Ajay (Hybrid)	7	HS
51	Varshadhan	4	MR
52	Satya Krishna (CR Dhan 10)	3	MR
53	Nua kalajeera	7	HS
54	Nua Dhusara (CR Sugandh Dhan 3)	5	MS
55	Chandan (CR Boro Dhan 2)	5	MS
56	Hanseswari (CR Dhan 70)	6	MS
57	Swarna Sub1	4	MR
58	CR Dhan 40	5	MS
59	Sahbhagidhan	5	MS
60	Phalguni	5	MS
61	Reeta (CR Dhan 401)	3	MR
62	Luna Suvarna (CR Dhan 403)	3	MR
63	Luna Sampad (CR Dhan 402)	8	HS
64	Nua Chinikamini	6	HS
65	CR Dhan 501	7	HS
66	CR Dhan 701	5	MS
67	CR Dhan 601	5	MS



Sl. No.	Variety	Disease score	Reaction
68	CR Dhan 500	7	HS
69	Satyabhama (CR Dhan 100)	7	HS
70	Pyari (CR Dhan 200)	4	MR
71	Hue (CR Dhan 301)	7	HS
72	Improved Lalat	5	MS
73	Improved Tapaswini	5	MS
74	Sumit (CR Dhan 404)	7	HS
75	Poorna Bhog (CR Basna Dhan 902)	6	MS
76	Jalamani (CR Dhan 503)	6	MS
77	Jayanti Dhan (CR Dhan 502)	5	MS
78	Luna Barial (CR Dhan 406)	7	HS
79	Luna Sankhi (CR Dhan 405)	7	HS
80	CR Sugandh Dhan 907	5	MS
81	CR Dhan 300	6	MS
82	CR Dhan 303	5	MS
83	CR Dhan 305	4	MR
84	CR Dhan 304	3	MR
85	CR Dhan 201	7	HS
86	CR Dhan 202	3	MR
87	CR Dhan 505	7	HS
88	CR Dhan 204	7	HS
89	CR Dhan 306 (IET 22084)	8	HS
90	CR Dhan 101 (Ankit)	9	HS
91	CR Dhan 206 (Gopinath)	7	HS
92	CR Dhan 307 (Maudamani)	7	HS
93	CR Dhan 408 (Chaka Akhi)	7	HS
94	CR Dhan 310 (IET 24780)	5	MS
95	CR Dhan 409 (Pradhan Dhan)	5	MS
96	CR Dhan 507 (Prasant)	7	HS
97	CR Dhan 800	5	MS
98	CR Sugandh Dhan 910	6	MS
99	CR Dhan 311 (Mukul)	6	MS
100	CR Dhan 506	8	HS
101	CR Sugandh Dhan 908	8	HS
102	CR Sugandh Dhan 909	9	HS

R - Resistant, MR - Moderately Resistant, S - Susceptible, MS - Moderately Susceptible, HS - Highly Susceptible



## ANNEXURE V. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to sheath blight.

Sl. No.	Varieties	Disease score	Disease reaction
1	Ratna	7	S
2	Saket-4	7	S
3	Kalinga-I	7	S
4	Kalinga-II	7	S
5	Supriya	9	HS
6	Indira	7	S
7	Ramakrishna	5	MT
8	Samalei	9	HS
9	Sattari	9	HS
10	Savitri	9	HS
11	Khitish	7	S
12	Kalinga-III	3	T
13	Utkalprabha	9	HS
14	Neela	9	HS
15	Sarasa	7	S
16	Udaya	7	S
17	Annada	7	S
18	CR 1014	1	MR
19	Dharitri	7	S
20	Gayatri	7	S
21	Heera	7	S
22	Khira	9	HS
23	Moti	9	HS
24	Padmini	7	S
25	Panidhan	9	HS
26	Tara	7	S
27	Tulasi	7	S
28	Vanaprabha	9	HS
29	Shaktiman	7	S
30	Lunishree	9	HS
31	Sneha	7	S



Sl. No.	Varieties	Disease score	Disease reaction
32	Vandana	3	T
33	Dhala Heera	7	S
34	Radhi	7	S
35	Sonamani	9	HS
36	Tapaswini	9	HS
37	Pooja	7	S
38	Sarala	7	S
39	Durga	1	MR
40	Shatabdi	9	HS
41	Anjali	3	T
42	Hazaridhan	9	HS
43	Sadabahar	9	HS
44	Abhishek	9	HS
45	Chandrama	5	MT
46	Virender	7	S
47	Geetanjali	3	T
48	Ketekijoha	5	MT
49	Naveen	1	MR
50	Rajalaxmi (Hybrid)	5	MR
51	Ajay (Hybrid)	5	MT
52	Varshadhan	5	MT
53	Satya Krishna (CR Dhan 10)	7	S
54	Nua kalajeera	7	S
55	Nua Dhusara (CR Sugandh Dhan 3)	7	S
56	Chandan (CR Boro dhan 2)	1	MR
57	Hanseswari (CR Dhan 70)	1	MR
58	Swarna Sub1	9	HS
59	CR Dhan 40	9	HS
60	Sahbhagidhan	1	MR
61	Phalguni	9	HS
62	Reeta (CR Dhan 401)	3	T
63	Luna Suvarna (CR Dhan 403)	7	S
64	Luna Sampad (CR Dhan 402)	7	S
65	Nua Chinikamini	7	S
66	CR Dhan 501	9	HS
67	CR Dhan 701	3	T
68	CR Dhan 601	1	MR
69	CR Dhan 500	9	HS
70	Satyabhama (CR Dhan 100)	7	S
71	Pyari (CR Dhan 200)	7	S



Sl. No.	Varieties	Disease score	Disease reaction
72	Hue (CR Dhan 301)	7	S
73	Improved Lalat	3	MR
74	Improved Tapaswini	9	HS
75	Sumit (CR Dhan 404)	5	MT
76	Poorna Bhog (CR Basna Dhan 902)	9	HS
77	Jalamani (CR Dhan 503)	7	S
78	Jayanti Dhan (CR Dhan 502)	7	S
79	Luna Barial (CR Dhan 406)	9	HS
80	Luna Sankhi (CR Dhan 405)	9	HS
81	CR Sugandh Dhan 907	7	S
82	CR Dhan 300	5	MT
83	CR Dhan 303	7	S
84	CR Dhan 305	7	S
85	CR Dhan 304	9	HS
86	CR Dhan 201	7	S
87	CR Dhan 202	9	HS
88	CR Dhan 505	7	S
89	CR Dhan 204	9	HS
90	CR Dhan 306 (IET 22084)	5	MT
91	CR Dhan 205 (IET 22737)	9	HS
92	CR Dhan 101 (Ankit)	9	HS
93	CR Dhan 203 (Sachala)	7	S
94	CR Dhan 206 (Gopinath)	7	S
95	CR Dhan 307 (Maudamani)	3	T
96	CR Dhan 408 (Chaka Akhi)	5	MT
97	CR Dhan 310 (IET 24780)	9	HS
98	CR Dhan 311 (Mukul)	7	S

T - Tolerant, MT - Moderately Tolerant, MR - Moderately Resistant, S - Susceptible, MS - Moderately Susceptible, HS - Highly Susceptible



## ANNEXURE VI. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to bakanae disease.

Sl. No.	Variety	Mean Elongation (%)	Disease incidence (%)	Disease Score	Disease Reaction
1	Ratna	7.5	56.5	5	MS
2	Saket-4	8.3	20.3	3	MR
3	Kalinga-I	12.3	23.3	3	MR
4	Kalinga-II	12.3	23.3	3	MR
5	Supriya	26.3	65.5	7	S
6	Indira	70.3	90.0	9	HS
7	Samalei	25.3	85.0	9	HS
8	Sattari	23.3	92.3	9	HS
9	Savitri	36.3	85.3	9	HS
10	Khitish	8.5	35.3	3	MR
11	Kalinga-III	26.3	85.3	9	HS
12	Utkalprabha	21.2	82.0	9	HS
13	Neela	6.3	13.0	1	R
14	Sarasa	5.2	3.5	0	HR
15	Udaya	10.3	24.5	3	MR
16	Annada	60.0	100.0	9	HS
17	CR 1014	10.5	25.3	3	MR
18	Dharitri	65.3	100.0	9	HS
19	Heera	55.2	85.5	9	HS
20	Kalashree	6.3	12.5	1	R
21	Kalyani-II	10.5	23.3	3	MR
22	Khira	3.3	6.2	0	HR
23	Moti	10.5	45.3	5	MS
24	Padmini	35.3	85.3	9	HS
25	Panidhan	25.3	54.0	5	MS
26	Tara	12.3	33.0	5	MR
27	Tulasi	31.3	91.3	9	HS
28	Vanaprabha	8.5	50.3	5	MS
29	Lunishree	10.3	22.0	3	MR
30	Sneha	25.3	81.0	9	HS
31	Vandana	32.3	82.0	9	HS
32	Dhala Heera	32.3	100.0	9	HS
33	Radhi	55.3	100.0	9	HS
34	Sonamani	35.2	82.3	9	HS
35	Tapaswini	65.3	95.0	9	HS
36	Pooja	25.3	92.5	9	HS





Sl. No.	Variety	Mean Elongation (%)	Disease incidence (%)	Disease Score	Disease Reaction
37	Sarala	54.3	82.3	9	HS
38	Durga	25.0	66.3	7	S
39	Shatabdi	18.3	38.5	3	MR
40	Anjali	60.5	85.5	9	HS
41	Hazaridhan	65.3	82.3	9	HS
42	Sadabahr	2.3	1.5	0	HR
43	Abhishek	55.5	100.0	9	HS
44	Chandrama	15.3	55.5	5	MS
45	Virender	36.5	65.5	7	S
46	Geetanjali	65.3	100.0	9	HS
47	Ketekijoha	10.3	22.0	3	MR
48	Naveen	15.3	28.5	3	MR
49	Rajalaxmi (Hybrid)	36.3	81.5	9	HS
50	Ajay (Hybrid)	26.3	85.0	9	HS
51	Varshadhan	10.3	32.2	3	MR
52	Satya Krishna (CR Dhan 10)	31.3	100.0	9	HS
53	Nua kalajeera	6.5	14.5	1	R
54	Nua Dhusara (CR Sugandh Dhan 3)	25.3	65.3	5	MS
55	Chandan (CR Boro dhan 2)	12.3	26.3	5	MR
56	Hanseswari (CR Dhan 70)	10.5	70.3	7	S
57	Swarna Sub1	8.5	12.3	1	R
58	Sahbhagidhan	60.3	90.0	9	HS
59	Phalguni	10.3	23.3	3	MR
60	Reeta (CR Dhan 401)	70.3	100.0	9	HS
61	Luna Suvarna (CR Dhan 403)	14.3	42.3	5	MS
62	Luna Sampad ( CR Dhan 402)	40.5	100.0	9	HS
63	Nua Chinikamini	26.3	30.3	3	MR
64	CR Dhan 501	35.3	85.5	9	HS
65	CR Dhan 701	56.0	90.0	9	HS
66	CR Dhan 601	25.3	62.3	7	S
67	CR Dhan 500	12.3	22.0	3	MR
68	Satyabhama (CR Dhan 100)	42.3	92.5	9	HS
69	Pyari ( CR Dhan 200)	32.3	35.3	3	MR
70	Hue (CR Dhan 301)	35.5	45.5	5	MS
71	Improved Lalat	8.3	26.5	3	MR
72	Improved Tapaswini	1.5	5.0	0	HR
73	Sumit (CR Dhan 404)	6.3	38.5	3	MR
74	Poorna Bhog (CR Basna Dhan 902)	5.7	15.0	1	R



Sl. No.	Variety	Mean Elongation (%)	Disease incidence (%)	Disease Score	Disease Reaction
75	Jalamani (CR Dhan 503)	25.3	45.5	5	MS
76	Jayanti Dhan (CR Dhan 502)	15.3	62.3	7	S
77	Luna Barial (CR Dhan 406)	35.3	82.3	9	HS
78	Luna Sankhi (CR Dhan 405)	2.3	6.3	0	HR
79	CR Sugandh Dhan 907	65.0	100.0	9	HS
80	CR Dhan 300	38.5	86.5	9	HS
81	CR Dhan 303	24.3	65.3	7	S
82	CR Dhan 305	5.8	38.5	3	MR
83	CR Dhan 304	68.5	45.3	5	MS
84	CR Dhan 201	50.0	100.0	9	HS
85	CR Dhan 202	26.3	70.3	7	S
86	CR Dhan 505	10.3	62.3	7	S
87	CR Dhan 204	45.3	85.5	9	HS
88	CR Dhan 306 (IET 22084)	55.3	85.5	9	HS
89	CR Dhan 101 (Ankit)	23.3	85.3	9	HS
90	CR Dhan 206 (Gopinath)	15.3	62.0	7	S
91	CR Dhan 307 (Maudamani)	13.5	22.5	3	MR
92	CR Dhan 408 (Chaka Akhi)	34.5	92.3	9	HS
93	CR Dhan 310 (IET 24780)	14.3	34.5	3	MR
94	CR Dhan 409 (Pradhan Dhan)	10.3	22.0	3	MR
95	CR Dhan 507 (Prasant)	32.5	100.0	9	HS
96	CR Dhan 800	8.5	31.0	3	MR
97	CR Sugandh Dhan 910	65.3	100.0	9	HS
98	CR Dhan 311 (Mukul)	2.3	3.5	0	HR
99	CR Dhan 508	26.3	82.0	9	HS
100	CR Dhan 506	10.5	62.5	7	S
101	CR Sugandh Dhan 908	30.5	81.0	9	HS
102	CR Sugandh Dhan 909	24.3	92.3	9	HS

HR - Highly Resistant, R - Resistant, MR - Moderately Resistant, S - Susceptible, MS - Moderately Susceptible, HS - Highly Susceptible



## ANNEXURE VII. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to seedling blight disease.

Sl. No.	Variety	Score	Disease Reaction
1	Ratna	5	S
2	Saket-4	7	HS
3	Kalinga-I	7	HS
4	Kalinga-II	7	HS
5	Supriya	5	S
6	Indira	5	S
7	Samalei	1	R
8	Sattari	5	S
9	Savitri	1	R
10	Khitish	5	S
11	Kalinga-III	5	S
12	Utkalprabha	7	HS
13	Neela	0	HR
14	Sarasa	1	R
15	Udaya	7	HS
16	Annada	7	HS
17	CR 1014	5	S
18	Dharitri	7	HS
19	Gayatri	7	HS
20	Heera	1	R
21	Kalyani-II	3	MR
22	Khira	1	R
23	Moti	7	HS
24	Padmini	7	HS
25	Panidhan	7	HS
26	Tara	3	MR
27	Tulasi	3	MR
28	Vanaprabha	1	R
29	Shaktiman	7	HS
30	Lunishree	1	R
31	Sneha	1	R
32	Vandana	1	R
33	Dhala Heera	1	R
34	Radhi	7	HS
35	Sonamani	5	S
36	Tapaswini	7	HS
37	Pooja	3	MR
38	Sarala	5	S
39	Durga	7	HS
40	Shatabdi	0	HR
41	Anjali	7	HS
42	Hazaridhan	7	HS
43	Sadabahar	1	R
44	Abhishek	5	S
45	Chandrama	5	S
46	Virender	5	S
47	Geetanjali	5	S
48	Ketekijoha	5	S



Sl. No.	Variety	Score	Disease Reaction
49	Naveen	3	R
50	Rajalaxmi (Hybrid)	7	HS
51	Ajay (Hybrid)	7	HS
52	Varshadhan	7	HS
53	Satya Krishna (CR Dhan 10)	7	HS
54	Nua kalajeera	7	HS
55	Nua Dhusara (CR Sugandh Dhan 3)	3	MR
56	Chandan (CR Boro dhan 2)	7	HS
57	Hanseswari (CR Dhan 70)	7	HS
58	Swarna Sub1	0	HR
59	CR Dhan 40	5	S
60	Sahbhagidhan	7	HS
61	Phalguni	7	HS
62	Reeta (CR Dhan 401)	7	HS
63	Luna Suvarna (CR Dhan 403)	1	R
64	Luna Sampad (CR Dhan 402)	5	S
65	Nua Chinikamini	3	MR
66	CR Dhan 501	5	S
67	CR Dhan 701	3	MR
68	CR Dhan 601	7	HS
69	CR Dhan 500	7	HS
70	Satyabhama (CR Dhan 100)	7	HS
71	Pyari (CR Dhan 200)	1	R
72	Hue (CR Dhan 301)	7	HS
73	Improved Lalat	5	S
74	Improved Tapaswini	7	HS
75	Sumit (CR Dhan 404)	5	S
76	Poorna Bhog (CR Basna Dhan 902)	5	S
77	Jalamani (CR Dhan 503)	7	HS
78	Jayanti Dhan (CR Dhan 502)	3	MR
79	Luna Barial (CR Dhan 406)	5	S
80	Luna Sankhi (CR Dhan 405)	5	S
81	CR Sugandh Dhan 907	7	HS
82	CR Dhan 300	5	S
83	CR Dhan 303	7	HS
84	CR Dhan 305	3	MR
85	CR Dhan 304	7	HS
86	CR Dhan 201	5	S
87	CR Dhan 202	5	S
88	CR Dhan 505	5	S
89	CR Dhan 204	7	HS
90	CR Dhan 306 (IET 22084)	5	S
91	CR Dhan 205 (IET 22737)	7	HS
92	CR Dhan 101 (Ankit)	1	R
93	CR Dhan 203 (Sachala)	0	HR
94	CR Dhan 206 (Gopinath)	0	HR
95	CR Dhan 307 (Maudamani)	3	MR
96	CR Dhan 408 (Chaka Akhi)	1	R
97	CR Dhan 310 (IET 24780)	0	HR
98	CR Dhan 311 (Mukul)	1	R

HR - Highly Resistant, R - Resistant, MR - Moderately Resistant, S - Susceptible, MS - Moderately Susceptible, HS - Highly Susceptible



## ANNEXURE VIII. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to brown plant hopper.

Sl. No.	Variety	TP	DP	DP (%)	Damage Score	Rating
1	Ratna	21	15	69.0	7	S
2	Saket-4	18	18	100.0	9	HS
3	Kalinga-I	27	27	100.0	9	HS
4	Kalinga-II	17	12	70.5	9	HS
5	Supriya	24	19	79.1	9	HS
6	Indira	21	19	90.4	9	HS
7	Samalei	20	19	95.0	9	HS
8	Sattari	26	26	100.0	9	HS
9	Savitri	22	20	90.9	9	HS
10	Khitish	20	15	75.0	9	HS
11	Kalinga-III	12	6	75.0	9	HS
12	Utkalprabha	17	14	82.3	9	HS
13	Neela	14	13	92.8	9	HS
14	Sarasa	15	13	86.6	9	HS
15	Udaya	26	24	92.3	9	HS
16	Annada	20	16	79.4	9	HS
17	Gayatri	20	16	80.0	9	HS
18	Heera	18	14	80.0	9	HS
19	Kalashree	24	11	46.8	5	MS
20	Kalyani-II	21	15	71.4	9	HS
21	Khira	20	16	77.5	9	HS
22	Moti	21	20	95.2	9	HS
23	Padmini	24	24	100.0	9	HS
24	Panidhan	27	27	100.0	9	HS
25	Tara	16	16	100.0	9	HS
26	Tulasi	27	17	79.5	9	HS
27	Vanaprabha	20	12	58.9	7	S
28	Shaktiman	22	22	100.0	9	HS
29	Lunishree	28	8	29.0	3	MR
30	Sneha	21	20	95.2	9	HS
31	Vandana	19	19	100.0	9	HS
32	Dhala Heera	25	24	96.0	9	HS
33	Radhi	26	16	62.7	7	S
34	Tapaswini	25	24	96.0	9	HS
35	Pooja	19	17	89.4	9	HS
36	Sarala	25	16	82.0	9	HS
37	Durga	21	21	100.0	9	HS
38	Shatabdi	25	25	100.0	9	HS
39	Anjali	25	24	96.0	9	HS
40	Hazaridhan	8	5	81.2	9	HS
41	Sadabahar	15	14	93.3	9	HS
42	Abhishek	28	27	96.4	9	HS
43	Chandrama	21	21	100.0	9	HS



Sl. No.	Variety	TP	DP	DP (%)	Damage Score	Rating
44	Virender	28	28	100.0	9	HS
45	Geetanjali	19	19	100.0	9	HS
46	Ketekijoha	30	30	100.0	9	HS
47	Naveen	22	18	81.4	9	HS
48	Rajalaxmi (Hybrid)	19	19	100.0	9	HS
49	Ajay (Hybrid)	26	24	92.3	9	HS
50	Varshadhan	22	20	90.9	9	HS
51	Satya Krishna (CR Dhan 10)	16	12	75.0	9	HS
52	Nua kalajeera	20	20	100.0	9	HS
53	Nua Dhusara (CR Sugandh Dhan 3)	38	38	100.0	9	HS
54	Chandan (CR Boro dhan 2)	20	20	100.0	9	HS
55	Hanseswari (CR Dhan 70)	22	16	74.4	9	HS
56	CR Dhan 40	16	16	100.0	9	HS
57	Sahbhagidhan	19	19	100.0	9	HS
58	Phalguni	19	18	94.7	9	HS
59	Reeta (CR Dhan 401)	23	20	86.9	9	HS
60	Luna Sampad (CR Dhan 402)	34	10	29.8	3	MR
61	Nua Chinikamini	35	35	100.0	9	HS
62	CR Dhan 501	26	20	76.9	9	HS
63	CR Dhan 701	28	26	92.8	9	HS
64	CR Dhan 601	25	25	100.0	9	HS
65	CR Dhan 500	22	21	95.4	9	HS
66	Satyabhama (CR Dhan 100)	29	29	100.0	9	HS
67	Pyari (CR Dhan 200)	22	21	95.4	9	HS
68	Hue (CR Dhan 301)	17	17	100.0	9	HS
69	Sumit (CR Dhan 404)	27	25	92.5	9	HS
70	Poorna Bhog (CR Basna Dhan 902)	14	14	100.0	9	HS
71	Jalamani (CR Dhan 503)	22	21	95.4	9	HS
72	Jayanti Dhan (CR Dhan 502)	29	27	93.1	9	HS
73	Luna Barial (CR Dhan 406)	28	28	100.0	9	HS
74	Luna Sankhi (CR Dhan 405)	20	17	85.0	9	HS
75	CR Sugandh Dhan 907	20	17	85.0	9	HS
76	CR Dhan 300	24	15	63.8	7	S
77	CR Dhan 303	22	18	89.0	9	HS
78	CR Dhan 305	20	17	85.0	9	HS
79	CR Dhan 304	28	19	67.8	7	S
80	CR Dhan 201	24	24	100.0	9	HS
81	CR Dhan 202	28	28	100.0	9	HS
82	CR Dhan 505	23	22	95.6	9	HS
83	CR Dhan 204	25	24	96.0	9	HS
84	CR Dhan 306 (IET 22084)	27	25	92.5	9	HS
85	CR Dhan 205 (IET 22737)	17	17	100.0	9	HS
86	CR Dhan 203 (Sachala)	21	20	95.2	9	HS
87	CR Dhan 206 (Gopinath)	23	22	95.6	9	HS
88	CR Dhan 307 (Maudamani)	29	15	75.8	9	HS
89	CR Dhan 408 (Chaka Akhi)	15	9	78.2	9	HS

MR - Moderately Resistant, S - Susceptible, HS - Highly Susceptible, TP - Total Plants, DP - Dead Plants



## ANNEXURE IX. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to gall midge.

Sl. No.	Variety	TP	SS	Percentage	Score	Resistance level
1	Ratna	15	15	100.0	9	HS
2	Saket-4	20	18	90.0	9	HS
3	Kalinga-I	20	8	40.0	7	HS
4	Kalinga-II	18	18	100.0	9	HS
5	Supriya	20	8	40.0	7	HS
6	Indira	25	8	32.0	7	HS
7	Samalei	18	0	0.0	0	HR
8	Sattari	22	20	90.9	9	HS
9	Savitri	15	8	53.3	9	HS
10	Khitish	18	17	94.4	9	HS
11	Kalinga-III	20	18	90.0	9	HS
12	Utkalprabha	15	10	66.6	9	HS
13	Neela	20	10	50.0	7	HS
14	Sarasa	22	6	27.2	7	HS
15	Udaya	16	8	50.0	7	HS
16	Annada	25	25	100.0	9	HS
17	Gayatri	25	25	100.0	9	HS
18	Heera	20	20	100.0	9	HS
19	Kalashree	20	18	90.0	9	HS
20	Kalyani-II	20	20	100.0	9	HS
21	Khira	15	12	80.0	9	HS
22	Moti	15	15	100.0	9	HS
23	Padmini	13	2	15.3	5	S
24	Panidhan	15	10	66.6	9	HS
25	Tara	20	20	100.0	9	HS
26	Tulasi	20	20	100.0	9	HS
27	Vanaprabha	20	15	75.0	9	HS
28	Shaktiman	12	4	33.3	7	HS
29	Lunishree	14	10	71.4	9	HS
30	Sneha	11	8	72.7	9	HS
31	Vandana	10	10	100.0	9	HS
32	Dhala Heera	20	20	100.0	9	HS
33	Radhi	18	8	44.4	7	HS
34	Tapaswini	18	8	44.4	7	HS
35	Pooja	18	10	55.5	9	HS
36	Sarala	20	18	90.0	9	HS
37	Durga	18	16	88.8	9	HS
38	Shatabdi	25	22	88.0	9	HS
39	Anjali	20	10	50.0	7	HS
40	Hazaridhan	15	15	100.0	9	HS
41	Sadabhar	13	10	76.9	9	HS
42	Abhishek	18	10	55.5	9	HS
43	Chandrama	20	6	30.0	7	HS
44	Virender	22	10	45.4	7	HS



Sl. No.	Variety	TP	SS	Percentage	Score	Resistance level
45	Geetanjali	22	10	45.4	7	HS
46	Ketekijoha	18	10	55.5	9	HS
47	Naveen	22	22	100.0	9	HS
48	Rajalaxmi (Hybrid)	22	20	90.9	9	HS
49	Ajay (Hybrid)	20	20	100.0	9	HS
50	Varshadhan	10	10	100.0	9	HS
51	Satya Krishna (CR Dhan 10)	15	13	86.6	9	HS
52	Nua kalajeera	18	6	33.3	7	HS
53	Nua Dhusara (CR Sugandh Dhan 3)	13	2	15.3	5	S
54	Chandan (CR Boro dhan 2)	20	8	40.0	7	HS
55	Hanseswari (CR Dhan 70)	22	8	36.3	7	HS
56	CR Dhan 40	18	6	33.3	7	HS
57	Sahbhagidhan	20	10	50.0	7	HS
58	Phalguni	15	7	46.6	7	HS
59	Reeta (CR Dhan 401)	20	20	100.0	9	HS
60	Luna Sampad (CR Dhan 402)	25	22	88.0	9	HS
61	Nua Chinikamini	12	12	100.0	9	HS
62	CR Dhan 501	25	6	24.0	7	HS
63	CR Dhan 701	20	20	100.0	9	HS
64	CR Dhan 601	18	10	55.5	9	HS
65	CR Dhan 500	20	10	50.0	7	HS
66	Satyabhama (CR Dhan 100)	18	18	100.0	9	HS
67	Pyari (CR Dhan 200)	17	17	100.0	9	HS
68	Hue (CR Dhan 301)	14	14	100.0	9	HS
69	Improved Lalat	20	10	50.0	7	HS
70	Improved Tapaswini	22	8	36.3	7	HS
71	Sumit (CR Dhan 404)	18	14	77.7	9	HS
72	Poorna Bhog (CR Basna Dhan 902)	20	10	50.0	7	HS
73	Jalamani (CR Dhan 503)	18	13	72.2	9	HS
74	Jayanti Dhan (CR Dhan 502)	26	4	15.3	5	S
75	Luna Barial (CR Dhan 406)	12	12	100.0	9	HS
76	Luna Sankhi (CR Dhan 405)	20	20	100.0	9	HS
77	CR Sugandh Dhan 907	18	10	55.5	9	HS
78	CR Dhan 300	20	2	10.0	3	HS
79	CR Dhan 303	22	22	100.0	9	HS
80	CR Dhan 305	14	6	42.8	7	HS
81	CR Dhan 304	25	25	100.0	9	HS
82	CR Dhan 201	14	10	71.4	9	HS
83	CR Dhan 202	6	2	33.3	7	HS
84	CR Dhan 505	18	15	83.3	9	HS
85	CR Dhan 204	14	9	64.2	9	HS
86	CR Dhan 306 (IET 22084)	25	7	28.0	7	HS
87	CR Dhan 205 (IET 22737)	8	8	100.0	9	HS
88	CR Dhan 203 (Sachala)	15	13	86.6	9	HS
89	CR Dhan 206 (Gopinath)	26	26	100.0	9	HS
90	CR Dhan 307 (Maudamani)	25	25	100.0	9	HS
91	CR Dhan 408 (Chaka Akhi)	20	8	40.0	7	HS

HR - Highly Resistant, S - Susceptible, HS - Highly Susceptible, TP - Total Plants, SS - Silver Shoots





## ANNEXURE X. Response of rice varieties released by ICAR-NRRI, Cuttack, Odisha to root-knot nematode.

Sl.No	Variety	Galls/root system	Gall index	Reaction
1	Kalinga	42.3	4	MS
2	Supriya	128.3	5	HS
3	Indira	136.3	5	HS
4	Sattari	103.6	5	HS
5	Savitri	102.0	5	HS
6	Khitish	32.3	4	S
7	Utkalprabha	105.3	5	HS
8	Neela	117.0	5	HS
9	Udaya	40.6	4	S
10	Annada	42.0	4	S
11	CR 1014	11.0	3	MS
12	Dharitri	12.6	3	MS
13	Gayatri	102.6	5	HS
14	Heera	148.3	5	HS
15	Kalashree	37.6	4	S
16	Kalyani-II	108.6	5	HS
17	Moti	113.6	5	HS
18	Padmini	49.3	4	S
19	Tulasi	22.0	3	MS
20	Vanaprabha	39.3	5	HS
21	Dhala Heera	56.0	4	S
22	Radhi	101.6	5	HS
23	Tapaswini	58.6	4	S
24	Pooja	118.3	5	HS
25	Sarala	18.3	3	MS
26	Durga	56.3	4	S
27	Shatabdi	50.0	4	S
28	Hazaridhan	45.0	4	S
29	Chandrama	47.0	4	S
30	Ketekijoha	24.3	3	MS
31	Naveen	41.6	4	S
32	Rajalaxmi (Hybrid)	35.3	4	S



Sl.No	Variety	Galls/root system	Gall index	Reaction
33	Ajay (Hybrid)	101.6	5	HS
34	Varshadhan	112.3	5	HS
35	Satya Krishna (CR Dhan 10)	62.0	4	S
36	Nua kalajeera	72.3	4	S
37	Nua Dhusara (CR Sugandh Dhan 3)	116.6	5	HS
38	Chandan (CR Boro dhan 2)	112.6	5	HS
39	Swarna Sub1	49.6	4	S
40	Phalguni	45.0	4	S
41	Reeta (CR Dhan 401)	7.0	2	MR
42	Luna Suvarna (CR Dhan 403)	35.6	4	S
43	Luna Sampad (CR Dhan 402)	39.3	4	S
44	CR Dhan 701	26.0	3	MS
45	CR Dhan 500	12.3	3	MS
46	Satyabhama (CR Dhan 100)	102.6	5	HS
47	Pyari (CR Dhan 200)	82.0	4	S
48	Sumit (CR Dhan 404)	26.6	3	MS
49	Jalamani (CR Dhan 503)	13.6	3	MS
50	CR Dhan 300	25.3	3	MS
51	CR Dhan 303	4.5	2	MR
52	CR Dhan 305	107.6	5	HS
53	CR Dhan 201	128.0	5	HS
54	CR Dhan 202	117.0	5	HS
55	CR Dhan 505	19.6	3	S
56	CR Dhan 204	36.3	4	S
57	CR Dhan 306 (IET 22084)	11.3	3	MS
58	CR Dhan 205 (IET 22737)	126.6	5	HS
59	CR Dhan 101 (Ankit)	23.6	3	MS
60	CR Dhan 206 (Gopinath)	37.0	4	S
61	CR Dhan 307 (Maudamani)	31.3	4	S
62	CR Dhan 408 (Chaka Akhi)	29.0	3	MS
63	CR Dhan 409 (Pradhan Dhan)	35.0	4	S
64	CR Dhan 507 (Prasant)	40.6	4	S
65	CR Dhan 508	32.6	4	S
66	CR Dhan 506	36.6	4	S

MR - Moderately Resistant, S - Susceptible, MS - Moderately Susceptible, HS - Highly Susceptible



## ANNEXURE XI. Glycemic index and resistant starch content of rice varieties released by ICAR-NRRI, Cuttack, Odisha.

Sl. No	Varieties	Glycemic index	Resistant starch (%)
1	Abhishek	70.3	0.8
2	Ajay	63.0	1.2
3	Anjali	63.3	1.3
4	Annada	68.5	0.6
5	Chakaakhi	65.7	0.8
6	Chandan	67.1	0.6
7	Chandrama	71.6	0.6
8	CR 1014	69.5	0.8
9	CR Dhan 101	63.2	1.1
10	CR Dhan 201	68.6	0.6
11	CR Dhan 202	67.9	0.7
12	CR Dhan 203	65.7	0.7
13	CR Dhan 204	66.1	0.6
14	CR Dhan 205	73.5	0.4
15	CR Dhan 300	66.7	0.7
16	CR Dhan 304	63.9	1.3
17	CR Dhan 305	61.8	1.3
18	CR Dhan 310	60.8	1.6
19	CR Dhan 311	59.5	1.5
20	CR Dhan 407	64.8	0.9
21	CR Dhan 500	61.4	1.2
22	CR Dhan 501	60.3	2.2
23	CR Dhan 505	59.6	1.5
24	CR Dhan 508	64.7	1.1
25	CR Dhan 601	63.8	0.7
26	CR Dhan 907	61.4	1.4
27	CR Dhan 908	62.9	1.3
28	CRHR-32	67.3	0.7
29	Dhala Heera	67.2	0.5
30	Dharitri	62.4	1.0



Sl. No	Varieties	Glycemic index	Resistant starch (%)
31	Gayatri	60.3	2.9
32	Geetanjali	63.9	1.0
33	Gopinath	61.6	1.4
34	Hanseswari	64.8	1.1
35	Hazaridhan	60.0	2.0
36	Heera	65.3	0.7
37	Hue	76.3	0.2
38	Indira	64.3	1.1
39	Jalamani	64.2	0.8
40	Jaya	66.8	0.7
41	Jayanti Dhan	59.7	2.4
42	Kalashree	59.1	2.7
43	Kalinga-I	67.2	0.6
44	Kalinga-II	70.7	0.6
45	Kalinga-III	62.8	1.3
46	Kamesh	63.3	1.1
47	Ketekijoha	62.1	1.0
48	Khira	66.5	0.7
49	Khitish	66.8	0.6
50	Lalat Mas	59.5	1.6
51	Luna Barial	70.1	0.6
52	Luna Sampad	63.2	1.1
53	Luna Sankhi	65.2	0.7
54	Luna Suvarna	69.5	0.7
55	Luni Shree	62.8	1.2
56	Maudamani	63.2	1.0
57	Moti	67.5	0.6
58	Neela	64.1	0.9
59	Nua Chinikamini	64.4	0.8
60	Nua Dhusara	59.7	1.8
61	Nua Kalajeera	61.7	1.7
62	Padmini	64.1	1.0



Sl. No	Varieties	Glycemic index	Resistant starch (%)
63	Panidhan	69.3	0.7
64	Phalguni	70.0	0.8
65	Pooja	66.7	0.8
66	Pradhan dhan	64.5	0.7
67	Pyari	70.1	0.5
68	Radhi	71.6	0.5
69	Rajalaxmi	62.2	0.9
70	Ratna	60.6	1.8
71	Reeta	62.9	1.1
72	Sadabahar	65.7	0.7
73	Sahbhagi Dhan	67.8	0.6
74	Saket-4	65.0	0.9
75	Samalei	69.3	0.7
76	Sarala	67.6	0.7
77	Sarasa	62.3	1.1
78	Satabdi	60.6	1.5
79	Sattari	62.4	1.1
80	Satyabhama	65.6	0.7
81	Satyakrishna	64.3	1.1
82	Savitri	58.7	1.9
83	Shaktiman	57.5	2.1
84	Sneha	62.8	1.1
85	Sonamani	62.4	1.3
86	Supriya	58.8	2.0
87	Swarna Sub-1	61.3	2.1
88	Tapaswini	62.4	1.5
89	Tulsi	61.4	1.4
90	Uday	63.1	0.8
91	Utkalprava	65.0	0.7
92	Vanaprava	72.5	0.5
93	Vandana	63.2	1.1
94	Varshadhan	63.5	0.8
95	Virendra	62.6	1.3



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