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High yielding varieties and their package of practices for Water logged ecologies of rice

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Water logged ecology is broadly classified into three groups. The 1st group is semi-deep water ecology comprises of lowland areas with standing water depth of upto 75 cm and remain water logged for about a month while in the 2nd group is deep water in which water depth goes up to one-meter and remains submerged for more than a month. The 3rd group is floating rice or very deep water ecology in which water depth is more than a meter and remains around a month. Water logging is simply the saturation of soil with water, either temporarily or permanently. When there is too much water in an area, the soil is unable to absorb the water thus cannot keep air between its particles. In our country, about 3.0 million hectare rice area is affected by water logging, mostly in the coastal region. The risk of frequent submergence due to flash floods and water logging makes the ecosystem less responsive to better management. In these areas, water accumulates to about 25-30 cm for substantial period of the crop growing season. Water logging at the early stages of crop growth suppresses tillering and increases plant mortality. Poor drainage in water logged areas leads to accumulation of toxic substance like iron toxicity, sulphide injury etc. and increase in incidence of pests and diseases. Rice is a crop that can flourish in flooded soils, whereas many other plants will die, so flooding of rice paddies is an important way to control weeds in rice fields. However, even rice plants can suffer yield loss or die if the water is too deep for a long time. By screening thousands of traditional landraces, several tolerant sources of different genetic background have been identified and several smart rice varieties suitable for deep and semi-deep water ecosystem are developed. The varieties released for water logged ecosystem are listed in the table.

Table. List of rice varieties for semi-deep and deep water ecologies

Name	Duration (day)	Average yield (t/ha)	Potential yield (t/ha)	Remarks
Semi-deep water				
Varshadhan	160	3.5-4.0	5.5	Grain-LB; Plant height–150 cm, stiff straw for water logging situation, MR-Neck blast, BB & ShR

CR Dhan 501	152	-	3.4	Resistant to neck blast
CR Dhan 506	165	3.8	4.4	Moderatly resistant to Sheath Blight, Sheath rot, brown Spot
CR Dhan 507 (Prasant)	160	5.6	4.75	Moderatly resistant to Brown Spot, Sheath Blight, Sheath Rot, Leaf Folder, Short Bold
CR Dhan 508	187	7.8	4.4	Moderatly resistant to Sheath Blight, Sheath Rot, Brown Spot
CR Dhan 510	160	5.88	4.6	Moderatly resistant to Leaf Folder, blast, Bacterial Leaf Blight, Stem Borer
CR Dhan 511	160	5.17	4.2	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
Sarala	150	-	4.75	Non-lodging,Photosensitive
CR Dhan 70 (Hanseswari)	150	-	3.0	Moderately resistant to Blast
Gayatri	155		4.0-6.0	Moderately resistant to Bacterial Leaf Blight, Blast & Gall Midge
Durga	155		4.3	Resistant to Rice Tungro Disease and suitable for late planting
Varshadhan	160	-	3.5-4.0	Moderately resistant to Neck blast, Bacterial Leaf Blight, Sheath Rot
Gayatri	155	-	4.0-6.0	Gain-SB; Semi dwarf (100 cm), MR- BLB, MR-Blast & GM
CR Dhan 409 (Pradhan Dhan)	160-165	7.55	4.7	Moderately resistant to Bacterial Leaf Blight,Bacterial Neck blast, Sheath Blight, Sheath Rot, Stem Borer, Leaf Folder
Deep water ecology				

CR Dhan 500	160	4.7	3.5	Moderately resistant to Blast, Neck blast, Brown spot, Gall Midge, Stem borer. Resistant to leaf folder
CR Dhan 502 (Jayantidhan)	160	4.7	4.6	Resistant Stem Borer, Leaf Folder,Moderatly resistant to Bacterial Leaf Blight, Neck blast, Sheath Blight, Sheath Rot, Rice Tungro Virus and Gall Midge
CR Dhan 503 (Jalamani)	160	6.3	4.6	Moderatly resistant to Leaf Folder, Bacterial Leaf Blight, Green Leaf Hopper, Neck blast, Brown Spot, Gall Midge, Short Bold
CR Dhan 505	162	6.1	4.5	Tolerance to submergence, blast, neck blast, sheath rot, sheath blight and rice tungro virus, stem borer (both dead heart and white ear heads), leaf folder, whorl maggot,

CR Dhan 500

The variety, CR Dhan 500 was released and notified for cultivation in the water logged areas of Odisha and UP. The variety is developed from the segregating materials of cross Ravana/Mahsuri. CR Dhan 500 was released from ICAR-National Rice Research Institute, Cuttack in the year 2011 by CVRC. The selection and evaluation work was carried out at ICAR-NatioalRice Research Institute, Cuttack, Odisha. CR Dhan 500 entered the co-ordinated testing programme under the name of IET 20220 and consistently out-performed the national, regional and local check varieties under National trials. Maturity duration of the variety is 155-160 days, tall plant type, possess moderate kneeing ability and elongation ability, suitable for deepwater/semi-deep lowland areas of region III of the country. It produces medium slender grain, 220-270 panicles/m^2 with 130-135 days to 50% floweirng, moderate tillering (6-10), more grains/panicle and compact panicle with test weight of 24 g. The variety possess good hulling, milling, white kernel, medium slender grain, no grain chalkiness and desirable alkali spreading value. Gel consistency of 37 mm, 25% of amylose content, alkali spreding value of 5.0, and milling recovery of 71% is observed in the variety. The variety is moderately resistant to leaf blast, neck blast, brown spot, gall midge biotype1 & 5, stem borer (dead heart & white ear head damage), whorl maggot and EHB attack while resistant to rice thrips and leaf folder attack.

DESCRIPTION OF THE VARIETY: CR Dhan 500 (IET 20220)

1.	Plant height	140-155 cm
2.	Plant type	Tall
3.	No. of tillers/plants	6-8
4.	No. of panicles/ m^2	222
5.	Flowering duration	135-140 days
6.	Panicle type	Compact panicle
7.	Panicle exertion	Well exerted
8.	Awning	No awn
9.	Apiculus colour	Straw
10.	1000 -grain weight	24 g
11.	Kernel length	5.64 mm
12.	Kernel breadth	2.14 mm
13.	L/B ratio	2.63 mm
14.	Grain type	MS
15.	Kernel appearance	White
16.	Milling recovery	71 %
17.	Alkali spreading value	5.0
18.	Amylose content	25%
19.	Gel consistency	37 mm

Fig. field view of CR Dhan 500 at flowering stage

Fig. Grains, panicles and kernels of CR Dhan 500

CR Dhan 501

The variety, CR Dhan 501 was released and notified for cultivation in the UP & Assam under semi-deep water Ecology. CR Dhan 501 was released from ICAR-National Rice Research Institute, Cuttack in the year 2010 by CVRC. The selection and evaluation work was carried out at ICAR-National Rice Research

Institute, Cuttack, Odisha. The variety, CR Dhan 501 (IET 19198; CR 2008-111) was developed from a cross Savitri/Padmini by pedigree method with the objective to breed high yielding variety for unfavorable shallow lowlands. This is a high yield variety for unfavorable lowland ecosystem with high seedling survival and tall plant type. It is a tall plant of about 132 cm with 79% seedling survival with a crop duration of 155 days, and non lodging genotype suitable for water logging semi-deepwater rice growing areas. It possesses long bold grain (6.62 mm), high panicles no./ m^2 (302) with 122-125 days to 50 % flowering, good tillering ability, long and dense panicle (28 cm) and test wt (24 g/1000 grain). It is moderately resistant to brown spot and resistant to neck blast. It has good adaptability characters like high seedling survival and submergence tolerance, kneeing ability with good phenotypic acceptability. The variety also high response to fertilizer comrade to check variety. CR Dhan 501 showed higher hulling (75%), milling (60%). The head rice recovery is 52% and intermediate amylose content (23.1%) and other desirable quality parameters for consumers preferences.

Characteristics of rice variety, CR Dhan 501

1.	Plant height	132 cm
2.	Plant type	Tall
3.	No. of tillers/plants	9-12
4.	No. of panicles/m^2	278-304
5.	Flowering duration	125-129 days
6.	Panicle type	Compact panicle
7.	Panicle exertion	Well exerted
8.	Awning	Awn less
9.	Apiculus colour	Straw
10.	1000 -grain weight	24 g
11.	Kernel length	6.62 mm
12.	Kernel breadth	2.31 mm
13.	L/B ratio	2.86
14.	Kernel appearance	White
15.	Hulling recovery	75 %
16.	Milling recovery	60 %
17.	Head - rice recovery	52 %
18.	Alkali value	4.76
19.	Amylose content	23.1%

Fig. Field view of rice variety, CR Dhan 501 at dough stage

Fig. Photographs showing kernels and grains of CR Dhan 501

CR Dhan 505

The variety CR Dhan 505 (IET 21719) was developed from the breeding materials of cross CRLC 899/AC.38606. CR Dhan 505 was released in the year 2014 by Central Variety Release Committee for the states of Odisha and Assam. Maturity duration of the variety is 160 days with average yield of 4.3t/ha. It showed increase over best inbred check in Odisha (31%) and Assam (40%) under water logged situation. The frequency in top position for grain yield across locations was higher in the variety compared to national, regional and local check varieties. The flowering duration of the proposed variety is 132-135 days and it produces long and heavy panicle with high test weight (31.6 gm). Kernel appearance is white with kernel length of 5.5 mm, kernel breadth of 2.01 mm and L/B ratio is 2.73. It is moderately resistant to leaf blast, neck blast, sheath rot, sheath blight, rice tungro virus, stem borer (both dead heart and white ear heads), leaf folder, whorl maggot GRH and rice thrips. The variety also response to higher dose of fertilizer application. CR Dhan 505 showed higher hulling, milling and head rice recovery and intermediate amylose content. It possesses intermediate amylose content (24.38%) and other desirable quality parameters for consumers preferences. The variery also possesses hulling recovery (80%), milling recovery (66.8%), head rice recovery (57.4%) and alkali value (6.0) for the variety CR Dhan 505.

DESCRIPTION OF THE VARIETY: CR2682-4-2-2-2-1 (IET 21719)

1.	Plant height	158 cm
2.	Plant type	Tall
3.	No. of tillers/plants	6-8
4.	No. of panicles/m^2	220
5.	Flowering duration	136 days
6.	Panicle type	Compact panicle

7.	Panicle exertion	Well exerted
8.	Awning	Awn less
9.	Apiculus colour	Normal
10.	1000-grain weight	31.6 g
11.	Kernel length	5.5 mm
12	Kernel breadth	2.01 mm
13.	L/B ratio	2.73
14.	Kernel appearance	White
15.	Hulling recovery	80 %
16.	Milling recovery	66.8 %
17.	Head - rice recovery	57.4 %
18.	Alkali value	6.0
19	Amylose content	24.38 %

Fig. Field view of rice variety, CR Dhan 505 at dough stage

Fig. Panicles of CR Dhan 505

Fig. Photographs showing kernels and grains of CR Dhan 505

CR Dhan 503 (Jalamani)

The variety CR Dhan 503 (IET 20214) (Jalamani) was developed from the segregating materials of cross between Panikekoa/Ambika. CR Dhan 503 was released in the year 2012 by State Variety Release Committee for the states of Odisha. It is identified as promising for deep water areas of Orissa and Uttar Pradesh under stress situations. The selection and evaluation work was carried out at ICAR-National Rice Research Institute, Cuttack, Odisha. The variety has consistently out-performed the national, regional and local check varieties in the national trials. CR Dhan 503 performed better yield advantage in Orissa over the local checks. The average yield of the culture under non-stress situation is 3.8 t/ha in region III of the country. Maturity duration of the culture is 155-160 days, tall plant type, possess moderate kneeing ability, phenotypic acceptibility and elongation ability, suitable for deepwater/ semi-deep areas of region III of the country. It produces plant height of 140 cm, medium slender grain, 220-270 panicles/m^2 with 132-135 days to 50% floweirng, moderate tillering (6-8), more grains/panicle, extra long panicle (27-28 cm) with test weight of 24 gm. Kernel appearance is white with Kernel length (5.65 mm), Kernel breadth (2.17 mm) and L/B ratio is 2.6. High milling (71%), head rice recovery (57%), intermediate amylose (22.86%), alkali spreding value (5.0) and gel consitancy (23 mm) was found in the variety CR Dhan 503. The line is moderately resistant to leaf folder, green leaf hopper, leaf blast, neck blast, brown spot, gall midge biotype 1 & 5, dead heart & white ear head damage of stem borer, whorl maggot, rice thrips and EHB attack. The genotype has high response to fertilizer application as compared to checks and qualifying vareities.

DESCRIPTION OF THE VARIETY: CR Dhan 503 (Jalamani)

1.	Plant height	140
2.	Plant type	Tall
3.	No. of tillers/plants	6-8
4.	No. of panicles/m^2	220-270
5.	Flowering duration	135-138 days
6.	Panicle type	Compact long panicle
7.	Panicle exertion	Well exerted
8.	Awning	Awn less
9.	Apiculus colour	Straw
10.	1000 -grain weight	24 g
11.	Kernel length	5.65 mm
12.	Kernel breadth	2.17 mm
13.	L/B ratio	2.6 mm
14.	Grain type	MS
15.	Kernel appearance	White
16.	Milling recovery	71 %

17.	Head - rice recovery	57 %
18.	Alkali spreading value	5.0
19.	Amylose content	22.86 %
20.	Gel consistency	23 mm

Fig. Photographs showing field view of CR Dhan 503

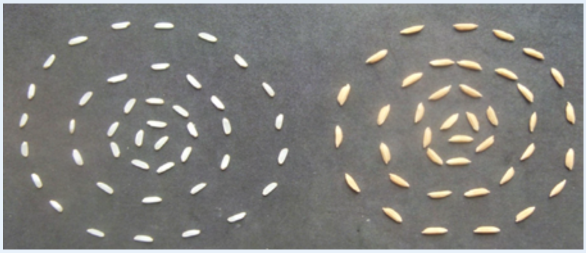

Fig. Kernels and grains of Jalamani (CR Dhan 503)

CR Dhan 502 (Jayanti Dhan)

CR Dhan 502 (Jayanti Dhan) (IET 20706) was released for the water logged area of odisha state by the SVRC, Odisha. CR Dhan 502 was developed from the cross between Samson Polo/Jalnidhi by adopting pedgree breeding method. The variety is identified as promising for the deep water areas of Odisha state under stress situations during 2011 AICRIP workshop. Maturity duration of the variety is 160-165 days, tall plant type, possess moderate kneeing ability and elongation ability, suitable for deepwater / semi-deepwater areas of Odisha state. It produces medium slender grain, 221 panicles/ m^2 with 135-138 days to 50% floweirng, moderate tillering (6-8), more grains/panicle and compact panicle with test weight of 22.5g. The variety is moderately resistant to leaf blast, neck blast, sheath bight, sheath rot, rice tungro virus and gall midge biotype1 while resistant to stem borer, leaf folder, rice thrips, whorl maggot and EHB. The variety possess good hulling, milling,white kernel, medium slender grain, no grain chalkiness and desirable alkali spreading value.The elite variety possesses adaptive traits like good kneeing abiity, elongation abiity, tolerance to major diseases and pests for deep water ecoogy. Medium slender grain, high milling (66.5%), head rice recovery, intermediate amylose (24.2%), alkali spreding value (5.0) and soft gel consitancy(24.0) was observed in the grains of variety, CR Dhan 502.

DESCRIPTION OF THE VARIETY: CR Dhan 502 (Jayanti Dhan)

1.	Plant height	160-170 cm
2.	Plant type	Tall
3.	No. of tillers/plants	6-8
4.	No. of panicles/m^2	221

5.	Flowering duration	135-140 days
6.	Panicle type	Compact panicle
7.	Panicle exertion	Well exerted
8.	Awning	No awn
9.	Apiculus colour	Straw
10.	1000 -grain weight	22.5 g
11.	Kernel length	5.62 mm
12.	Kernel breadth	1.96 mm
13.	L/B ratio	2.86 mm
14.	Grain type	MS
15.	Kernel appearance	White
16.	Milling recovery	66.5%
17.	Alkali spreading value	5.0
18.	Amylose content	24.2%
19.	Gel consistency 160-170cm	24.0 mm

Fig. Photographs showing field view of CR Dhan 502

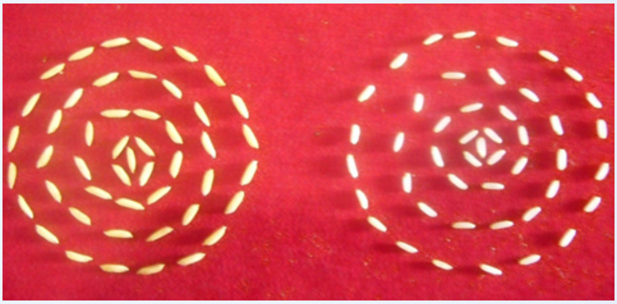

Fig. Photographs showing grains and kernels of CR Dhan 502

CR Dhan 506

The variety, CR Dhan 506 (IET 23053) was released for the semi-deep water ecology of Assam, Andhra Pradesh and Karnataka states. The variety was developed from the breeding materials of cross CRLC899/Warda2. CR Dhan 506 was released in the year 2017 by Central Variety Release Committee for the water logged ecology. Selection, evaluation and testing was done at the National Rice Research Institute, Cuttack, Odisha with the objective to breed high yielding variety with tolerance to major diseases and insects for semi-deep condition. CR Dhan 506 (IET 23053) entered the co-ordinated testing programme under the name of IET 23053 during WS 2012 under NSDWSN. It has consistently out-performed the check varieties. The varity has been identified by VIC during 51st Annual Rice Research Group Meeting, 2016. The variety is strongly photosensitive with average maturity duration of 160 days. It possesses long bold grain with a long heavy panicle having moderate test weight (23g). The variety is 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. CR Dhan 506 showed good hulling, milling and head rice recovery compared to check and qualifying varieties. It possesses 4.0 alkali spreading value, intermediate amylose content, long bold grain and other desirable grain quality parameters.

Morphologic and quality traits of CR Dhan 506

1.	Flowering	135-139 days
2.	Maturity duration	160 days
3.	1000-grain weight (g)	23.3
4.	Lodging	Non-lodging
5.	Panicle type	Intermediate
6.	Panicle exertion	Well exserted
7.	Hulling	80.45%
8.	Milling	69.9%
9.	Head Rice Recovery	63.9%
10.	Kernel Length	6.25 mm
11.	Kernel Breadth	2.29 mm
12.	L/B Ratio	2.73
13.	Grain type	LB
14.	Grain Chalkiness	VOC
15.	Alkali Spreading Value	4.0
16.	Amylose Content	24.75%
17.	Gel Consistency	46 mm

Fig. Photographs showing field view of CR Dhan 506

Fig. Photographs showing panicles of CR Dhan 506

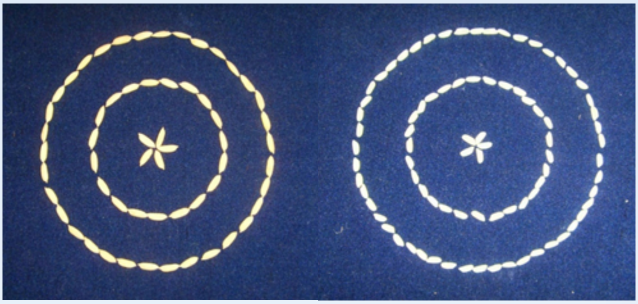

Fig. Photographs showing grains and kernels of CR Dhan 506

CR Dhan 409 (Pradhan Dhan)

CR Dhan 409 (Pradhan Dhan) is very good grain type rice variety for the shallow lowland ecology. The variety was released by the SVRC, Odisha during the year, 2016. The average yield of the variety in Odisha is around 5 t/ha. Maturity duration of the variety is 160-165 days with semi-tall plant type (130-140 cm). Maturity duration of the variety is 160-165 days with semi-tall plant type (130-135cm). It possesses long slender grain, more panicles per m2 (250-300) with 135-140 days to 50% flowering, high tillering (12-15), medium and dense panicle with moderate test weight (22.5g). It is moderately resistant to leaf blast, neck blast, sheath blight, sheath rot, stem borer (both dead heart and white ear heads) and leaf folder. CR Dhan 409 has good hulling, milling and head rice recovery. It possesses intermediate amylose content, long slender grain and other desirable grain quality parameters. The base of the plant is purple in colour and hence suitable for separating weeds from rice seedlings in direct seeded plot. CR Dhan 409 is suitable for puffed rice, puffed paddy, beaten rice, wet rice preparations and fried rice also.

Morphologic and quality traits of CR Dhan 409

1.	Plant height	125-145 cm
2.	Flowering	132-136 days
3.	Maturity duration	160-163 days
4.	1000-grain weight (g)	23.5
5.	Lodging	Non-lodging
6.	Panicle type	Intermediate
7.	Panicle exertion	Well exserted
8.	Hulling	80.0%
9.	Milling	71.4%
10.	Head Rice Recovery	69.9%

11.	Kernel Length	6.32 mm
12.	Kernel Breadth	2.3 mm
13.	L/B Ratio	2.74
14.	Grain type	LS
15.	Grain Chalkiness	A
16.	Alkali Spreading Value	4.0
17.	Amylose Content	26.12%
18.	Gel Consistency	23 mm

Fig. Field view of rice variety, CR Dhan 409 (Pradhan dhan) at dough stage of the crop

Fig. Panicles of rice rice pradhan dhan

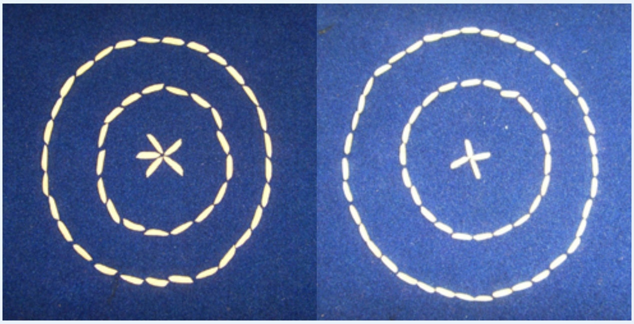

Fig. Kernels and grains of rice variety Pradhan dhan (CR Dhan 409)

Varshadhan (CRLC 899)

It is a late maturing (160 days), tall (150 cm), non-lodging and photosensitive popular variety with stiff straw. It was released in 2005 by SVRC, Odisha for semi-deep water ecology in the state. The variety was notified during 2006 for cultivation in the low land areas of Odisha state. It has long bold grains with average productivity of 4.0 t/ha. It is tolerant to neck blast, bacterial leaf blight, shealth rot and white backed plant hopper. It can tolerate prolonged water logging up to depth of 75 cm.

Gayatri (CR 210-1018)

It is a late duration (160 days), semi tall (110 cm) photosensitive popular variety, released and notified (1988) for cultivation in low land of state Odisha, West Bengal and Bihar. It has short bold good cooking quality grains with average productivity of 5.0 t/ha. It has field tolerance against major diseases and pests. It has significant extent of grain dormancy, can tolerate up to 50 cm water stagnation and suitable for delayed transplanting.

CR Dhan 507 (Prasant)

The variety, CR Dhan 507 (Prasant) was released for water logged rice areas of Odisha. The variety was developed from the breeding materials of cross Gayatri/Sudhir//Varshadhanat ICAR- National Rice Research Institute, Cuttack.CR Dhan 507 was released in the year 2016 by State Variety Release Committee, Odisha. The variety consistently out-performed the check varieties under national trials. The variety has exhibited stability for yield and other characters in the states of Odisha. The mean yield in Odisha was observed to be 4751kg/ha. The variety is strongly photosensitive with average maturity duration of 160 days. It possesses short bold grain with a long heavy panicle having moderate test weight (25 g). CR Dhan 507 is moderately resistant to neck blast, brown spot, sheath blight, sheath rot, stem borer (both dead heart and white ear heads), leaf folder and whorl maggot. The variety showed high response to the applied nitrogen, The variety produced good hulling, milling, head rice recovery and alkali spreding value (6.5) compared to check varieties. It possesses intermediate amylose content, medium slender grain and other desirable grain quality parameters.

Morphologic and quality traits of CR Dhan 507

1.	Plant height	135-150 cm
2.	Flowering	132-136 days
3.	Maturity duration	160-162 days
4.	1000-grain weight (g)	24.5
5.	Lodging	Non-lodging
6.	Panicle type	Heavy & compact
7.	Panicle exertion	Well exserted
8.	Hulling	76.3%
9.	Milling	63.9%
10.	Head Rice Recovery	58.5%
11.	Kernel Length	5.75 mm
12.	Kernel Breadth	2.1 mm
13.	L/B Ratio	2.73
14.	Grain type	MS
15.	Grain Chalkiness	VOC
16.	Alkali Spreading Value	6.5
17.	Amylose Content	22.79%
18.	Gel Consistency	22.5 mm

Fig. Photographs showing field view of CR Dhan 507

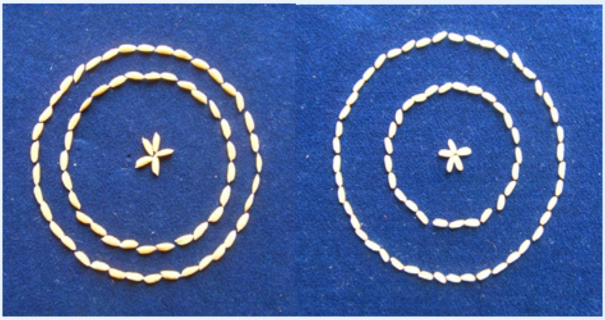

Fig. Photographs showing grains and kernels of CR Dhan 507

CR Dhan 508

The variety, CR Dhan 508 (IET 23601) was recommended by CVRC for release in the year 2017 for the water logged rice areas of Assam, Odisha and West Bengal. The variety was developed from the breeding materials of cross CRLC899/ AC.38700 by pedigree method. The mean yield in Assam, West Bengal and Odisha were 3.4 t/ha, 6.4t/ha and 3.6 t/ha, respectively. Maturity duration of the variety is 160-165 days and days to 50% flowering is 132-136 days. The plant height is found to be 130-150cm. The variety produces short bold grain, with heavy panicle with high test weight (28g). The variety is moderately resistant to neck blast, brown spot and sheath rot, stem borer (both dead heart and white ear heads), leaf folder and whorl maggot. CR Dhan 508 was found to response higher dose of fertilizer application. CR Dhan508 showed good hulling, milling, alkali spreding value (4.5) and head rice recovery as compared to check varieties. It possesses intermediate amylose content, short bold grain and other desirable grain quality parameters.

Morphologic and quality traits of CR Dhan 508

1.	Plant height	135-150 cm
2.	Flowering	135-138 days
3.	Maturity duration	160-165 days
4.	1000-grain weight (g)	27.8
5.	Lodging	Non-lodging
6.	Panicle type	Heavy & compact
7.	Panicle exertion	Well exserted
8.	Hulling	69.8%
9.	Milling	64.6%
10.	Head Rice Recovery	6.33%
11.	Kernel Length	2.27 mm
12.	Kernel Breadth	2.79 mm
13.	L/B Ratio	22.28
14.	Grain type	LB
15.	Grain Chalkiness	A
16.	Alkali Spreading Value	4.5
17.	Amylose Content	22.28%
18.	Gel Consistency	24.0 mm

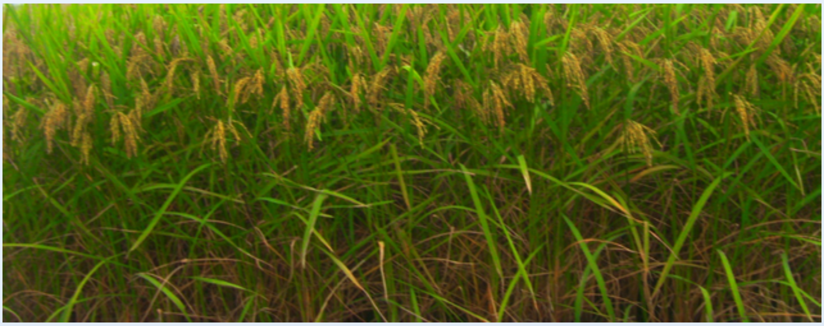

Fig. Photographs showing field view of CR Dhan 508

Fig. Photographs showing panicles of CR Dhan 508

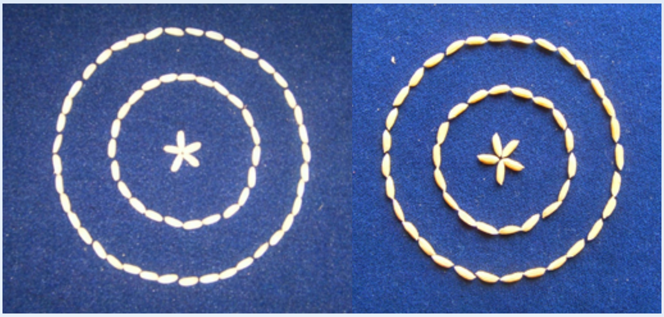

Fig. Photographs showing grains and kernels of CR Dhan 508

CR Dhan 510

The variety CR Dhan 510 (IET 23895) was developed from the breeding materials of cross of Sarala/Varshadhan/CRMAS 2232-85. CR Dhan510 was released in the year 2019 recommended by Central Variety Release Committee for the states of West Bengal and Odisha. Selection, evaluation and testing was done at the ICAR-National Rice Research Institute, Cuttack, Odisha with objectives of tolerance to water logging, major pests and diseases suitable for semi-deep water ecology. CR Dhan 510 (IET 23895) entered the coordinated testing programme under the name of IET 23895 during wet season, 2013 under NSDWSN. It has consistently out-performed the check varieties. The variety has exhibited stability for yield and other characters for the states of West Bengal, Odisha, Andhra Pradesh and Karnataka. The genotype is strongly photosensitive with average maturity duration of 160-165 days. Tall, erect plant type and possesses short bold grain with a long heavy panicle having moderate test weight (23.9g). The variety is moderately resistant to leaf blast, neck blast, bacterial blight, stem borer (both dead heart and white ear heads) and leaf folder. The variety showed higher respose to higher dose of fertilizer application. CR Dhan 510 has good hulling, milling and head rice recovery compared to check varieties. It possesses intermediate amylose content, short bold grain and other desirable grain quality parameters.

Morphologic and quality traits of CR Dhan 510

1.	Plant height	120-140 cm
2.	Flowering	135-138 days
3.	Maturity duration	160-165 days
4	1000-grain weight (g)	23.9
5.	Lodging	Non-lodging
6.	Panicle type	Intermediate

7.	Panicle exertion	Well exserted
8.	Hulling	79.85%
9.	Milling	70.95%
10.	Head Rice Recovery	66.6%
11.	Kernel Length	5.355 mm
12.	Kernel Breadth	2.25 mm
13.	L/B Ratio	2.375
14.	Grain type	SB
15.	Grain Chalkiness	VOC/OC
16.	Alkali Spreading Value	4.5
17.	Amylose Content	23.17%
18.	Gel Consistency	33 mm

Fig. Photograph showing field view of the variety CR Dhan 510

Fig. Photographs showing panicles, grain and kernels of the variety CR Dhan 510

CR Dhan 511

The variety, CR Dhan 511 (IET 23906) was released in the year 2019 from Central Variety Research Committee for the states of West Bengal and Andhra Pradesh. The variety was developed from the breeding materials of cross Gayatri/Mahsuri/CR 997. Selection, evaluation and testing of the variety, CR

Dhan 511 was done at the National Rice Research Institute, Cuttack, Odisha with the objective to breed high yielding variety with tolerance to major diseases and insects for the semi-deep condition. CR Dhan 511 (IET 23906) entered the co-ordinated testing programme under the name of IET 23906 during wet season 2013 under NSDWSN. The variety consistently out-performed the check varieties. CR Dhan 511 exhibited stability for yield and other characters for the states of West Bengal and Andhra Prasesh. The mean yield in West Bengal and Andhra Pradesh were 4.73 t/ha, and 3.76 t/ha, respectively. The variety is strongly photosensitive with average maturity duration of 160-162 days. It possesses short bold grain with a long heavy panicle having moderate test weight (21.8g). It has purple pigmented leaf sheath and apiculus colour which is good for weeding purposes. The variety is moderately resistant to leaf blast, neck blast, bacterial blight, stem borer (both dead heart and white ear heads) and leaf folder. The showed higher response to higher dose of fertilizer application. CR Dhan 511 has good hulling, milling and head rice recovery as compared to check and qualifying varieties. It possesses intermediate amylose content, short bold grain and other desirable grain quality parameters.

Morphologic and quality traits of CR Dhan 511

1.	Plant height	125-145 cm
2.	Flowering	131-137 days
3.	Maturity duration	160-165 days
4.	1000-grain weight (g)	21.7 g
5.	Lodging	Non-lodging
6.	Panicle type	Intermediate
7.	Panicle exertion	Well exserted
8.	Hulling	77.85%
9.	Milling	67.2%
10.	Head Rice Recovery	54.7%
11.	Kernel Length	5.09 mm
12.	Kernel Breadth	2.385 mm
13.	L/B Ratio	2.13
14.	Grain type	SB
15.	Grain Chalkiness	VOC
16.	Alkali Spreading Value	4.5
17.	Amylose Content	25.65%
18.	Gel Consistency	44.5 mm

Fig. Photographs showing field view of the variety CR Dhan 511

Fig. Photographs showing field view of the variety CR Dhan 511

Package of practices for water logged ecologies

S. No.	Particulars	Details
1.	Suitability of the variety for the area-agro- climatic zone	Select the suitable variety recommended for the area-agro- climatic zone
2.	Selection of field/land preparation practices.	Plough the land immediately after the harvest of wet season rice, preferably with a mould board plough. One or two summer ploughings after pre-monsoon rain during April-May and ploughing before sowing makes the soil to a fine tilth.
4.	Sowing time	The optimum time of sowing is from last week of May to first week of June. Sowing should be done after receiving pre-monsoon rain for proper plant stand establishment before accumulation of water in the semi-deep and deep water rice fields.

5.	Seed rate/sowing method-line sowing with row to row and plant to plant distance/ direct sowing.	Use 50-60 kg seeds/ha.Treat the seeds with Agrosan GN or Ceresan (dry) or Bavistin at the rate of 2gm/ Kg of seed before sowing.
6.	Fertilizer doses with timing per acre	Apply N: P: K @ 40:20:20 kg/ha in case of poor soil fertility status (based on soil test results). Apply half N, full P and three fourths K as basal in the furrows in the line sown rice with farm yard manure at the rate of 5t/ha. Apply 10 kg of N as top dressing at beushening in broadcast rice and after weeding on line sown rice and the rest N and K fertilizers at panicle initiation stage, if water recedes.
7.	Weed control- chemicals with doses & timing	Before accumulation of rain water, the beushening and weeding operations are to be completed which is around 45-60 days after seeding. Spray herbicide bispyribac sodium at the rate of 30g a.i/ha in direct seeded rice for control of major grasses, sedges and broad leaf weeds. This is a post-emergence herbicide and it can be applied after 12 days of sowing.
8.	Disease and pest control- chemicals with doses & timing	Apply Streptocyclin (150mg) + Copper Oxychloride (1g) in one litre of water for controlling bacterial leaf blight disease. For controlling sheath rot disease, soak the seeds in 0.05%-0.1% Bavistin for 30 minutes before sowing. After raising the crop, minimize the disease by foliar spray of 0.05%-0.1% Bavistin or 0.4% Dithane M-45 or 0.1% Hinosan. For controlling the insect attack, spray is not feasible due to deepwater situation. Use of bio- control method is preferable. Release of *Trichogramma japonica*, an egg parasite at the rate of 50,000 numbers/ha is recommended for control of the pest. If water level reduces apply Monocrotophos at the rate of 0.5Kg a.i/ha or apply granular insecticides Carbofuran 3G at the rate of 33 Kg/ha or Cartap 4G at the rate of 25 Kg/ha on the basis of ETL (One egg mass/ m^2 or 5% dead heart)
9.	Irrigation schedule	Rainfed crop
10.	Harvesting	Harvest the crop at 25-30 days after flowering. Thresh immediately after harvesting and dry gradually under shed up to 12% moisture content for seed purpose and up to 14% moisture for milling.

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