

CR Dhan 412

(NICRA Dhan: Luna Ambiki)

High yielding rice variety for coastal saline areas

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Salinity followed by stagnant flooding is a major bottleneck for improving productivity of rice in coastal ecology. Around 4 lakh ha area distributed in seven coastal districts of Odisha is affected by salinity due to tidal inundation. Tall *indica* varieties with salinity and stagnant flooding tolerance such as Patnai 23, SR 26B, Rahaspunjar and improved varieties such as Lunishree, Luna Suvarna are grown in this rainfed lowland areas. But there is immense scope for introducing varieties with higher yield potentiality for this ecosystem. IET 27852 (CR 2851-S-1-6-2B-4-1), a derivative of the cross, Gayatri / SR 26B was developed through bulk-pedigree method of breeding at ICAR-NRRI, Cuttack. In IVT and AVT-1-CSTVT trials in 2018 and 2019, respectively, IET 27852 performed well at zonal level (eastern zone- zone III) with 3063 kg/ha, 4878 kg/ha and 3970 kg/ha grain yield under salinity stress ($EC=3.5-7.57\text{ dSm}^{-1}$), under non-stress and over the location, respectively. The mean grain yield of this entry exceeded all checks including coastal saline national check, Bhuthnath in all the situations. It was found tolerant to moderately tolerant to salinity stress at seedling and reproductive stages at EC level up to $6-7\text{ dSm}^{-1}$ as reported at national testing. It was also found moderately tolerant to stagnant flooding. **Finally, IET 27852 has been released and notified in 2021 for cultivation in *kharif* (wet) season at coastal saline areas in Odisha as CR Dhan 412 (NICRA Dhan : Luna Ambiki).**

With an average grain yield of 4380 kg/ha, it showed yield superiority over the varieties released in recent past for coastal saline ecology such as Luna Suvarna and Luna Barial and other local checks in the national and state multi-locational testing at various level of salinity stress ($EC=2.2-7.2\text{ dSm}^{-1}$) in coastal saline ecosystem in Odisha. CR Dhan 412 (IET 27852) at national level was found moderately tolerant to neck blast and sheath rot and moderately resistant against stem borer and leaf folder. In Odisha, it was found tolerant to bacterial leaf blight, moderately tolerant to sheath rot, moderately resistant to stem borer and resistant to leaf folder. This variety has acceptable head rice recovery (57.4%) and good cooking quality with 26% amylose content coupled with soft GC (45). This is late duration (140 days) with semi-dwarf, compact plant type and has good initial growth and tillering ability. Due to its salinity and stagnant flooding tolerance, non-lodging plant type and yield advantages over the existing recommended varieties it is accepted by growers in coastal saline areas of Odisha. Acceptable grain type with good milling and cooking quality also supports its acceptability by millers and consumers.



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Table 1. Parentage and important features of rice variety CR Dhan 412

Sl. No.	Parameters	Characteristics
1	Parentage	Gayatri / SR 26B
2	Plant height (mean)	115 cm
3	Distinguishing morphological characters	Semi dwarf, non-lodging, compact plant type, erect flag leaf, well exerted long dense panicle with medium slender grain and white kernel
4	Maturity (range in number of days) (from seed to seed)	140 days (135-145 days)
5	1000 grain weight	23.5 g
6	Recommended ecology	Rainfed coastal areas of Odisha in <i>kharif</i> season
7	Recommended fertilizer dose	N:P:K::80:40:40, green manuring with Dhaincha
8	Tolerance to abiotic stress	Tolerant to moderately tolerant to salinity stresses at seedling and reproductive stages at EC level upto 6-7 dSm ⁻¹ at national testing.
9	Average attainable yield levels	4380 kg/ha

Table2. Physicochemical properties of rice variety CR Dhan 412

Sl. No.	Parameters	Characteristics
1	Hulling (%)	77.6
2	Milling (%)	67.4
3	HRR (%)	57.4
4	Kernel length (mm)	5.8
5	Kernel Breadth (mm)	2.14
6	L/B ratio	2.71
7	Grain type	Medium slender
8	Grain Chalkiness	Occasionally Chalky
9	Alkali spreading value (ASV)	5
10	Amylose Content (%)	26
11	Gel Consistency (mm)	45

RECOMMENDED CULTURAL PRACTICES

Suitable ecology/land condition

- Suitable for Odisha in coastal saline soil condition during wet (*Kharif*) season.

Land preparation

- Leaving the land fallow during dry season aggravates the problem of salinity. So, if feasible, a second crop should be raised after the harvest of wet season rice.
- Initial ploughing after the harvest of wet season rice, followed by summer ploughing after the first pre-monsoon shower, helps reduce the salt accumulation in surface soil.
- Final land preparation should be done by puddling twice at 7-10 days interval followed by laddering after the accumulation of adequate rainwater.
- Proper land levelling and bunding is important for effective leaching of soluble salts.

Seed selection and treatment

- If farmers grown their own seed, proper roughing should be done by removing off-type plants and disease-free crop needs to be selected for seed purpose.
- Seed should be properly cleaned, dried and stored in airtight containers.
- Before sowing, seed should be dipped in 2% salt solution to remove the floating materials, partially filled grains and weed seeds.
- For *dry* sowing: Treat the seed with Carben-dazim (Bavistin) @2.0 g/kg of seed and sow the seeds under raised seed bed in the first fortnight of June.
- For *wet* sowing: Soak the seed for 8-10 hours in a solution prepared by dissolving 1.5 g Tetracycline and 20 g Captan in 20 litres of water, which is sufficient for 10 kg of seed, and then drain the water.
- 30-35 kg seed is required for transplanting one-hectare land.

Seed-bed preparation

- Seedling should be raised in less saline fields as far as possible. Nursery area of 1000 m² is required for transplanting one hectare of land.
- Farmers may prefer dry or wet nursery as per their convenience.

Dry nursery

- Land with higher elevation should be selected for dry nursery.
- Field should be ploughed twice during April-May after the pre-monsoon showers. Use rotavator after two ploughings for obtaining fine tilth and level the field properly.
- Seedbeds of about 1.0 metre width, 10-15 cm height and convenient length are to be prepared, leaving 40 cm wide channel between two beds.
- Seed should be sown during the first fortnight of June using a seed rate of 40-50 gm per square metre. A fertilizer dose of 10 kg each of N, P₂ O₅ and K₂O ha⁻¹ is recommended along with FYM/compost at 50 quintals ha⁻¹.

- Raised seedbed technique should be practiced in fields with high soil salinity where seed beds of 20-30 cm height are prepared with small bunds at the top on all sides for holding rainwater that will facilitate leaching of salts. Seeds are to be sown after 2-3 showers during first fortnight of June. It will also help to protect seedlings from damage due to sudden water-logging.

Wet nursery

- Field should be ploughed twice during late May to early June. Puddling should be done twice at 7-10 days interval after accumulation of rainwater in the field during middle of June. Standing water in the field between two puddlings will facilitate leaching of soluble salt as well as decomposition of weeds.
- The plot may be divided into sub-plots of 1.0 metre width with convenient length with drainage channels between two beds. The field should be well-leveled and banded to facilitate water retention.
- Incorporation of well decomposed FYM or *Azolla* compost at 50 quintals ha⁻¹ during the land preparation along with 10 kg each of N, 20 kg P₂O₅ and K₂O ha⁻¹ are recommended for robust and healthy seedlings.
- Keep the seeds in the warm place for 24 hours to sprout before sowing. While sowing apply well rotten compost @ 5 t/ha and 10 kg/ha each of N, P₂O₅ & K₂O for healthy and robust seedlings.

Crop establishment

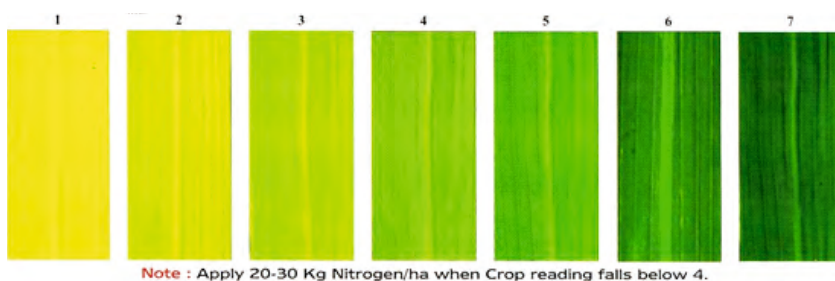
- Early transplanting during second fortnight of July using 40-days old seedlings at 15 x 15 cm spacing is recommended for shallow lowlands. In intermediate lowlands, transplanting by the end of July using 50-days old seedlings at a closer spacing of 15 x 10 cm ensures better crop establishment.
- Delay in transplanting significantly reduces crop yield due to poor crop establishment under higher water depths and occasional submergence.
- In general, 2-3 seedlings per hill are planted. If required, gap filling should be done within 10-12 days after transplanting.

Nutrient management

- Application of 80 kg of nitrogen along with phosphorus and potassium fertilizers at 40 kg ha⁻¹ is recommended. 'N' should be applied in three splits, half as basal 7-10 days after transplanting and one-fourth each at active tillering and panicle initiation stages.
- However, integrated nutrient management by combining chemical fertilizers with organic manures is important for improving and sustaining the crop productivity in saline soil.
- In shallow lowlands, *Sesbania* green manuring followed by urea topdressing at 20 kg of nitrogen ha⁻¹ at panicle initiation stage is recommended.
- In lowlands where chances of rain water accumulation is less, *Azolla* dual cropping along with urea application at 20 and 12 kg of nitrogen ha⁻¹ as basal before transplanting and at active tillering, respectively, is as effective as the recommended dose of 80 kg of N ha⁻¹ through chemical fertilizer. In case of *Azolla* dual cropping, 10-15 kg of phosphate ha⁻¹ through single superphosphate

should be applied in three equal splits at weekly intervals starting from the day of *Azolla* inoculation.

- In intermediate lowlands, *Sesbania* green manuring or application of FYM at 50 quintals ha^{-1} + 20 kg N ha^{-1} as basal has been found promising.
- Phosphorus and potassium fertilizers at 40 kg ha^{-1} of phosphate (P_2O_5) and potash (K_2O) are recommended. In case of *Azolla* dual cropping, the phosphorus fertilizer used for growing *Azolla* is a part of that recommended for rice. The rest of phosphorus along with $2/3^{\text{rd}}$ of potassium should be applied at the time of final puddling and the remaining $1/3^{\text{rd}}$ potassium should be given along with nitrogen during final top dressing.
- In case of *Sesbania* green manuring, seeds are to be sown at 25 kg ha^{-1} in the last week of May or early June and 40-45 days old *Sesbania* plants are to be incorporated into the soil during puddling.
- For *Azolla* dual cropping, *Azolla* can be multiplied in small ponds or ditches and fresh *Azolla* at 1 t ha^{-1} are to be applied in rice field one week after transplanting.
- Farmers can also use 'Leaf Colour Chart (LCC)-based nitrogen application technique' for increased N-use efficiency



Weed management

- There is very little scope to use herbicides for controlling weeds in intermediate lowlands due to presence of standing water at varying depth during early stage. However, in rainfed shallow lowlands where standing water can be drained out during early crop stage, post-emergent herbicides can be applied for weed control.
- In the stagnant water, manual weeding once at 30 - 35 days after transplanting controls the weeds effectively, but it involves huge labour cost.
- Chemical control by using low-dose herbicide with broad spectrum weed control is least expensive. But, the herbicides are most effective only when there is a thin layer of water in rice field during application time.
- Spraying of Pyrazosulfuron ethyl at 20 g a.i. ha^{-1} (Saathi at 200 g ha^{-1}) within 2-3 days of sowing is recommended for suppressing weed in nursery bed.
- In very low infested areas, spray Bispyribac-sodium at 25-30 g ha^{-1} (Nominee gold at 250-300 ml ha^{-1}) 12-15 days after transplanting (DAT) i.e., at 2-3 leaf stage in areas where weed infestation is relatively less to suppress early emergent grasses and sedges.

- In relatively moderate to high weed infestation, spray herbicide mixtures viz., Fenoxaprop-p-ethyl + Ethoxysulfuronat 50+15 g ha⁻¹ (tank-mix rice star + sunrise at 700+120 ml ha⁻¹) or Ready-mix Triflome + Ethoxysulfuronat 45+22.5 g ha⁻¹ (Council Active at 225 ml ha⁻¹) 15-18 DAT or Bensulfuron-methyl + Pretilachlorat 60 + 600 g ha⁻¹ (Erase strong at 10 kg ha⁻¹) at 3-7 DAT for broad spectrum weed control in rice field with mixed population of weeds
- The alternative way for effective control of the early emergent grasses as well as late emergent broad-leaved and aquatic weeds in coastal lowlands is by spraying bispyribac-sodium at 10-12 DAT followed by mechanical weed control by operating power weeder at 30-35 DAT. Under this management option, crop should be established at 25 cm apart rows. Spraying should be done in the presence of thin film of water after draining out excess water from the field. The recommended dose of herbicides should be mixed in 350 litres of water for application in one hectare of land. In case of sand-mix application, mix with 30 kg sand for application in one hectare of land.

Control of insect pests and diseases

- **Stemborer** is the most important insect pest in this ecosystem. Generally, the peak period of its brood emergence is September-October. In the endemic areas, install light trap @ 1 trap / ha or pheromone traps @ 8 traps/ha for pest monitoring and 20 traps/ha for direct control through mass trapping. Apply Fipronil 0.3 G @ 33 kg/ha in nursery at 5 to 7 days before uprooting the seedlings. Apply Chlorantraniliprole 0.4G @ 10kg/ ha or Imidacloprid 0.3 G @15kg/ha or Cartap 4G @ 25 kg/ha or Fipronil 0.3 G @ 25 kg/ha in the main field after 20-25 DAT.
- **Brown Plant hopper** is another major insect pest of rice which suck the cell sap and show the “hopper burn” symptom. To manage this, do alternate wetting and drying the field, if possible. Prepare alley at 6ft interval to facilitate the exposure of sunlight to the basal portion of the plant and facilitate spraying operation. Spray Triflumezopyrim 10SC@ 5 ml/10 lit, Pymetrozine 50 WG @ 6 g/10 lit or Flonicamide 50WG @ 3 g/10 lit or Dinotofuran 20SG@ 3 g/10 lit or Clothianidin 50WDG @ 0.4 g/10 lit or Imidacloprid 17.8 SL @ 2.5 ml/10 lit or Thiamethoxam 25WG @ 2 g/10 lit.
- For management of leaf folder, spray Chlorantraniliprole 18.5 SC @ 3 ml/10 lit or Flubendiamide 20 WG @ 2.5 g/10 lit or Cartap 50 WP @ 2 g/lit of water or apply Cartap 4 G @ 25 kg/ha.
- **Bacterial blight** is the most important disease occurs due to prevalence of cloudy weather. Spraying of Streptomycin sulphate + Tetracycline combination 300 g + Copper Oxychloride 1.25kg/ha in 500 litre of water/ha is recommended for Bacterial blight.
- **Sheath blight** is also important disease. Validamycin 3L 2.0 ml/liter or Propiconazole (25% EC) at 1 ml/liter in 500 liters of water/ha twice at 15 days interval after appearance of the disease symptoms is recommended for control of sheath blight.
- Keep the field bunds clean to minimize the infestation of diseases and insect pests. Drain out the water when more than 50% crops are matured to reduce the incidence of false smut.

Harvesting and storage

- Roughing should be done at 120-125 days after transplanting to avoid seed mixtures, especially in seed production fields.
- Drain out the water from the field 15 days before harvesting to avoid lodging.
- Harvest the crop at 28-30 days after 50% flowering when the grain attains physiological maturity when 80% of the grains in panicles have got matured to avoid loss due to shattering.
- After threshing and proper cleaning, dry the grains under sun until 14% moisture content and pack it properly before storing. Store the grain in cool and dry place.



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