

the rate of 30 kg per hectare.

- During panicle initiation stage, apply of Chlorpyrifos @ 2.5 l/ha for effective control of stem borer.
- If symptoms of the sheath blight diseases appears, apply Sheathmar (Validamycin) or Tilt at 2.5ml/l. About 500 litres are required for covering one hectare of land.
- To minimize the insect pest and disease infestation, keep the bunds of the field clean.

Harvesting, drying and milling

- Harvest the crop at 20-22% grain moisture or when 80-85% grains are straw colored and those in the lower part of the panicle are in the hard doe stage.
- Thresh the crop immediately after harvest and sun dry the grains to 12% moisture for seed purpose and to 14% if it is to be used as grain or is to be milled.

Cropping system

- As this variety can be harvested early in the wet season, *rabi* rice, groundnut, maize, potato, vegetables and mustard can be grown after harvest.
- Cropping systems like rice-rice, rice-maize-cowpea, rice-potato-sesame and rice-sunflower-moong bean are recommended for higher returns.



A nutrient rich rice variety for Odisha **MUKUL (CR Dhan 311)**

Krishnnedu Chattopadhyay, Lotan Kumar Bose, Torit Baran Bagchi, Bishnu Charan Marndi, Sanjoy Saha, Prakash Chandra Rath, Arup Kumar Mukherjee, Annie Poonam and Srigopal Sharma



Rice is the main source of calories for billions of people in Asia-Pacific region. It contributes 29% dietary protein for population in the region. But in general rice is deficient in protein. Therefore, a large section of the world population suffers from protein malnutrition. Backcross breeding procedure has been followed to transfer high grain protein content to var. Naveen, a popular high yielding variety for irrigated ecosystem. IET 24772 (CR2829-PLN-100), a derivative of the cross, ARC10075/Naveen belongs to BC3F5 generation. This nutrient rich rice IET 24772 (CR 2829-PLN-100) has been released by SVRC, Odisha as **Mukul** (CR Dhan 311) and has been notified for cultivation in State in 2019. It has high protein (10.1%) and moderately high level of Zn (20 ppm) content in 10% polished rice. It has medium duration (120-125 days), semi-dwarf plant type (110 cm) with long bold grain. It is suitable for irrigated and favorable shallow rainfed areas. National average of grain yield is 4331 kg/ha and in Odisha it is 5542 kg/ha. Mukul has been found at par with the checks with regard to its response to important biotic stresses. It showed tolerance to leaf blast, glume discoloration, brown spot, RTD and bacterial leaf blight and moderate tolerance against brown plant hopper, gall midge and stem borer. This has very high head rice recovery (60.15%) and good cooking quality as evident from its alkali spreading value (5) and intermediate amylose content (23.67%). It performed at par with its parent, Naveen in station and state trials.

A nutrient rich rice variety for Odisha **MUKUL (CR Dhan 311)**



NRRI Technology Bulletin - 148

© All Rights Reserved, ICAR-NRRI, May, 2020

Editing and layout : G.A.K. Kumar, JP Bisen & Sandhyarani Dalal

Photography: Prakash Kar & Bhagaban Behera



Laser typeset at the National Rice Research Institute, Indian Council of Agricultural Research, Cuttack (Odisha) 753 006, India and printed at Printech offset, BBSR. Published by The Director, for the National Rice Research Institute, Cuttack (Odisha) 753 006.

Recommendation for scientific cultivation

Land suitability

- Suitable for cultivation in favourable shallow rainfed medium and in irrigated land during *wet/Kharif* season and in irrigated land during *dry/rabi/boro/summer* season.

Nursery preparation for rice seedlings

Method for preparing nursery

- Select a suitable land near a water source for irrigation during mid-June and November for *kharif* and *rabi* crop, respectively.
- Plough the field 3-4 times and level the field well with the help of a leveler.
- Apply fertilizer N: P: K to the nursery bed at the rate of 100:20:20 kg per hectare.
- Apply five tons of farmyard manure or compost per hectare of nursery.
- By raising the soil, prepare nurseries of one meter width and convenient length and maintain a gap of 30cm between the nursery beds all around. Prepare drainage channel all around the beds for drainage of excess water.
- Seedlings obtained from one nursery bed can be planted in ten times the area of its size.

Selection of seeds

- Prepare a salt solution by adding 60g common salt in one litre of water and pour the seeds in the solution. The volume of total solution depends on the amount of seeds to be used in nursery bed.
- Remove the floating seeds and wash the remaining seeds in fresh water. Dry the seeds in shade.

Seed rate and seed treatment

- For direct sowing, use seeds @ 40-50kg/ha and for transplanting @ 30-35kg/ha. If seed drill or pneumatic seeder is used, 25 kg of seeds per hectare will be sufficient.
- Mix well two gm of carbendazim (Bavistin) or Agrosan GN with one kg of seed.

Sowing time

- *Kharif/wet* season: sow directly till the first fortnight of June in favourable shallow medium land.
- For transplanting: sow in first week of June in seed bed.
- *Dry/boro/summer* season: sow in seed bed during the period from the end of November to mid December.

Maintenance of nursery

- After 24 hours of soaking the seeds, drain the water and cover the seeds with gunny bags of germination.
- Sow the germinated seeds in the nursery and keep it wet for first few days.
- Apply Pyrazosulfuron ethyl (10WP) @ 200g/ha, 1-3 days after sowing.
- When the seedlings grows up to one inch, maintain one cm water level in the nurseries.
- Fifteen days after the germination of seeds, apply Furadon 3G (Carbofuran) @ 33kg/ha to the bed.

Main field preparation and transplanting

- At seven to eight days of interval, plough the field twice and make a fine puddle field.
- Use 20-25 days old seedlings in *kharif/wet* season and 30 days old seedlings for *rabi/bor/summer* season for transplanting.

Spacing and crop establishment

- In *kharif* season, during mid of July, transplant in the main field by maintaining a spacing of 15cm from plant to plant. The space between the rows should be 30cm.
- During the *rabi* season, while planting, the spacing between the rows should be 15cm and the spacing from plant to plant should be 15cm.
- Fertilizer application (for both wet and dry season)
- The dose of N: P: K for the variety is 120:60:60 kg/ha respectively. Use farmyard manure @ five tons/ha.
- Before final puddling, apply half of nitrogen (60kg), entire amount of phosphorous (60kg) and three fourth of potash (45kg) in the field.
- Initially, apply zinc at the rate of 25kg/ha in zinc deficient soil.
- Apply rest amount of nitrogen by splitting into two equal parts, initially after three weeks after transplanting and lastly during panicle initiation stage. Also, apply the rest one fourth of potash during initiation of panicles.
- Use the Leaf Color Chart (LCC) for increasing the nitrogen use efficiency and for saving Nitrogen fertilizer.

Weed management

- For effective weed control, use Bensulfuron methyl 0.6+ Pretilachlor 6 GR @ 10kg/ha at 7 days after transplanting (DAT) followed by spraying of Penoxulam 21.7 SC @ 120ml/ha, at 15 DAT or at 3-4 leaf stage of weeds.
- All the herbicides are to be applied in saturated soil moisture using knapsack sprayer fitted with flat fan nozzle, with total spray volume of 350l/ha.
- Granules of Bensulfuron methyl 0.6+ Pretilachlor 6 GR is to be applied by mixing with 10 kg sand/ha.
- Alternatively, manual weeding can be done 20 and 40 days after transplanting.

Water management

- After transplanting, keep the field saturated with water for one week so that the roots can grow and plants become firm.
- Throughout the crop development period, maintain a water level of 3-5 cm in the field. Before applying fertilizers as top dressing, drain out the water from the field and irrigate the field after 24-36 hours.
- After 15 days of milking stage, drain out the water from the field.

Insect and Disease control

- Generally, this variety is tolerant to major insect pests and diseases. In *rabi* season during the initial period of growth, plants are affected by yellow stem borer. Before transplantation, dip the roots of seedlings overnight in 0.02% Chlorpyrifos. In *kharif*, for effective control during the panicle initiation stage, apply Carbofuran granules at