

# Diseases of Rice and Their Management

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Rice (*Oryza sativa* L.) is considered as one of the most important staple food crops of the world and nearly half of the world's population is dependent on it. The crop plays a pivotal role in global food security. Since rice is grown in wide area across the globe, it is prone to get attacked by several plant pathogens such as, fungi, bacteria, viruses and nematodes. Among the major diseases rice blast, bacterial leaf blight, bacterial leaf streak, sheath blight, sheath rot, stem rot, false smut and rice tungro virus are economically important

and they cause huge monetary losses. In the recent years, due to alteration in the global temperature and climate change, various minor diseases appeared as major ones and thus posing a threat to food safety and security. The various management

practices includes use of resistant varieties, cultural practices, biological and chemical control. All these strategies have varied degrees of success in managing rice diseases. But their integration could be more effective and successful management of plant disease in rice. The various diseases in rice includes:

**Blast: *Pyricularia oryzae***

## Symptoms

- Above-ground parts of the rice plant (leaves, nodes and neck) are attacked by the fungus
- Initial symptoms are white to grey-green lesions or spots with brown borders
- Small specks originate on leaves - subsequently, enlarge into spindle-shaped spots (0.5 to 1.5 cm length and 0.3 to 0.5 cm width) with an ashy center.
- Older lesions are elliptical or spindle-shaped and whitish to grey with necrotic borders.

Several spots coalesce to form big irregular patches.

- Lesions on the neck are greyish brown and cause the girdling of the neck and the panicle to fall over.
- If an infection of the neck occurs before the milky stage, no grain is formed, but if the infection occurs later, grains of poor quality are formed.



Fig. 1. Type of blast a) Leaf blast b) Collar blast c) Nodal blast

## Management

### Cultural methods

- Planting resistant varieties against the rice blast is the most practical and economical way of controlling rice blast.
- Use of tolerant varieties (CO 47, CO 50, ADT 36, ADT 37, ASD 16, ASD 20, ADT 39, ASD 19, TPS 3, White ponni, ADT 44, IR 64 and IR 36)
- Avoid excess N - fertilizer application
- Apply nitrogen in three split doses.

### Chemical methods

- Thiram or captan or carboxin or carbendazim at 2 g/kg of seeds.
- Carbendazim or Tricyclozole at 2 g/lit of water for 1 kg of seed.
- Soak the seeds in the solution for 2 h

- Drain the solution, sprout the seeds and sow in the nursery bed.
- Treat the seeds with talc-based formulation of *P. fluorescens* (Pf1) @ 10g/kg of seed and soak in 1 litre of water overnight.
- Decant the excess water and allow it to sprout the seeds for 24 h and then sow.



Fig. 2 i) Wavy margin ii) Bacterial ooze

**Bacterial leaf blight:** *Xanthomonas oryzae* pv. *oryzae*

#### Symptoms

- Water-soaked to yellowish stripes on leaf blades or starting at leaf tips with a wavy margin
- Leaves with undulated yellowish white or golden yellow marginal necrosis, drying of leaves back from tip and curling, and leaving mid rib intact are the major symptoms.
- The appearance of bacterial ooze that looks like a milky or opaque dewdrop on young lesions early in the morning
- Severely infected leaves tend to dry quickly
- Loss in grain yield may be up to 60%.

#### Favourable conditions

- Presence of weeds
- Presence of bacteria in the rice paddy and irrigation canals
- Warm temperature (25-30° C), high humidity, rain and deep water.
- Irrigation water and splashing or windblown rain can disseminate the bacterium from plant to plant.
- The use of trimming tools for transplanting and by handling during transplanting can also trigger new infections.

#### Management

##### Preventive method

- Seed treatment - seed soaking for 8 hours in Agrimycin (0.025%) and wettable Ceresan (0.05%) followed by hot water treatment for 30 min at 52-54 °C;
- Seed soaking for 8 hours in Ceresan (0.1%) and treat with Streptocyclin (3g in 1 litre);
- Spray neem oil 3% or NSKE 5%

##### Chemical methods

- Spray Streptomycin sulphate + Tetracycline combination 300 g + Copper oxychloride 1.25kg/ha. If necessary repeat after 15 days.
- Application of bleaching powder @ 5 kg/ha in the irrigation water is recommended at the kresek stage.
- Foliar spray with copper fungicides alternatively with Streptocyclin (250 ppm) to check secondary spread.
- Two sprays of Copper hydroxide 77 WP@1.25 kg/ha 30 DAP & 45 DAP

**Bacterial leaf streak:** *Xanthomonas campestris* p.v. *oryzicola*

#### Symptoms

- Fine translucent streaks appear between the veins of the leaf are the first symptoms.



- The lesions enlarge lengthwise and advance over larger veins laterally and turn brown.
- On very susceptible varieties a yellow halo appears around the lesions.
- On the surface of the lesions, bacteria ooze out and form small yellow band-like exudates under humid conditions.



**Fig. 4 Apprance of yellow leaf and identification of RTVP & RTSV under microscope**

#### Favourable conditions

High relative humidity (83-93%) or dew during morning hours for 2 to 3 hours

#### Management

- Affected stubbles are to be destroyed by burning or through ploughing.
- Judicious use of nitrogenous fertilizers. .
- Soak the seed in Streptocycline (250 ppm) followed by hot water treatment at 52 °C for 30 minutes eradicates seedling infection.



**Fig. 3 Bacterial leaf streak**

- Spray Streptocycline (250 ppm) along with copper oxychloride (0.3%)

**Rice tungro virus:** *Rice tungro bacilliform virus (RTBV)* and *Rice tungro spherical virus (RTSV)*

#### Symptoms

- Plants affected by tungro exhibit stunting and reduced tillering. Leaves become yellow or orange-yellow, and it may also have rust-colored spots.
- Discoloration begins from the leaf tip and extends down to the blade or the lower leaf portion
- Most panicles are sterile or partially filled grains
- Tungro virus disease affects all growth stages of the rice plant specifically high at the vegetative stage.

#### Favourable conditions

- Presence of the virus sources.
- Presence of the vector.
- Age and susceptibility of host plants.
- Synchronization of the three above factors.
- All growth stages of rice plant specifically the vegetative stage

#### Management

##### Trap methods

- Light traps are to be set up to attract and control the leaf hopper vectors as well as to monitor the population.

- In the early morning, the population of leafhopper alighting near the light trap should be killed by spraying/dusting the insecticides. This should be practiced every day.

## Cultural methods

- Planting of resistant varieties against tungro virus disease is the most economical means of managing the disease.
- Among the cultural management practices, adjusting the date of planting is recommended.
- Ploughing and harrowing the field to destroy stubbles right after harvest

## Chemical methods

- Leaf yellowing can be minimized by spraying 2 % urea mixed with Mancozeb at 2.5 gm/lit.
- Green leaf hoppers as vectors are to be controlled effectively in time by spraying.
- Vegetation on the bunds should also be sprayed with the insecticides. Maintain 2.5 cm of water in the nursery and broadcast anyone of the following in 20 cents Carbofuran 3 G 3.5 kg (or) Phorate 10 G 1.0 kg (or) Quinalphos 5 G 2.0 kg.

## Sheath Blight: *Rhizoctonia solani*

### Symptoms

- The fungus affects the crop from tillering to heading stage.
- Initial symptoms are noticed on leaf sheaths near water level.
- On the leaf sheath oval or elliptical or irregular greenish grey spots are formed.
- As the spots enlarge, the centre becomes greyish white with an irregular blackish brown or purple brown border.

- Lesions on the upper parts of plants extend rapidly coalescing with each other to cover entire tillers from the water line to the flag leaf.
- The presence of several large lesions on a leaf sheath usually causes death of the whole leaf, and in severe cases all the leaves of a plant may be blighted in this way.
- The infection extends to the inner sheaths resulting in death of the entire plant.
- A yield loss of 25% was reported if the flag leaves are infected.

## Favourable Conditions

High relative humidity (96-97 per cent), high temperature (30-32 °C), closer planting and heavy doses of nitrogenous fertilizers.



Fig.5 Sheath blight disease in Rice

## Management

### Cultural methods

- Apply FYM 12.5 t/ha or green manure 6.25 t/ha to promote antagonistic microflora
- Avoid excess doses of fertilizers.
- Adopt optimum spacing.
- Eliminate weed hosts.
- Avoid flow of irrigation water from infected fields to healthy fields.
- Deep ploughing in summer and burning of stubbles.

## Chemical methods

- Apply Neem cake at 150 kg/ha



- Foliar spray with Neem oil at 3% (15 lit /ha) starting from disease appearance.
- Soil application of *P. fluorescens* talc based formulation at 30 DAT @ 2.5 Kg/ha and foliar spray (0.2%) at boot leaf and 10 days later @ 1 Kg/ha.
- Hexaconazole 75% WG @ 100mg/ lit 1st spray at the time of disease appearance and 2nd spray 15 days later (or)

#### Brown Spot: *Helminthosporium oryzae*

##### Symptoms

- Brown Spot is also called as sesame leaf spot or *Helminthosporiosis*, attacks seedling in nursery to milky stage in main field.
- The disease appears first as minute brown dots later becoming cylindrical or oval to circular (resemble sesame seed).
- Spots measures 0.5 to 2.0 mm in breadth - coalesce to form large patches leads to leaf dries up.
- Seedlings die and affected nurseries can be often recognized from a distance by their brownish scorched appearance. Dark brown or black spots also appear on glumes.
- In severe cases yield reduction is up to 50%.



Fig. 5 Brown spot

##### Favourable Conditions

- Temperature around 25-30 °C with relative humidity above 80 per cent are highly favourable.

- Excess of nitrogen aggravates the disease incidence.

#### Management

##### Cultural methods

- As disease is seed borne, Use disease free seeds.
- Removal of alternate & collateral hosts.
- Growing resistant varieties like ADT 44, PY 4, CORH1, CO44, Cauvery, Bhavani, TPS 4 and Dhan.

##### Chemical method

- Seed soak / seed treatment with Captan or Thiram at 4.0g /kg of seed or treat the seed with Agrosan or Ceresan 2.5 g/kg seed to ward off appearance of seedling blight stage..
- Seed treatment with tricyclazole followed by spraying of mancozeb + tricyclazole at tillering and late booting stages gave good control of the disease.

#### False smut: *Ustilagonoidea virens*

##### Symptoms

- Individual rice grain transformed into a mass of yellow fruiting bodies
- Growth of velvety spores that enclose floral parts

- Infected grain has greenish smut balls with a velvety appearance.
- The smut ball appears small at first and grows gradually up to the size of 1 cm.
- It is seen in between the hulls and encloses the floral parts.
- As the fungi growth intensifies, the smut ball bursts and becomes orange then later yellowish-green or greenish-black in color.
- Infection usually occurs during the reproductive and ripening stages, infecting a few grains in the panicle and leaving the rest healthy.



Fig. 6 False smut

### Management

#### Cultural methods:

- Among the cultural control, destruction of straw and stubble from infected plants is recommended to reduce the disease.
- Use varieties that are found to be resistant or tolerant against the disease in India.
- Avoid field activities when the plants are wet.

- Early planted crop has less smut balls than the late planted crop.

#### Chemical methods

- Seed treatment with carbendazim 2.0g/kg of seeds.
- Spraying of copper oxychloride @ 2.5 g/litre or Propiconazole @ 1.0 ml/litre at boot leaf and

milky stages will be more useful to prevent the fungal infection.

- At tillering and preflowering stages, spray Hexaconazole @ 1ml/lit or Chlorothalonil 2g/lit.
- At tillering and pre-flowering stages, spraying of carbendazim fungicide or copper base fungicide can effectively control the disease

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