

Major Nursery and Field Diseases of Rice (Paddy) and their Management

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Introduction

Rice (*Oryza sativa*) represents the major food, feeding more than half of the world population every day. The dependence of such a large population to meet their daily dietary requirements on this tropical crop causes large-scale production in different parts of the world. The rice diseases, mainly caused by bacteria, fungi, and viruses, lead to significant damage and loss in the crop yield. The fungal diseases mainly attack stems, roots, grains, and foliage. The level of plant damage caused by these diseases depends on the innate capacity of the crop species to withstand the disease, severe environmental conditions, soil fertility and composition, the effect of agrochemicals, and the stage of plant growth.

Diseases in Rice includes both in the nursery and in the main field. Here, all common diseases of Rice (Paddy) are summarized based on causing agents, damage symptoms and their management.

A. Nursery Disease:

1. **Blast-** *Pyricularia grisea* or *Magnaporthe grisea*
2. **Bacterial Leaf Blight-** *Xanthomonas oryzae pv.oryzae*
3. **Rice Tungro disease-** *Rice tungro virus*

B. Field Disease:

1. **Brown Leaf Spot-** *Helminthosporium oryzae*
2. **Sheath Rot-** *Sarocladium oryzae*
3. **Sheath Blight-** *Rhizoctonia solani*
4. **False Smut-** *Ustilaginoidea virens*
5. **Leaf streak-** *Xanthomonas oryzae pv. Oryzicola*
6. **Bakanae or Foolish Seedling-** *Fusarium moniliforme* or *Gibberella fujikuroi*

A. Nursery Disease

1. **Blast Disease or Rotten neck or Rice fever**
✓ Blast disease caused by fungus

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Pyricularia oryzae or *Magnaporthe grisea*

Management:

Symptoms:

- ✓ Symptoms appear on leaves, nodes, rachis, and glumes.
- ✓ Disease can infect paddy at all growth stages and all aerial parts of plant (Leaf, neck and node).
- ✓ When Neck region of panicle develops a black color and shrivels completely/partially grain set inhibited, called neck blast.
- ✓ In case of Nodal Blast, nodes become black and break up.
- ✓ Among the three leaves and neck infections are more severe.
- ✓ Small specks originate on leaves – subsequently enlarge into spindle shaped spots with ashy center.

- ✓ Adjust planting time. Sow seeds early, when possible, after the onset of the rainy season.
- ✓ Remove collateral weed hosts from bunds and channels.
- ✓ Use only disease free seedlings.
- ✓ Avoid excess nitrogen. Apply N in three split doses (50% basal, 25% in tillering phase and 25% N in panicle initiation stage).
- ✓ Flood the field as often as possible.
- ✓ Spray Carbendazim 50WP @ 500g/ha (or) Tricyclozole 75 WP @ 500g/ha (or) Metominostrobin 20 SC @ 500ml/ha (or) 47Azoxystrobin 25 SC @ 500 ml/ha.

2. Bacterial Leaf Blight

- ✓ The disease caused by bacteria

Xanthomonas oryzae pv. *Oryzae*



Symptoms:

- ✓ It is also known as seedling wilt or kresek.
- ✓ Water-soaked to yellowish stripes on leaf blades or starting at leaf tips then later increase in length and width with a wavy margin.
- ✓ Appearance of bacterial ooze that looks like a milky or opaque dewdrop on young lesions early in the morning.
- ✓ Lesions turn yellow to white as the disease advances.
- ✓ If the cuts end of leaf is kept in water it becomes turbid because of bacterial ooze.
- ✓ The disease favors temperatures at 25–34°C, with relative humidity above 70%.
- ✓ Ensure good drainage of fields (in conventionally flooded crops) and nurseries.
- ✓ Keep fields clean. Remove weed hosts and plow under rice stubble, straw, rice ratoons and volunteer seedlings, which can serve as hosts of bacteria.
- ✓ Allow fallow fields to dry in order to suppress disease agents in the soil and plant residues.
- ✓ Spray fresh cow dung extract 20% twice (starting from initial appearance of the disease and another at fortnightly interval).
- ✓ Neem oil 60 EC 3% (or) NSKE 5% is recommended for the control of sheath rot, sheath blight, grain discoloration and bacterial blight.



Management:

- ✓ Best to use resistant varieties.
- ✓ Use balanced amounts of plant nutrient, especially nitrogen.

3. Rice Tungro

- ✓ It is caused by the combination of two viruses, *Rice Tungro Baciliform Virus*

(RTBV) and Rice Tungro Spherical Virus (RTSV).

Symptoms:

- ✓ Stunting, delayed flowering which may delay maturity, reduced number of tillers, small and not completely exerted panicles, as well as a higher than normal percentage of sterile panicles or partially filled grains, covered with dark brown blotches.
- ✓ Discoloration begins from leaf tip and extends down to the blade or the lower leaf portion.

reduce inoculum sources and destroy the eggs and breeding sites of green leaf hopper.

- ✓ 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.

B. Field Disease:

1. Sheath Blight



Management:

- ✓ Grow resistant varieties.
- ✓ Practice synchronous planting with surrounding farms.
- ✓ Adjust planting times to when green leafhopper are not in season or abundant, if known Plow infected stubbles immediately after harvest to

- ✓ The disease caused by bacteria *Rhizoctonia solani*

Symptoms:

- ✓ Oval or ellipsoidal greenish gray lesions, usually 1-3 cm long, on the leaf sheath. Under favorable conditions, these initial lesions multiply and expand to the upper part

- of the sheaths, leaves, and then spread to neighboring tillers belonging to different hills (transplanted rice) or plants (direct-seeded rice).
- ✓ Lesions on the leaves usually have irregular lesions, often with gray-white centers and brown margins as they grow older.
 - ✓ In subtropical environments, the disease is mostly initiated by sclerotia (up to two million of which can be produced per square meter in a diseased crop).
 - ✓ Occurs in areas with high temperature (28–32°C), high levels of nitrogen fertilizer, and relative humidity of crop canopy from 85–100%.
- ✓ Use reasoned density of crop establishment (direct seeding or transplanting).
 - ✓ Carefully control of weeds, especially on the levees.
 - ✓ Drain rice fields relatively early in the cropping season to reduce sheath blight epidemics.
 - ✓ Apply Neem cake at 150 kg/ha. Foliar spray with Neem oil at 3% (15 lit /ha) starting from disease appearance.
 - ✓ Carbendazim 50 WP @ 500g/ha or Hexaconazole 75% WG @ 100mg/ lit 1st spray at the time of disease appearance and 2nd spray 15 days later

2. Sheath Rot

- ✓ The disease caused by fungus *Sarocladium oryzae*



Management:

- ✓ Use a reasonable level of fertilizer adapted to cropping season.

Symptoms:

- ✓ Irregular spots or lesions, with dark reddish brown margins and gray center.

- Lesions enlarge and often coalesce and may cover the entire leaf sheath.
- ✓ Discoloration in the flag leaf sheath.
- ✓ Severe infection causes entire or parts of young panicles to remain within the sheath
- ✓ Whitish powdery growth inside the affected sheaths and young panicles. Infected panicles sterile, shrivelled, or with partially filled grain.
- ✓ It can also occur in areas with high amounts of nitrogen fertilizer application and high relative humidity and temperatures (20–28°C) at heading to mature crop stages.
- ✓ Uses Neem oil 3%

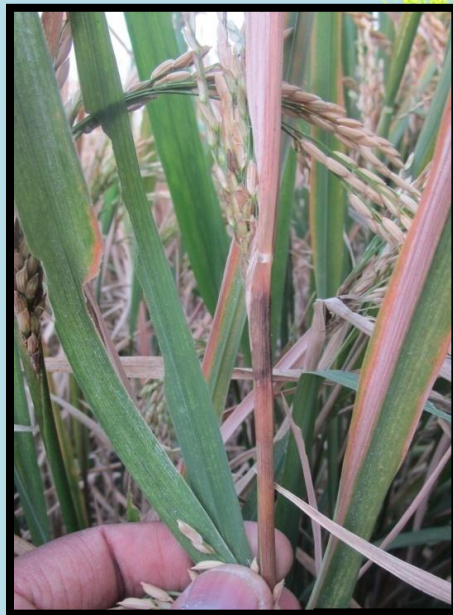
- ✓ Use Ipomoea leaf powder extract (25 kg/ha)
- ✓ Carbendazim @ 500g/ha or Metominostrobin @ 500 ml/ha or Hexaconazole 75% WG @ 100 mg/ lit 1st spray at the time of disease appearance and 2nd spray 15 days later

3. Brown Leaf Spot

- ✓ Brown leaf spot disease caused by the fungus *Helminthosporium oryzae*

Symptoms

- ✓ Occur in nursery as well as main field and causes blight of seedlings.
- ✓ Also called as sesame leaf spot or Helminthosporiose or fungal blight.



Management:

- ✓ Apply Gypsum @ 500 kg/ha at two equal splits once basally and another at active tillering stage.

- ✓ Leaf spotting is very common, Isolated brown, round to oval (resemble sesame seed).

- ✓ Seed also infected (black or brown spots on glumes spots are covered by olivaceous velvety growth).
 - ✓ Infection also occurs on panicle neck with brown colour appearance.
 - ✓ 50% yield reduction in severe cases.
- products/ha dissolved in 100 litres and dipping for 30 minutes.
 - ✓ Since the fungus is seed transmitted, a hot water seed treatment (53-54°C) for 10-12 minutes may be effective before sowing.



Management:

- ✓ As disease is seed borne, Use disease free seeds.
 - ✓ Removal of alternate & collateral hosts.
 - ✓ Growing Resistant varieties like ADT-44, PY-4, CORH-1, CO-44, CAUVERY, BHAVANI, TPS-4 and Dhanu.
 - ✓ Seed treatment with *Pseudomonas fluorescens* @ 10g/kg of seed followed by seedling dip @ of 2.5 kg or
- ✓ Spray Mancozeb (2.0g/lit) or Edifenphos (1ml/lit) - 2 to 3 times at 10 - 15 day intervals.

4. False Smut

- ✓ The disease caused by the fungus *Ustilaginoidea virens*

Symptoms:

- ✓ Only few grains in a panicle are usually infected and the rest are normal.
- ✓ Individual rice grain transformed into a mass of yellow fruiting bodies.

- ✓ Growth of velvety spores that enclose floral parts.
- ✓ Immature spores slightly flattened, smooth, yellow, and covered by a membrane.
- ✓ Mature spores orange and turn yellowish green or greenish black.



Management:

- ✓ Use of disease-free seeds that are selected from healthy crop.
- ✓ Seed treatment with carbendazim 2.0g/kg of seeds.
- ✓ Two sprayings of Propiconazole 25 EC @ 500ml/ha (or) Copper hydroxide 77

WP @ 1.25 kg/ha at boot leaf and 50% flowering stages.

5. Leaf streak

- ✓ It is bacterial disease caused by *Xanthomonas oryzae* pv. *Oryzicola*

Symptoms:

- ✓ Initially, small, dark-green, water-soaked translucent streaks grow larger on veins from tillering to booting stage.
- ✓ Lesions turn brown and bacteria ooze out under humid weather.
- ✓ Leaves turn brown and then gray-white in color before they die



Management:

- ✓ Spray fresh cow dung water extract 20%.
- ✓ Copper hydroxide 77 WP@1.25 kg/ha is also recommended.
- ✓ Control of bacterial leaf streak is dependent on the use of resistant rice varieties and on planting of treated seed

6. Bakanae or Foolish Seedling or Foot Rot

- ✓ The disease caused by fungus *Fusarium moniliforme* or *Gibberella fujikuroi*

Symptoms:

- ✓ Seedlings are elongated, slender, stunted and chlorotic.



- ✓ Abnormal elongation of older plants which often makes them visible as they grow taller than uninfected plants in the field.
- ✓ Sterile plants which do not produce panicles or produce empty panicles.
- ✓ Reduced tillering and drying leaves at late infection.
- ✓ In the seedbed, infected seedlings with lesions on roots die which may die before or after transplanting.

Management:

- ✓ Seed treatment using fungicides such as thiram, thiophanate-methyl, or benomyl is effective before planting.
- ✓ Benomyl or benomyl-t at 1-2% of seed weight should be used for dry seed coating.
- ✓ Seed treatment with organo mercurials - Agrosan GN, Ceresan @ 2 g a.i./kg seed is highly effective; steeping seeds in 1% CuSO₄ solution or 2% formalin also recommended.