Important Diseases of Paddy and Their Management

ARTICLE ID: 0067

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Paddy is cultivated globally. It is considered to be the food of half of the world’s population. Paddy is also cultivated on large scale in India. Paddy is cultivated on approximately 148 million hectares of land worldwide. 90 percent of paddy cultivation takes place in Asian countries. Paddy is cultivated in many states of India including West Bengal, Haryana, Punjab, Uttar Pradesh and Chhattisgarh. The biggest problem faced by the farmers cultivating paddy is due to the major pests and diseases affecting it.

A. Rice Blast

Causal organism: *Pyricularia oryzae* (Fungus)

Symptoms: This disease causes small blue spots on leaves, which grow into boat-shaped areas. It is known as blast disease and comes in various forms, such as leaf blast, node blast, and neck blast. The affected areas turn brownish-black and may rot, causing grain damage. 'Neck rot' refers to the rotting of the plant's neck due to this disease. 'Node rot' affects the nodes, leading to plant breakage. Additionally, it creates greyish-brown spots on the lower parts of the plant. Leaf blast results in ash-gray centers with brown-edged spots on the leaves and can even damage the flowering part. This disease weakens the plant's structure, leading to reduced grain production and potential crop loss. In simple terms, blast disease harms paddy plants, causing spots, rot, and reduced yields.

Disease Management
Grow disease-resistant varieties like IR 36, IR 64, and others.
Treat seeds with Bavistin (2g) or Captan (2.5g) per kilogram before sowing.
In standing crops, use 1g of Tricyclazole or Kasugamicin (1ml per liter of water) for spraying.
Consider spraying Hinosan when disease is noticed in the nursery and repeat every 10-15 days until panicle emergence.
Use Beam (300ml in 1000 liters of water) for spraying.

B. Sheath Blight / Foliage Blight

Causal organism: *Rhizoctonia solani* (Fungus)

Symptoms: A significant disease has become a major concern in developed areas of India, and it's caused by a fungus known as *Rhizoctonia solani* or *Thanetophorus cucumeris*. This disease affects paddy crops from the early tillering stage to the heading stage. The first signs are visible above the water in paddy fields. It starts with greenish-brown or straw-colored spots on the leaf sheaths near the water's surface, later spreading to the stems and surrounding the plants. The middle part of the leaves turns grayish-white, and the edges become brownish-red. Small brownish grains, called sclerotium, may form on the leaves under favorable conditions. In severe cases, all leaves become infected, making the plant look withered, and the ears can't emerge from their sheaths. This disease can lead to up to a 50% loss in crop yield, primarily when it strikes during the tillering stage. High humidity and suitable temperatures encourage the growth of the fungus and sclerotium.

Disease Management

- Weeds and crop residues should be burnt in the field. Do deep ploughing of the field in summer.
- Do not apply excess nitrogen and potash.
- Grow disease resistant verities like Pankaj, Savanandhan and Manasarovar etc.
- Dissolve 2 kg of Bavistin or 2.5 kg of Indofil M-45 in 1000 liters of water and spray it per hectare.
- Spraying of 0.2 percent of *Pseudomonas fluorescens* on the leaves should be done at the boot leaf stage and after 10 days.
- Foliar spray of Propiconazole 1 ml per liter of water when symptoms of the disease appear.

C. Bacterial Leaf Blight Disease

Causal organism: *Xanthomonas oryzae pv. oryzae* (Bacteria)

Symptoms: Bacterial leaf blight is a widespread problem in paddy farming, particularly in Indian states like Punjab, Himachal Pradesh, and others. It's also spreading in Bihar. Symptoms appear about 5-6 weeks after transplanting, affecting leaves in two stages: leaf blight and sheath blight. In the leaf blight stage, greenish-yellow spots develop on the upper leaves, followed by yellow or straw-colored stripes that dry them out. These stripes may have pearl-like bacterial substances, causing early leaf drying. The severe "Lania crassa" stage makes the whole plant wither, releasing milky water when leaves are cut, endangering paddy crops, especially during complete blight stage.

Blight stage: Lesions develop on the surface of the leaves, starting from the upper tips of the leaves. Later these lesions become pale yellow or straw colored and spread downwards with wavy edges. These lesions become blighted rapidly through necrosis.
Wilt or Kresek Stage: This stage of the disease appears in the nursery and starts with chlorosis and sudden wilting of leaves, followed by a more severe wilting stage within 3-4 weeks of transplantation. Leaves shrink, dry up, and sometimes have lesions, with oozing bacteria that dries into yellow-orange crusts. In waterlogged fields, there's a foul smell, and severe cases lead to plant death.

Disease Management
❖ Choose disease-resistant varieties like IR-20, TKM 6, and others.
❖ Maintain 10-15 cm spacing during transplanting.
❖ Ensure proper drainage and avoid excessive nitrogen use.
❖ Prevent water flow from infected fields to healthy ones.
❖ Use certified seeds.
❖ Soak seeds in a solution of one-gram Streptocycline per 45 liters of water for 12 hours before sowing.
❖ Treat seeds with 0.05% Ceresan and 0.025% Streptocycline before sowing.
❖ Apply Pseudomonas fluorescens at a rate of 10 grams per kilogram of seeds.
❖ In standing crops, use a mixture of streptomycin sulphate, tetracycline, and copper oxychloride if disease is observed.
❖ Use balanced fertilizers and avoid nitrogen-containing fertilizers if symptoms appear.

D. Brown Spot Disease of Rice
Causal organism: Helminthosporium oryzae (Fungus)

Symptoms: This paddy disease is widespread in India, particularly in West Bengal, Orissa, Andhra Pradesh, Tamil Nadu, and North Bihar. It's a seed-borne disease that damages the entire plant, from the stalk to the grains. Circular brown spots with varying sizes and shapes appear on the leaves, along with light yellow halos. The disease affects plant growth and grain quality, reducing germination capacity. In severe cases, leaves dry up, and black spots develop on the seed coat. The disease is most noticeable between May and September.

Disease Management
❖ Use disease-tolerant paddy varieties like Bala, Krishna, Kusuma, and more.
❖ Apply the recommended amount of nitrogen in your field.
❖ Spray 2.5 kg of Indofil M-45 in 1000 liters of water per hectare every 15 days in standing crops.
❖ Remove weeds and diseased plant residues.
❖ Apply adequate potash, phosphorus, manganese, and lime to the soil.
❖ Treat seeds with 10 grams of Pseudomonas fluorescens per kilogram or Agrosan/Ceresan at 2.5 grams per kg.
❖ When the disease appears, spray 500 grams of Indofil Z-78 WP in 200 liters of water, first at the boot stage and then after 15 days.

E. Rice Smut Disease (False Smut)
Causal organism: Ustilaginoidea virens (Fungus)

Symptoms: False smut is a major disease in paddy crop during high humidity and cloudy atmosphere. As a result, some panicles in the inflorescence are affected then the spores of the smut disease in the crop affect the grains of the paddy panicle. Due to this, velvety yellow coloured powder first starts appearing on the affected grains, which later turns black in colour. When
the panicle infected its grains not only spoiled but also its eight reduces. This disease mostly infects the panicle of plants or grains.

**Disease Management**
- Healthy seeds should be selected.
- Seed treatment with carbendazim 2gm per kg seeds.
- Deep ploughing during summer and treat the field with Trichoderma dust or Trichoderma culture before transplanting.
- Avoid excess dose of nitrogen at initial stage.
- Foliar spray of 3 gm copper oxychloride per liter of water or Hexaconazole 1 ml per liter of water during panicle emergence.

**F. Root Knot Nematode Disease**

**Causal organism:** *Meloidogyne species* (Nematode)

**Symptoms:** This nematode causes damage to the crop by affecting the primary and secondary roots. Its presence more than a certain number hinders the plants from getting water and other nutrients, which adversely affects the quality and also reduces the production. Despite the availability of nutrients and water in the soil, plants are not able to absorb them in the required quantity through the roots. The roots appear swollen and the plants become weak, dwarf and yellow. Plants suffering from this disease develop rot/fungal disease quickly.

**Disease Management**
- Deep ploughing during summer season.
- Single cropping system should not be adopted.
- Use resistant varieties. 4. Treat the soil of the nursery with 0.3-gram active ingredient of Carbofuron per square meter.

**Conclusion**

Paddy cultivation is of paramount importance, feeding half the global population, with India playing a significant role. However, the threat of various diseases like rice blast, sheath blight, bacterial leaf blight, brown spot disease, false smut, and root knot nematode disease can lead to substantial crop losses. To mitigate these challenges, farmers must employ a combination of disease-resistant varieties, proper seed treatments, and good agricultural practices. Vigilance and proactive management are essential to safeguard this vital food source.

**References**