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Diseases of Rice and Their Management

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Abstract

Rice is a staple food crop for about 65% of the Indian population, contributing 40% of total food grain production, thus occupies a pivotal role in the food and livelihood security of people. The major pathogens such as fungi, bacteria and virus diseases which affect the crop growth as well as yield. The impact of these diseases is very devastating and widespread in different rice growing areas. Both Chemical as well as biological management are important for favored, susceptible rice cultivars.

Introduction

Rice is an important food crop; over half of the population in the world depends on rice, especially in many Asian and African countries (Chukwu *et al.*, 2019). Global climate change has increased the distribution and frequency of heavy rainfall that can negatively affect plant growth and development. If it persists for a number of days, it may lead to the plant's death. Many crops, including rice, a semi-aquatic plant, are significantly negatively impacted by flooding, resulting in annual yield loss. More than 20 million hectares of rice in Asia and over 16% of rice in the world are adversely influenced by flooding because of submergence each year. The estimated annual economic loss of this year is more than US\$ 600 million. Flooding and reaeration can cause plant oxidative stress, leading to the production and rapid accumulation of reactive oxygen species (ROS) (Ella *et al.*, 2003). There tend to be a few common problems in each growing situation, such as Blast, brown spot, Sheath rot, Sheath blight, Udbatta disease, bacterial leaf blight, rice tungro disease and rice yellow drawf disease.

1. Blast - *Pyricularia grisea* (*P. oryzae*)

Symptoms

Blast disease (Figure 1) attacks the crop at all stages of crop growth. Symptoms appear on leaves, nodes, rachis, and glumes. On the leaves, the lesions appear as small bluish green flecks, which enlarge under moist weather to form the characteristic spindle shaped spots with grey centre and dark brown margin (Leaf blast). Small brown to black spots may also be observed on glumes of the heavily infected panicles. The pathogen causes yield losses ranging from 30-61 percent depending upon the stages of infection.

Managements

- Grow resistant to moderately resistant varieties CO47, IR 20, ADT36, ADT39, ASD18 and IR64. Avoid cultivation of highly susceptible varieties viz., IR50 and TKM6 in disease favorable season.
- Treat the seeds with Captan or Thiram or Carbendazim or

Tricyclazole at 2 g/kg or *Pseudomonas fluorescens* @ 10 g/kg of seed. Spray the nursery with carbendazim 500 mg/L or tricyclazole 300 mg/L.

- Spray the main field with Edifenphos 500 ml or Carbendazim 500 g or Tricyclazole 500 g or Iprobenphos (IBP) 500 ml/ha.

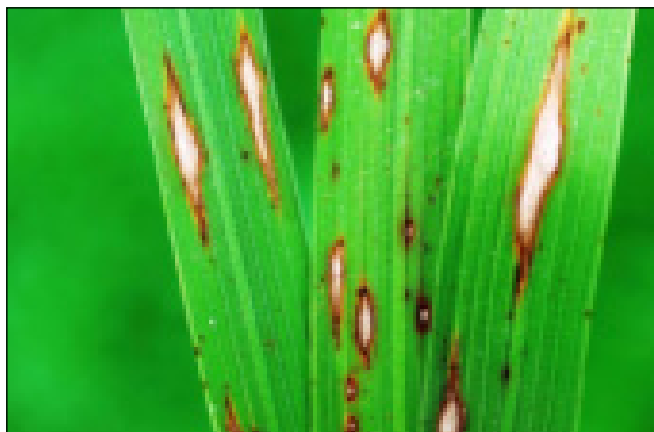


Figure 1: Spindle shaped spots with grey centre and dark brown margin seen on leaves

2. Brown Spot - *Helminthosporium oryzae*

Symptoms

Brown spot disease (Figure 2) attacks the crop from seedling to milky stage in main field. Symptoms appear as minute spots on the coleoptile, leaf blade, leaf sheath, and glumes, being most prominent on the leaf blade and glumes. The spots become cylindrical or oval, dark brown with yellow halo later becoming circular. Several spots coalesce and the leaf dries up. Dark brown or black spots also appear on glumes leading to grain discoloration. It causes failure of seed germination, seedling mortality and reduces the grain quality and weight.



Figure 2: The minute spots observed in leaves and grains of different rice varieties

Managements

- Field sanitation-removal of collateral hosts and infected debris from the field.
- Grow tolerant varieties viz., CO44 and Bhavani.
- Treat the seeds with Thiram or Captan at 4 g/kg. Spray the nursery with Edifenphos 40 ml or Mancozeb 80 g for 20 cent nursery.

- Spray the crop in the main field with Edifenphos 500 ml or Mancozeb 2 kg/ha when grade reaches 3. If needed repeat after 15 days.

3. Sheath Rot - *Sarocladium oryzae*

Symptoms

Sheath rot diseases (Figure 3) were noticed only on the upper most leaf sheath enclosing young panicles. The flag leaf sheath show oblong or irregular greyish brown spots. They enlarge and develop grey centre and brown margins covering major portions of the leaf sheath. The young panicles remain within the sheath or emerge partially. The panicles rot and abundant whitish powdery fungal growth is seen inside the leaf sheath.

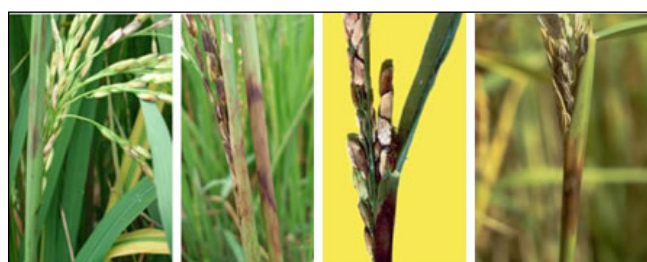


Figure 3: The flag leaf sheath show oblong or irregular greyish brown spots

Managements

- Spray Carbendazim 500 g or Edifenphos 1 L or Mancozeb 2 kg/ha at boot leaf stage and 15 days later.
- Soil application of gypsum (500 kg/ha) in two splits.
- Application of Neem Seed Kernel Extract (NSKE) 5% or neem oil 3% or Ipomoea or Prosopis leaf powder extract 25 Kg/ha.

4. Bacterial Leaf Blight - *Xanthomonas oryzae* pv. *oryzae*

Symptoms

Bacterial leaf blight disease (Figure 4) is usually noticed at the time of heading but it can occur earlier also. Seedlings in the nursery show circular, yellow spots in the margin, that enlarge, coalesce leading to drying of foliage. "Kresek" symptom is seen in seedlings, 1-2 weeks after transplanting. The bacteria enter through the cut wounds in the leaf tips, become systemic and cause death of entire seedling. The lesions enlarge both in length and width with a wavy margin and turn straw yellow within a few days, covering the entire leaf.

Managements

- Use optimum dose of fertilizers.
- Grow resistant cultivars IR 20 and TKM 6.
- Spray Streptomycin sulphate and tetracycline combination 300 g + Copper oxychloride 1.25 Kg/ha.

5. Rice Tungro Disease (RTD) - *Rice tungro bacilliform virus* (RTBV) and *Rice tungro sphericalvirus* (RTSV)

Symptoms

Rice Tungro Disease (Figure 5) occurs both in the nursery and main field. Plants are markedly stunted. Leaves show yellow to orange discoloration and interveinal chlorosis. Young leaves are sometimes mottled while rusty spots appear on older leaves. Tillering is reduced with poor root system. Panicles not formed in very early infection, if formed, remain small with few, deformed and chaffy grains.



Figure 4: In leaves lesions cover the entire lamina which turns white or straw coloured

Managements

- Grow disease tolerant cultivars like Pankhari203, BM66, BM68, Latisail, Ambemohar102, Kamod253, IR50 and Co45.
- Control the vectors in the nursery by application of Carbofuran 170 g/cent 10 days after sowing to control hoppers.

- Spray Phosphomidan 500 ml or Monocrotophos 1 litre/ha (2 ml/litre) or Neem oil 3% or NSKE 5% to control the vector in the main field 15 and 30 days after transplanting.

Conclusion

Due to climatic changes and emergence of new virulent strains of pathogens the effective control of the fungal, bacterial and viral diseases in Rice is a challenging task. So, to formulate an effective, sustainable and location appropriate plant disease management tool, the study of the major diseases of a crop, its occurrence, symptoms and extent of losses of rice becomes very important. The integrated disease management approaches like cultural methods, improved tillage practices, planting resistant cultivars, host plant resistance, biological control, use of botanicals, chemical methods and biotechnological approaches can be useful in management of diseases. Better knowledge about disease is a key player to improvise the trait improvements in crop development programme.

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