B.Sc. Botany

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Paper-II: Microbiology Fungi and Plant Diseases

GROUP-B

BLAST DISEASE OF RICE

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BLAST DISEASE OF RICE

Hundreds of millions of people world-wide depend on rice as a staple food (Figures 1, 2). A crop failure, for any reason, poses a real threat of starvation. Rice blast, caused by a fungus, causes lesions (Figure 3) to form on leaves, stems, peduncles, panicles, seeds, and even roots. So great is the potential threat for crop failure from this disease that it has been ranked among the most important plant diseases of them all. It is a major problem in rice production in countries like Japan, India, Taiwan and the USA. Blast disease is more severe in areas with high humidity and rainfall.

HOSTS: Rice **(***Oryza sativa).*

PATHOGEN: *Magnaporthe oryzae* ***(anamorph:*** *Pyricularia oryzae***)**

Class: Deuteromycetes

1. Several physiological strains of Pyricularia oryzae are present.
2. These strains differ in their ability to infect different varieties of rice.
3. The pathogen produces two toxins namely Pyricularin and Picolinic acid. These toxins inhibit the growth of the plant.

Symptoms:

The symptoms of rice blast include lesions that can be found on all parts of the plant, including leaves, leaf collars, necks, panicles, pedicels, and seeds. A recent report shows that even roots can become infected. However, the most common and diagnostic symptom, diamond shaped lesions, of rice blast occur on the leaves, whereas lesions on the sheaths are relatively rare.

1. Brownish lesion and spots are formed on leaf blade, leaf sheath, culms and panicles.
2. The spots are spindle-shaped with grey or white central part and brownish or reddish borders.
3. The spots enlarge as the disease progress.
4. Brown to black spots or rings is formed on the rachis of the mature inflorescence.
5. Small brown or black spots on ear heads.
6. Shriveled culms in severe cases.
7. The culms were covered with fluffy mycelium of the pathogen.
8. The occurrence of bluish patches on the neck or stem.
9. If the infection occurred before the grain formation, panicles droops and no grain formation.
10. If the infection occurred after grain formation, the grains become small, whitish and chaffy.
11. In advanced stages of the disease, necrotic rotting of neck and falling of the ears occurs.
12. Plants become stunted and untimely leads to the complete death of the plant.

Disease cycle

1. The pathogen survives in the collateral hosts present in the fields.
2. Favourable weather conditions promote the production of conidia.
3. The conidia help in the rapid spread of the disease.

Control measures

1. Foliar spray of fungicides is effective
2. Application of Bordeaux mixture is also practice.

3. Organo-meruric fungicides such as Hinosan and Blitox are also used.
4. Spraying on the seeds, seedbed, tillers, and neck emerging state is done.
5. Antibiotics such as Blastin and Blasticidin application are found to be effective.
6. Field sanitation practice (removal of infected plants) can reduce the secondary spread of the disease.
7. Destruction of alternate hosts in the field can be practiced.
8. Use of resistant varieties is the best method to avoid the occurrence of the disease.

Rice is the staple food crop for a large part of the human population in the world today. Rice blast is by far the most important disease of the many diseases that attack rice. Failures of entire rice crops have resulted directly from rice blast epidemics. The challenge for research continues to be to produce high quality food, in ever-increasing amounts at a lower costs, all while in the presence of an unforgiving and unrelenting pathogen. All of the plant disease management strategies and techniques that have been generated through research have been brought to bear against rice blast, but often with limited success. Rice blast has never been eliminated from a region in which rice is grown, and a single change in the way in which rice is grown or in the way resistance genes are deployed can result in significant disease losses even after years of successful management. Many investigators have considered it to be a model disease for the study of genetics, epidemiology, molecular pathology of host parasite interactions and biology. Recent advances in understanding the genes that govern the avirulence (resistance) and virulence (susceptibility) interactions have been made with rice blast, and each advance has helped us to understand how other plant diseases work. It is also important to note that the entire genomes of the rice blast fungus and rice have been sequenced and that M. oryzae is the first plant pathogenic fungus to have its genome sequenced and released to the public.