

Reference 24 Major diseases in rice

Summary

This reference presents the causes and symptoms of the three main diseases of inland-valley rice: blast, rice yellow mottle virus and bacterial leaf blight.

Diseases are considered major constraints in rice production. Rice diseases are mainly caused by fungi, bacteria or viruses. Stunting is one of the symptoms; others are: color changes, wilting or abnormal development of certain organs. These symptoms can be found in all the organs of the plant. The most common and most severe diseases in rice are blast, rice yellow mottle virus (RYMV) and bacterial leaf blight.

Blast

Blast is caused by the fungus *Pyricularia oryzae*. Blast can infest any organ of the plant: leaf, neck, panicle rachis, stem node, grain, etc. When the disease attacks the leaves, we talk of leaf blast (*see* Photo pages: Photo 24.1). There are other kinds of blast: neck blast when the base of the panicle starts to rot, and node blast at the level of the stem nodes (*see* Photo pages: Photo 24.2). When blast infests the neck of the panicle, nutrients cannot reach the grains.

The disease multiplies rapidly by spores, multiplying on leaves and panicles, which then penetrate into tissues; a few days later, the lesions or symptoms appear. The tips of leaf lesions are typically spindle-shaped, wide in the center and pointed at the ends. Large lesions usually develop gray centers bordered by brown to dark red. Chlorophyll disappears in the parts attacked, which means that photosynthesis and yield are reduced.

On the base of the ear, the same symptoms can be present (neck blast): blast infects the tissue, the ear pivots and breaks off. If the infestation starts at the milky grain stage, the panicle remains empty; if it starts later, the grains do not fill well and the rice quality is affected (chalky, brittle or greenish). Stem blast causes soft rot at node level, the nodes break resulting in different degrees of damage depending on the crop development stage. Blast is favored by too high a dose of nitrogen and high humidity.

Rice yellow mottle virus

Rice yellow mottle virus (RYMV) is a plant virus disease. The most important symptom on a rice plant is that leaves turn yellow, with alternate yellow and green stripes that give its typical mottled appearance to the plant (*see* Photo pages: Photo 24.3). The other symptoms are: stunting, reduced tillering, leaf mottle with yellow stripes, incomplete panicle exertion, the panicle sometimes being badly formed, and spikelet sterility.

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In natural conditions, RYMV is transmitted from an infested plant to a healthy plant by insect vectors of the beetle group (most important *Sesselia pussilla* and other vectors such as *Chaetocnema* spp., *Aulacophora africana*, *Trichispa sericea* and *Dicladispa viridicynea*), or by lesions caused by tillage practices (transplanting, weeding, etc.). The disease can be transmitted mechanically; touching an infested plant and later a healthy plant can transmit the disease. In an infested field, yellow patches indicate the infestation.

Bacterial blight

Bacterial blight is the third main rice disease in West Africa; it is confined to the Sahelian region (Mali, Senegal, Niger, etc.). This disease is caused by *Xanthomonas oryzae* pv *oryza*. Transparent stripes appear on the leaves, later these lesions dry and become brown and opaque (see Photo pages: Photos 24.5 and 24.6). In severe cases, the whole field seems to have been burnt. The spread of this disease (also known as bacterial stripe) is favored by wind, storm and ill-balanced mineral nutrients in the soil.

Bibliography

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- Sy, A.A., and Y. Séré, 1996. *Manuel de formation en pathologie du riz*. Association pour le développement de la riziculture en Afrique de l'Ouest (ADRAO), Bouaké, Côte d'Ivoire, 94 pp.

Table 24.1. Classification of rice diseases in western Africa

| Category | Disease name | Pathogen | |
|---------------------|--------------------------|------------------------------------------|--------------------|
| | | Scientific name | Nature |
| Major pathogens | Blast | <i>Magnaporthe grisea</i> | Fungus |
| | Rice yellow mottle virus | <i>Pyricularia oryzae</i> | Fungus |
| | Bacterial blight | RYMV <i>Xanthomonas oryzae oryzae</i> | Virus Bacterium |
| Secondary pathogens | Brown spots | <i>Drechslera oryzae</i> | Fungus |
| | | <i>Bipolaris oryzae</i> | Fungus |
| | | <i>Gerlachia oryzae</i> | Fungus |
| | Leaf blast | <i>Monographella albescens</i> | Fungus |
| | | <i>Rhizoctonia solani</i> | Sterile fungus |
| | Sheath blight | <i>Thanatephorus cucumeris</i> | Fungus |
| Minor pathogens | False smut | <i>Ustilaginoidea virens</i> | Fungus |
| | | <i>c. oryza sativa</i> | Fungus |
| | Bakanae disease | <i>Fusarium moniliforme</i> | Fungus |
| | | <i>Gibberella fujikuroi</i> | Fungus |
| | Cercosporiosis | <i>Cercospora oryzae</i> | Fungus |
| | Sheath rot | <i>Acrocyndrium oryzae</i> | Fungus |
| | White gall | <i>Coralloctostroma oryzae</i> | Fungus |
| | Fading color of sheaths | Fungi complex | Fungus |
| | Culm disease | Fungi complex | Fungus |
| | Bacterial stripes | <i>Xanthomonas oryzae</i> | Bacterium |

Reference 25 Integrated rice disease management

Summary

Integrated rice disease management is the combination of different methods to control diseases in a cost-effective way, based on sound environmental management. Pathogen populations are kept at low levels, not causing economic damage, using a combination of appropriate technologies. None of these methods or techniques can by itself ensure efficient and sustainable protection.

Varietal resistance and crop management practices—primary elements of integrated management

Integrated disease management focuses on varietal resistance, because it is the simplest and cheapest way to limit pathogen populations, and thus the most accessible method for farmers.

This means that varieties are chosen because they are resistant to disease infestation. The method gives good results, especially in the case of rice yellow mottle virus (RYMV) and blight.

However, varietal resistance is often not enough to protect the crop in a sustainable way. For instance, for blast, the occurrence of new pathogen races or environmental conditions favorable to the disease (high level of inoculum, overcast sky, high atmospheric humidity) can trigger epidemics on previously tolerant varieties. For this reason, WARDA recommends an integrated control strategy in which varietal resistance is accompanied by preventive measures both favorable to rice and reducing disease proliferation. These measures are detailed below.

Crop management techniques

- Appropriate sowing or transplanting date to avoid flowering coinciding with high atmospheric humidity (generally during the rainy season). High humidity is favorable to blast infestation.
- Synchronized sowing and transplanting to avoid build up of insect pests that can transmit diseases such as RYMV.
- Using healthy or treated seed—fungal diseases (blast) and bacterial diseases can be transmitted via seed.
- Destruction of weeds and crop residues that can act as reservoirs for pathogens and insect vectors.
- Balanced and reasonable fertilizer use: high doses of N can increase blast infestations, while high doses of K generally limit blast infestation.
- Destruction of rice stubbles and vector host plants to avoid pathogen build up and to interrupt the life-cycles of insect vectors.
- Cleaning of canals and borders of plots that can be reservoirs of RYMV, alternative hosts and insect vectors.