Rice blast

Magnaporthe grisea

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Diamond-shaped lesions on the leaves of rice.

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Rice blast may attack the stem at the nodes.

SUMMARY: Rice blast, caused by the fungus *Magnaporthe grisea*, attacks leaves, stems and flowers, killing plants up to tillering, or reducing grain yield and quality on plants that reach maturity. In Africa it is a problem of upland rice in particular. Diamond-shaped spots with white centres and dark borders occur on the leaves and rots develop on stems and flower heads. Control is by using tolerant or resistant varieties, dividing nitrogen fertilizer into several splits, avoiding water-stressed plants, eliminating crop residues, and application of seed treatments if fungicides are affordable and available.

KEY SIGNS

Oval or diamond-shaped spots (5-15 mm long and 3-5 mm wide) with dark borders occur on the leaves. Often the spots have yellow halos. Spots develop quickly under moist conditions and produce a large number of spores on both sides of the leaves. As they age, the spots become longer, the centres turn whitish-grey and the borders become wider and red-brown. The spots join together and the leaves die. Severely infected fields have a scorched appearance.

Spores from the leaves infect the leaf sheath, stem and panicle and cause rots. There are several different types of rot: collar rot appears at the junction of leaf base and leaf sheath; this can kill the leaf; neck rot (also called rotten neck) appears on the stem below the panicles (the flower heads) and can destroy the stem or result in pale-coloured grains that are partly filled, known as whiteheads; panicle rot occurs on the branches of the panicle so that it appears brown or black; node rot (slightly swollen parts of the stem where the leaves and tillers develop) occurs on the stem below the panicles, the rots become black-brown and dry and, if the stem breaks, the plant dies.

MANAGEMENT

Prevention – what to do before signs are seen

Cultural approaches: Although the main method of control of blast is the use of resistant varieties, nevertheless, cultural practices help to lessen the disease and should always be considered.

Plant blast-resistant or tolerant varieties, especially NERICA varieties – hybrids between *Oryza sativa* and *O. glaberrima* bred by AfricaRice, that have high yield potential and short growth cycle. These include NERICA 9, 12, 15, 16 and 18, which have done well in Burkina Faso, Guinea, Mali and Nigeria. Additionally, lowland WITA varieties have been released for West and Central Africa, bred for improved grain yield, resistance to diseases (blast and rice yellow mottle virus), and tolerance to drought and iron toxicity. Check if these varieties are available locally.

Where it is possible to alter the planting date, select a time to avoid flowering coinciding with periods of high humidity, which favours blast disease. Ideally, neighbouring farmers should plant at the same time to avoid spread of blast from older infected crops to those that are younger.

During crop growth, be careful to avoid any cultural practices that weaken the plants and make them more susceptible to blast. For instance, if applying nitrogen, divide the application into two or three splits, rather than applying it all at once. If possible, avoid water stress, or extended drain periods. Flood the field as often as possible.

Chemical approaches: Treat seed of upland rice with fungicide 1-2 days before sowing to reduce seed-borne infections of blast. A number of products are effective, for instance captan and mancozeb, as well as systemic products such as pyroquilon, azoles and strobilurins. Check the registration of these products and their availability.

Control – what to do after signs are seen

Cultural approaches: Although fungicides are available for controlling blast, expense and availability are major issues for smallholders, and they are rarely used. If required, use the products mentioned above for seed treatments. Treatments should be applied when symptoms of blast are first seen in the crop. Eliminate crop residues as soon as possible after harvest, to reduce the possibility of the fungus surviving to infect crops of the next season's plantings.

CAUSE

The fungus *Magnaporthe grisea* is responsible for rice blast. This is the sexual state of the fungus (created when two fungal strains combine), but it is rarely found on rice plants in the field. It is the asexual state which causes blast on rice and also grey leaf spots on wild grasses. This is known as *Pyricularia grisea*. There are many strains of blast, and analysis of them in West Africa and Asia has shown that populations vary in their ability to infect rice and cause severe damage. This variability is important in the management of the disease because it allows the fungus to overcome the resistance in breeders' varieties.

Blast is the most serious disease of rice in West Africa, particularly in upland rice, which represents about 40% of the rice cultivated in West and Central Africa. The disease affects all above ground parts of the rice plant, at all growth stages – leaf development, flowering and seed formation. Seedlings are killed and so are older plants up to the time of tillering. After tillering the plants are more resistant to the disease, but leaf and panicle infections still lower yields.

The disease is particularly serious in areas of frequent, prolonged showers and temperatures in the range of 24-28°C. This is because the leaves need to be wet for 6-8 hours for spore germination, and high humidity – close to 100% – is needed for infection and spore formation. In upland areas, conditions are favourable to the disease because differences between day and night temperatures cause dew to form on the leaves and the overall temperatures are cooler. By contrast, in lowland tropical areas, leaf infection is less, but blast is still serious in seedling nurseries and on panicles.

Spread occurs mainly from spores released on the wind. There is also spread in irrigation waters. Spores are spread long distances on air currents and wind. Survival between crops is in straw and stubble, in or on seed, through volunteer rice plants, and alternative hosts, mostly grass species.

IMPACT

Blast is one of the most destructive diseases of rice. It is estimated that the amount of rice that is lost to blast annually could feed 60 million people. However, impact varies greatly with cropping system, the varieties grown and management practices. In Africa, the impact of the disease is said to be less than that in Asia where, in many places, 2-3 overlapping crops guarantee that spores are present to cause major epidemics. There are three main reasons for this difference in Africa: (i) rice crops are often rotated with root crops and legumes, (ii) they are intercropped with non-hosts, such as sorghum, maize, cassava and vegetables and (iii) there is lower fertilizer use. However, losses are reported in upland rice in Sierra Leone (3-14%), Liberia (77%), Ivory Coast (0.5-59%) and Uganda (up to 50%), and it can also cause major damage to rain-fed lowland and irrigated rice cultivation.

DISTRIBUTION

Blast occurs in all rice-growing countries. Over 85 countries have reported the disease.

FURTHER READING

Blast (leaf and collar rot). Rice Knowledge Bank. (http://www.knowledgebank.irri.org/training/fact-sheets/pest-management/diseases/item/blast-leaf-collar).

Magnaporthe grisea. CABI Crop Protection Compendium. (http://www.cabi.org.ezproxy.library.uq.edu.au/cpc/datasheet/46103).

Magnaporthe grisea. Wikipedia. (http://en.wikipedia.org/wiki/Magnaporthe_grisea).

National Diagnostic Protocol for Rice Blast on rice only: caused by Magnaporthe oryzae. (http://plantbiosecuritydiagnostics.net.au/wordpress/wp-content/uploads/2012/12/NDP-14-Rice-blast-Magnaporthe-V1.0.pdf).

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