Rice Blast Disease

IDENTIFICATION GUIDE

Blast disease of rice was found for the first time in California rice in 1996. Blast is generally considered the most important world-wide disease of rice due to its widespread distribution (over 80 countries) and the potential to cause up to 50% yield loss when conditions are favorable for its occurrence. Blast can infect rice from the seedling stage through maturity. Infection results in lesions on most of the plant including leaves, leaf collar, stems, nodes, panicles and grain. The leaf sheath is usually not infected. The disease may also be called leaf blast, collar rot, node blast, panicle blast or rotten neck blast depending on the portion of the rice plant infected.

CAUSAL ORGANISM

Rice blast is caused by the fungus, *Pyricularia grisea* (Cooke) Sacc. The teleomorph, *Magnaporthe grisea* (T.T. Hebert) Yaegashi & Udagawa, has not been found in nature but is known to occur in laboratory culture.

SYMPTOMS—LEAF BLAST

The leaf blast phase occurs mostly between the seedling and late tillering stages. Leaf lesions begin as small whitish, grayish or bluish spots (FIG 1). They enlarge quickly under moist, warm conditions to either oval spots with gray or white centers and narrow brown or reddish brown borders (FIG 2). Lesions usually become diamond shaped or linear lesions with pointed ends. As lesions mature their centers often appear cottony on the surface and dark bluish due to the production of conidia (spores) (FIG 3). The shape, color and size of leaf lesions may vary in time due to the age of the plant or cultivar. In cases of severe or multiple infections, lesions may coalesce covering most of the leaf blades (FIG 4). When

(continued on reverse)

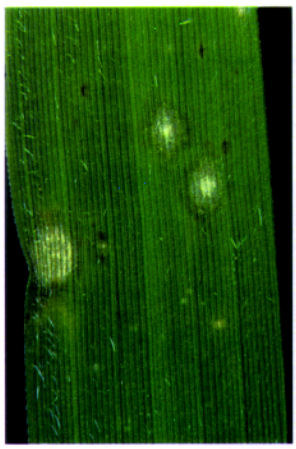

FIGURE 1 Initial leaf blast symptoms begin as gray spots, typically elliptical with gray to whitish centers.

FIGURE 2 Lesions enlarge and become typically diamond shaped with gray or white centers and narrow brown or reddish colored margins.

FIGURE 3 Mature lesion. Cottony appearance of the center is due to production of conidia.

FIGURE 4 Multiple infections with lesions coalescing. Typically there is yellowing outside the reddish borders of the lesions.

conditions remain favorable for sporulation, infection and disease spread, whole plants and areas of a field may be killed (FIG 5 and 6).

COLLAR ROT

The collar rot phase occurs due to infection at the junction of the leaf blade and sheath resulting in a characteristic brown to dark brown lesion (FIG 7 and 8). Severe collar rot infection on the flag or second to last leaf often kills the entire leaf (FIG 9).

FIGURE 5 Early infection center of leaf blast showing killed plants.

FIGURE 6 Area in older field showing spot where leaf blast has killed plants.

FIGURE 7 Collar rot symptoms resulting from infection at the junction of the leaf blades.

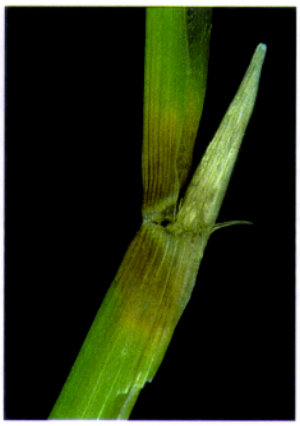

FIGURE 8 Close up of collar rot.

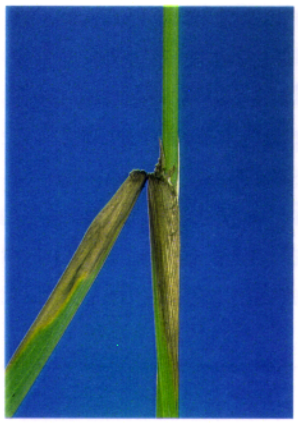

FIGURE 9 Collar rot where leaf has been killed.

NODE BLAST

Lesions on stem nodes cause the rice tissue to turn blackish and to shrivel as the plant approaches maturity. The infected area may become dark purple to blue gray due to the production of conidia by the fungus (FIG 10). Culms and leaves become straw colored and then die above the infected node. Node blast may cause the plant to lodge or break off at the infected nodes.

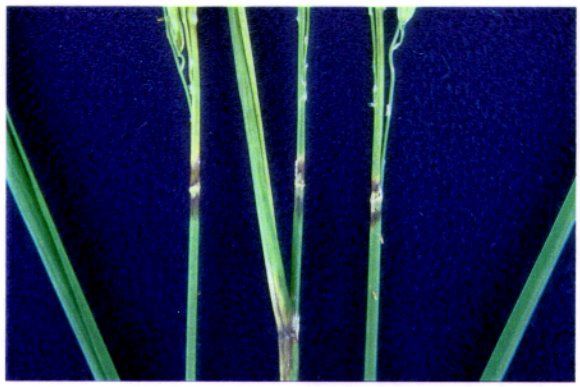

FIGURE 10 Node infections showing dark color and sporulation of the blast fungus.

NECK ROT, ROTTEN NECK AND PANICLE BLAST

The neck rot or rotten neck blast phase is caused by infection of the neck node. Rotten neck symptoms appear at the base of the panicle starting at the node (FIG 11). The infected tissue turns dark brown to black and shrivels often causing the stem to break. Panicles usually turn straw colored and are either completely or partially blanked (FIG 12 and 13). Often they break and the heads fall to the ground. Panicle branches and glumes may also be infected (FIG 14). Florets that don't fill usually turn grayish in color.

FIGURE 11 Infected node and healthy node showing early symptoms of neck blast.

FIGURE 12 Typical neck blast. Note infected node below killed panicle.

FIGURE 13 Blasted panicle. Note dark purple to black color of infected node and empty glums.

FIGURE 14 Panicle blast where only some of the panicle branches are affected due to infection of the rachis of the branches.

Infections resulting in neck rot or rotten neck blast and panicle blast are the most injurious often resulting in severe yield loss. Blasted panicles turn straw colored before the normal maturation of healthy panicles and are easily visible in the field (FIG 15 and 16).

FIGURE 15 Straw colored blasted panicles appear soon after neck blast infection.

FIGURE 16 Close up of blasted panicles in the field.

BLAST DISEASE CYCLE

The blast pathogen over seasons in infected crop residue or in seed. Weed hosts have been reported, primarily from studies in the greenhouse, but little is known of the importance of inoculum from weed hosts in the field. Infected residue is probably the most important source of inoculum under the culture conditions practiced in California.

The Blast pathogen may go through several disease cycles in a single season. Each begins when a blast spore (conidium) infects and produces a lesion on the rice plant, produces new spores on the lesion and they are dispersed to another area on that plant or other plants. Most dispersion and spread of spores is through the air. As a result, rice in a field without leaf blast may develop collar and neck blast from airborne spores.

When environmental conditions are favorable for sporulation and infection, a single-cycle of disease may occur within 7–10 days with individual lesions producing thousands of spores. This may result in several disease cycles providing exponential amounts of air-borne inoculum (conidia) to cause the various stages (leaf, collar and neck) of blast throughout the season.

ENVIRONMENTAL CONDITIONS FAVORING BLAST

Environmental conditions that favor the occurrence of the blast disease include extended periods of free moisture on plant surfaces and temperatures at night between 63–73 °F with little or no wind and high relative humidity. Conidia are produced and released under high RH with no spore production below 89% RH. Leaf wetness or free moisture from dew or other sources is required for infection to occur. Optimum temperatures for germination, infection, lesion formation and sporulation are 77–82 °F.

BLAST DISEASE MANAGEMENT

Management of the blast disease requires an integrated approach including resistant cultivars, cultural practices and fungicides. California cultivars are all susceptible to blast and thus resistance is not available at this time. Destruction of infested residue, use of non-infested seed, water seeding, continuous flood and avoidance of excess nitrogen fertilization are culture practices recommended to limit the prevalence and severity of the disease.

Quadries is now registered for use on rice in California. The fungicide is intended as a protectant against the neck rot phase of the disease and if used should be applied in accordance with the product label.

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