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Rice Diseases

J. Allen Wrather and Einar W. Palm, Department of Plant Pathology
Joseph H. Scott, Department of Agronomy
College of Agriculture

Diseases cause rice crop yield reductions in Missouri each year. No estimates of the impact of these diseases on rice production are available; however, any loss is too much. Crop loss due to diseases can be minimized by following certain preventive measures (See *General Control Measures*). The best disease control practice often is dependent upon specific diseases in the crop. It is, therefore, beneficial to identify rice diseases for efficient use of control practices.

This publication is designed to help growers identify rice diseases by their symptoms, and to provide disease control recommendations. Fortunately, most rice diseases can be diagnosed by the plant's symptoms. Variations in symptoms, however, may occur due to different growing conditions and different rice varieties.

Major Diseases

Seedling Blight. Seedling blight causes rice stands to be spotty, irregular, and thin. This sometimes has serious effects on total production.

Several fungi, such as *Rhizoctonia, Pythium,* and *Fusarium* species, are responsible for infections of seeds and young seedlings. The symptoms of these infections are dead or weakened seedlings, sometimes referred to as damping-off or cold weather injury (Figure 1).

Damage occurs when the seed- or soil-borne organisms attack the seeds or the emerging seedlings. Weak or damaged seeds lack the vigor necessary to germinate rapidly and establish healthy seedlings. Those weak seedlings are especially vulnerable to the soil fungi that cause seedling diseases. How widespread and severe blights become in a rice field depends chiefly on (1) the percentage of infected seeds, (2) low soil temperatures at time of germination, and (3) high soil moisture from germination to post-emergence.

Control. Losses from seedling blight can be reduced by use of good quality seeds treated with a suitable fungicide (Table 2), and by following other *General Control Measures*.

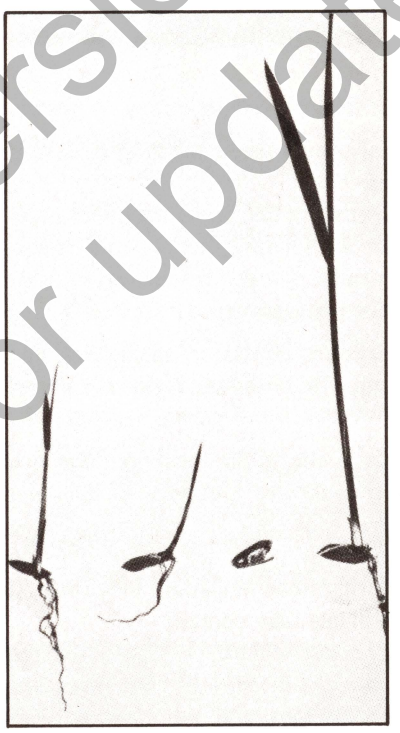

Figure 1. Three blighted rice seedlings and a healthy one, at right.

Brown Leaf Spot. The disease is found on leaves, leaf sheaths, panicles, branches, glumes, and grains. The first symptom of this fungus disease, caused by *Drechslera oryzae* (formerly, *Helminthosporium oryzae*), is the appearance of small oval to circular brown spots (1/16 to ⅛ in. diameter) on the leaves. On severely affected plants, large parts of the leaf area may be damaged before the grain is mature. This adversely affects carbohydrate production in the leaves and results in reduced yield and seed quality.

Infection of the hull causes it to become black. This may result in seed infection and reduced grain quality. This symptom may be confused with kernel smut. Brown spot can be distinguished from kernel smut by rubbing the blackened hulls with a finger. If a black smudge appears on the finger, kernel smut is present. If not, the discoloration is brown leaf

Figure 2. Sheath blight symptoms appear on the sheaths enclosing the stems just above the water line.

spot. The same fungus also may cause seedling disease if infected seeds are planted.

The disease is prevalent when rice plants are under stress from abnormally low or high temperatures, cold water, improper herbicide treatments, nitrogen deficiency, or other conditions unfavorable for plant growth.

Control. Control measures consist of identifying and elmininating stresses along with observing *General Control Measures*.

Sheath Blight. This is one of the most common rice diseases in Missouri. It is caused by a fungus, *Rhizoctonia oryzae*, that normally lives in the soil. The sclerotia (resting bodies of the fungus about ⅛ in. in diameter) survive in the soil during the winter. During flood irrigation, they float on the water and can infect plants they contact.

Disease symptoms are water-soaked spots just above the water line on the leaf blades and the sheaths. The spots turn gray-green, have irregular outlines, and red-brown borders (Figure 2). The entire leaf can be killed as the lesions enlarge. Black sclerotia can be seen in the center of these spots, and they can easily be detached.

Infection usually occurs in late tillering or early heading stages during periods of warm, moist weather. When infection occurs early, plants are killed before the grain is mature. This can cause losses in both yield and quality.

The pattern of damage in the field usually will be sunken spots (1-3 ft. in diameter) most apparent when seen at harvest from the combine. When the disease is very severe, these spots connect to form large damaged areas. Dense foliage caused by thick stands and excessive nitrogen fertility enhance disease development.

Control. Damage can be reduced by following the *General Control Measures*.

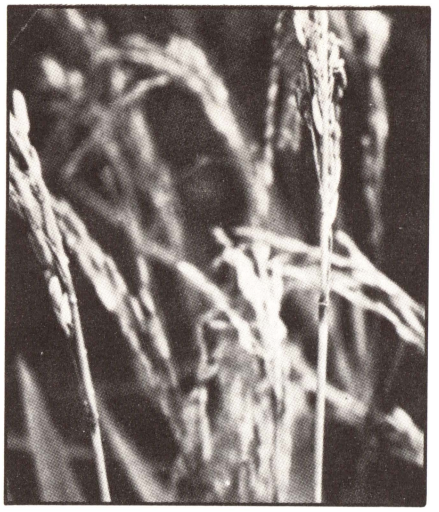

Figure 3. Rottenneck symptoms of blast.

Blast. This disease is caused by a fungus known as *Pyricularia oryzae*. This micro-organism overwinters in rice seeds and infected rice trash. The fungus can be spread from these two sources to new rice plants during the next growing season and, thus, starts the disease. Losses from blast varies from none to very severe, depending on the presence of inoculum, weather conditions, and the rice variety grown.

Symptoms occur on leaves, nodes, and panicles, but seldom on the leaf sheaths. Leaf spots are typically elliptical with more or less pointed ends, grayish centers, and brown margins. Leaf symptoms of blast can be distinguished from

General Control Measures

Disease losses can be minimized by following these preventive measures:

1. Practice crop rotation to avoid the buildup of disease-causing organisms.
2. Destroy previous crop stubble at least six weeks prior to expected planting date unless rice is following rice. In this case, destroy the stubble as soon after harvest as feasible.
3. Use the least susceptible variety to the most prevalent diseases in the field's history (Table 1).
4. Use good quality seeds treated with a good fungicide (Table 2).
5. Prepare a suitable seedbed, and plant during the time recommended for the variety.
6. Avoid excessive plant population. A stand of 15-20 plants/ft_2 is desirable.
7. Control grasses and other weeds.
8. Apply nitrogen fertilizer at the time and rate recommended for the variety.
9. Use a recommended foliar fungicide if blast, stem rot, sheath blight, or brown spot are problems. (Consult current recommendations from area extension agronomist or state extension plant pathologist for labeled fungicides).

brown leaf spot symptoms because blast spots are longer and develop more rapidly.

The disease can occur on the nodes (joints) causing a dark discoloration of the nodes. This can cause the death of the stem and panicle above the infected nodes, and the plants may break over at this point.

The most obvious symptom of blast results when the fungus attacks the base or branches of the panicle (Figure 3). The infected portions often break over. This stage of the disease is referred to as "rotten-neck." Affected panicles range from completely blank to near normal, depending on the stage of development when infections occur. Quality is reduced when kernels are only partially filled at the time of disease development.

Lush, dense foliage due to thick stands and excess nitrogen accompanied by frequent rains, heavy dews, and extended periods of high relative humidity are favorable for the development of the disease. The disease can be spread rapidly by spores produced by the fungus in the infected portions of the plants. These spores are blown easily by wind and infections may occur downwind.

Control. In addition to *General Control Measures,* the following specific practices are helpful:

- Apply small increments of nitrogen during mid-season —no more than 30 lb/acre per application.
- Manage flood water to maintain adequate but not excessive depth.

Stem Rot. This disease is caused by a fungus, *Sclerotium oryzae,* which usually begins to appear in the field during the later stages of rice plant growth. Stem rot starts with small, black, irregular lesions near the water line on the outer leaf sheaths. The lesions enlarge and the disease can progress through the outer sheaths into the inner leaf sheaths. Brown-black lesions appear on the stems with penetration into the stems. Stems can be rotted and lodged. On splitting the stems, dark grey mycelium (fungus growth) is found within the hollow stems; and small black sclerotia (overwintering structures of this fungus) can be seen on the stem's inner surface (Figure 4).

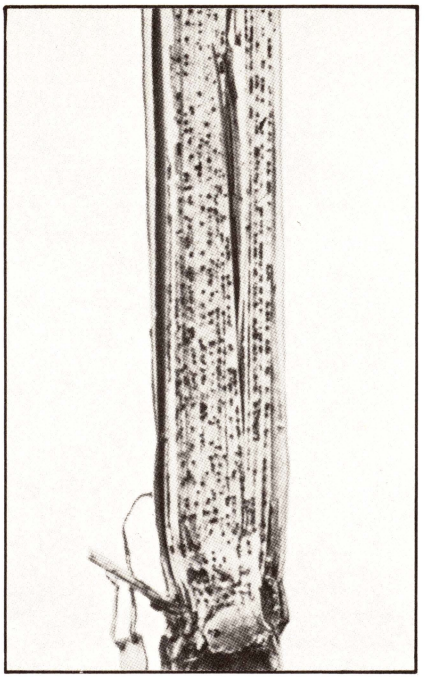

Figure 4. Stem rot is identified by black fruiting bodies on the stem's inner surface.

Infections start from these sclerotia that overwinter in the soil, float to the surface of the flood water, and rest against a plant stem. If infections occur early, reduction in grain yield and quality results.

Control. Stem rot may be worse on potassium-deficient soils. Specific control measures in addition to *General Control Measures* are:

- Apply potash fertilizer according to soil test recommendations.
- Avoid draining water from a field with a history of stem rot into a field where the disease has not occurred.
- Do not use rice straw for erosion control on banks of ponds or reservoirs used for irrigating rice.

Table 1. Reactions[a] of Recommended Rice Varieties to Diseases.[b]

Variety	Grain Type	Sheath Blight	Blast	Stem Rot	Straight Head	Kernel Smut	Brown Spot
Starbonnet	Long	6	5	7	3	6	6
Bonnet 73	Long	6	6	7	3	7	4
Lebonnet	Long	8	2	7	3	4	4
Labelle	Long	8	2	6	2	5	5
Nato	Medium	5	8	6	6	6	5
Nova 76	Medium	5	4	5	7	4	5
Brazos	Medium	7	8	5	5	3	6
Nortai	Short	4	4	5	2	2	4

[a]Degree of susceptibility: 1 = least susceptible to 9 = most susceptible. Ratings indicate potential damage under conditions favorable for development of the specific disease.

[b]Ratings based on currently available research data and observations of University of Arkansas, USDA-ARS, and State Cooperative extension specialists and researchers.

Figure 5. With straighthead, the rice matures, but most heads contain so few grains that they remain upright.

Straighthead. When straighthead occurs, the panicles usually remain upright at maturity because of failure of grain development. The plants may be unusually dark green during the early vegetative stage of growth, and this intense color may persist. Hulls may be distorted into a "parrot beak" shape, especially on long-grain varieties. Missing or blank florets (empty) may occur. In some cases, shoots may develop from lower nodes. In severe cases, panicles may fail to develop (Figure 5).

The cause is unknown. Straighthead can be induced by arsenic residues in the soil, but other factors also can induce the disease. The disease is likely to occur in fields that have had arsenicals (MSMA, calcium arsenate, etc.) applied or in fields with a previous history of straighthead. Light soils with high organic matter or fields with sandy subsoils are also likely to exhibit the disease. Rice plants on clay soils seldom have the disease.

Control. Use the least susceptible varieties, and drain fields to allow the soil to dry to the point of cracking.

Kernel Smut. This fungus, *Tilletia barclayana*, attacks the rice embryo. Symptoms of this disease are seen as the plants approach maturity. Gross appearance may be similar to that caused by the brown leaf spot organism on the hulls (see description under brown leaf spot to help distinguish the two diseases). When the kernels are examined, diseased ones show minute, black pustules or streaks bursting through the glumes. Sometimes the entire grain is replaced by a powdery, black mass of smut spores.

The disease is favored by warm, rainy weather and by high rates of nitrogen fertilizer. Losses from this disease are seldom severe.

Control. None is recommended.

Table 2. Rice Seed Treatments.

Chemical	Rate	Application	Manufacturer
Vitavax R (Flow) Carboxin 17%+ Thiram 17%	3-4 oz/100#	Slurry	Uniroyal
Difolatan 4F Captafol 39%	4-6 oz/100#	Slurry	Chevron
Orthocide 4F Captan 35%	3 2/5 oz/100#	Slurry	Chevron
Terr-Coat L-205 PCNB 23.2%+ Terraz. 5.8%	2-4 oz/bu.	Spray mist	Olin
Arasan 70-S 70% Thiram+ 2% Methoxychlor	1 oz/bu.	Slurry	DuPont
Captan 25 Captan 25%	6 oz/bu.	HB	Stauffer

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