Rice

Rice Diseases

Best results in disease management are achieved when an integrated pest management (IPM) strategy is used. The combination of host resistance, cultural practices and reasonable use of fungicides offers better disease control than these methods applied isolated. Overall, varieties with some levels of disease resistance are available for most of the relevant rice diseases, and their use is encouraged. Unbalanced mineral fertilization and late planting are frequently associated with severe disease epidemics for most diseases. Because the list of labeled fungicides may change, check with your cooperative extension agent for current recommendations. Fungicide timing is critical for disease control (Table 1 and Figure 1).

- **Bacterial Panicle Blight (BPB):**
  Bacterial panicle blight, caused by the bacterias *Burkholderia glumae* and *B. gladioli*, is one of the most important rice diseases in the South. The disease is associated with warm temperatures (day and night) and moisture. Losses include reduced yields and poor milling. The bacteria are seed-borne, survive in the soil and live on the surface of the leaves and leaf sheaths following the canopy up.

  The bacteria infect the grain at flowering and cause grain abortion and rotting during grain filling. The disease is first detected as a light- to medium-brown discoloration of the hulls' lower third to half shortly after emergence. The stem below the infected grain remains green. Pollination occurs, but the grain aborts sometime after grain filling begins. Rain splash can disperse the bacteria on the plant surface to other plants, developing a circular pattern in the field with the most severely affected panicles in the center remaining upright because of grains not filling.

  No chemical control measures are recommended. Fungicide application will not control or prevent BPB. Some varieties have more resistance than others. Rice planted later in the season and fertilized with high nitrogen rates tends to have more disease.

- **Blast:**
  Blast is caused by the fungus *Pyricularia grisea*. The leaf blast phase occurs between the seedling and late tillering stages. Leaf spots begin as small white-, gray- or blue-tinged spots and then enlarge quickly under moist conditions to either oval diamond-shaped spots or linear lesions with pointed ends with gray or white centers and narrow brown borders. Leaves and whole plants are often killed under severe conditions. Rotten-neck symptoms appear at the base of the panicle, starting at the node soon after heading. The tissue turns brown to chocolate-brown and shrivels, causing the stem to snap and lodge. Panicle branches and stems of florets also have gray-brown lesions.

  Varieties with good resistance are available, although new races can develop fast and overcome genetic resistance. Scouting for blast should begin early in the season, and the flood must be maintained. Areas of heavy nitrogen fertilization and edges of the fields are also potential sites. If leaf blast is in the field or has been reported in the same general area and if the variety is susceptible, fungicide applications are advisable to reduce rotten-neck blast. The absence of leaf blast does not mean rotten-neck blast will not occur. Fungicide timing is critical (Table 1 and Figure 1). If a single fungicide application is used to control blast, it should be applied when 50% to 70% of the heads have begun to emerge. Application before or after this growth stage will not control this disease well. This growth stage is very difficult to detect, so it is important to scout for the crop growth stage at the same time as scouting for disease. Allow time to obtain a fungicide, schedule the application, and consider the chances of poor weather conditions. Under heavy blast pressure and conducive weather conditions, two applications, one at boot and one at 50% to 70% heading, may be needed to suppress blast effectively.

- **Cercospora:**
  This disease is caused by the fungus *Cercospora janseana*, and symptoms can develop on the leaf, sheath, panicle and grains. Similarly to blast, different names are used for this disease depending on the infected site. When symptoms occur in the leaf, the disease is referred to as **narrow brown leaf spot (NBLS)**, with linear and reddish-brown lesions along the leaf blade as the classic symptoms of NBLS. Some variation of the disease symptoms can be observed depending on the cultivar's resistance, with more susceptible varieties having wider, more numerous, and lighter brown with gray necrotic centers. Spots usually appear near or after heading growth stage, but both young and old leaves are susceptible. When symptoms develop on the sheath, the disease is called **Cercospora net-blotch (CNB)** due to the brown cell walls and the tan-to-yellow intracellular areas forming a netlike pattern. When infection occurs in the panicle, it can be referred to as **Cercospora panicle blight (CPB)**, where branches of the seed heads can become infected, causing premature ripening and unfilled grains. Symptoms of CPB can be confused with blast rotten-neck and panicle blast lesions, but CPB symptoms usually are darker brown and develop in the internodal area of the neck. Glumes can also be infected, causing significant discoloration and necrosis, and grain infected appears as a diffused brown discoloration. The distinction between NBLS, CNB, and CPB is important because some varieties can have some genetic resistance to NBLS, such as those with CRPS2.1 gene, but not CNB and CPB.

  The disease's intensity is intermittent between years but is often severe on late planting fields and in the second crop. Warm, rain, and conditions that prolong leaf moisture favor the disease infection and development. However, it can take up to 30 days from the infection to the development of visible symptoms. The best fungicide timing for NBLS is between early boot to heading growth stages (Table 1 and Figure 1). However, the later the rice is planted, the earlier the fungicide must be applied. Triazoles fungicides, such as propiconazole and difeconazole, provide the best efficacy.

- **False Smut:**
  The false smut fungus, *Ustilaginoidea virens*, infects rice at flowering. The disease is characterized by large orange to olive-green spore masses that replace one or more grains on the panicle. In the middle of the spore masses are sclerotia that act as the survival structure. These sclerotia can be spread with the seed and infect the next crop. Removal of the sclerotia in seed cleaning reduces spread. A fungicide seed treatment also reduces inoculum potential. False smut spores cause discoloration of milled rice, but no significant yield loss is associated with the disease. The presence of the smut sclerotia in grain for export has caused problems. Some foliar fungicides applied at boot can reduce disease incidence. Research results indicate the 2- to 4-inch panicle in the boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.
- **Grain and Head Disorders:**
  Many fungi and bacteria infect developing grain and cause spots and discoloration on the hulls or kernels. Damage by the rice stink bug also causes discoloration of the kernel. Kernels discolored by fungal infections or insect damage are commonly called pecky rice. This complex disorder in rice involves many fungi, the white-tip nematode, and insect damage. High winds at the early heading stage may cause similar symptoms. Proper insect control and disease management will reduce this problem.
- **Kernel Smut:**
  Kernel smut symptoms appear just before maturity. A black mass of smut spores replaces all or some of the seed's endosperm. Often, the spores ooze out of the grain, leaving a black mass along the seam of the hulls. The fungus, *Tilletia barclayana*, overwinters as spores in the soil of affected fields and seeds. Significant yield reductions are possible, but usually, the damage is limited to grain quality. High nitrogen rates favor disease development. Research results indicate that boot applications of demethylation inhibitors (propiconazole and difenoconazole) reduce damage significantly. Applications after boot split have little, if any, activity.
- **Sheath Blight:**
  Sheath blight is one of the most important diseases in rice in Louisiana. It is characterized by large oval spots on the leaf sheaths and irregular spots on the leaf blades. Infections usually begin during the late tillering/joint-elongation stages of growth. The fungus, *Rhizoctonia solani* AG-1, survives between crops as structures called sclerotia or as hyphae in plant debris.

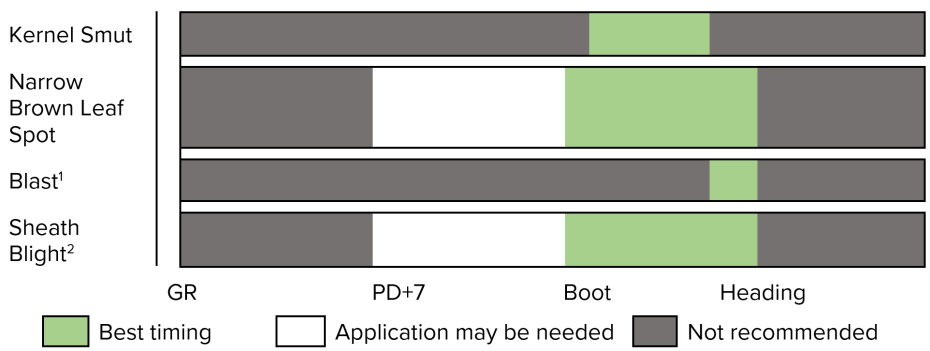
  Sclerotia on plant debris floating on the surface of irrigation water serve as sources of inoculum that attack and infect lower sheaths of rice plants at the waterline. Fungal mycelium grows up the leaf sheath, forms infection structures, infects and causes new lesions. The infection can spread to leaf blades. After the panicle emerges from the boot, the disease progresses rapidly to the flag leaf on susceptible varieties. With very susceptible varieties, the fungus will spread into the culm from early sheath infections, weakening them and causing tillers to lodge.

  As lesions coalesce on the sheath, the blades turn yellow-orange and eventually die. Damage is usually most common where wind-blown, floating debris accumulates. Disease severity can be reduced by integrating several management practices. Dense stands and excessive use of nitrogen fertilizer both tend to increase sheath blight damage. The same pathogen also causes aerial blight on soybeans. Therefore, rotation with soybeans or continuous rice increases the amount of inoculum in soils and should be avoided when possible. Fungicides are available for managing sheath blight. Avoid late application beyond 50% to 70% heading (Table 1 and Figure 1). In some areas of south Louisiana, the fungus has developed resistance to the strobilurin fungicides (e.g., azoxystrobin), and the use of other modes of action, such as carboxamides (e.g., flutolanil), is recommended where fungicide resistance was detected.
- **Sheath Rot:**
  Sheath rot is caused by the fungus *Sarocladium oryzae*. Symptoms are most severe on the uppermost leaf sheaths that enclose the young panicle during the boot stage. Lesions are oblong or irregular oval spots with gray or light brown centers and a dark reddish-brown diffuse margin. Early or severe infections may affect the panicle so that it only partially emerges. The non-emerged portion of the panicle rots with florets turning reddish-brown to dark brown. A powdery white growth consisting of spores and hyphae of the pathogen is usually observed on the inside of affected leaves. Insect or mite damage to the boot or leaf sheaths increases the damage from this disease. Emerged panicles may be damaged with florets discolored reddish-brown to dark brown and unfilled. Some varietal resistance is available. The disease is usually minor, affecting scattered tillers in a field and plants along levees. Occasionally, large areas may have significant damage. No control measures are currently recommended.
- **Stem Rot:**
  The fungus *Sclerotium oryzae* causes stem rot. Losses are not usually detected until late in the season when control practices are ineffective. Damage appears as severe lodging, which makes harvesting difficult. Seed sterility also has been reported. No high level of resistance to stem rot is available. High nitrogen and low potassium levels favor the disease. Stem rot is more serious in fields that have been in continuous rice for several years. The pathogen overwinters as sclerotia in the top 2 to 4 inches of soil and in plant debris. During early floods, sclerotia float to the surface, contact plants, germinate and infect the tissues near the water surface.

The first symptom is a black angular lesion on leaf sheaths near the waterline at tillering or later growth stages. As lesions develop, the outer sheath may die as the fungus penetrates the inner sheaths and the culm. These become discolored and have black or dark brown lesions. At maturity, the softened culm breaks, plants lodge, and numerous small, round, black sclerotia develop in the dead tissues. The fungus can continue to develop in the stubble after harvest, and numerous sclerotia are produced. Control measures include burning or cultivating stubble after harvest to destroy sclerotia, using crop rotation when possible, applying potassium fertilizer, and avoiding excessive nitrogen rates. Fungicide applications used against other fungal diseases may reduce stem rot damage.

- **Straighthead:**
  This physiological disorder is associated with sandy soils, fields with arsenic residues, or fields having anaerobic decomposition of large amounts of organic matter incorporated into the soil before flooding. Panicles are unfilled and upright at maturity or do not emerge from the flag leaf sheath. Hulls may be distorted and discolored, with portions missing or reduced in size. Distorted florets with a hook on the end are called “parrot beak” and are typical of straighthead. Plants are darker green or blue-green and often produce new shoots and adventitious roots from the lower nodes. These symptoms can be confused with herbicide damage. Management is accomplished by using resistant varieties and draining the field approximately ten days before internode elongation (green ring), allowing the soil to dry until it cracks. This growth stage can be determined by slicing the crown of the plant lengthwise and counting the nodes. When three nodes are distinctly visible, internode elongation is approximately ten days away. It is important that the flood be established again by internode elongation.

Figure 1: Rice Fungicide Timing



[1] Susceptible varieties under high disease pressure may require an application at the boot stage followed by 50-70% heading.

[2] An early application may be necessary if a sheath blight appears before the boot stage.

Rice Disease Management

The yield potential of any rice variety can be severely reduced under high disease levels. Management strategies with integrated pest management have a higher chance of successfully maintaining the disease below economic damage levels. It is important to have a comprehensive understanding of the field’s history and variety’s disease resistance package to plan the disease management strategy. Avoid scenarios that can increase the risk for multiple diseases. For example, late planting with a susceptible variety for sheath blight and blast in a field with historical problems for sheath blight may require multiple fungicide applications with uncertain control efficacy or investment return. For overall disease management, consider the following:

- Field disease’s historic from pathogens that can survive in the soil (e.g., kernel smut). Also, consider crop rotation that can host rice pathogens, such as soybean aerial blight and rice sheath blight.
- Choose varieties with some level of genetic resistance.
- Avoid late planting as rice is more likely to encounter foliar disease problems.
- Maintain proper fertility levels.
- Maintain adequate irrigation flood, especially for varieties susceptible to blast.
- Use fungicides at the correct growth stage when necessary.
- Consider the yield potential, cost application, and overall disease intensity and risk for fungicide application.
- Rice cultivated for seed production purposes should have the minimum disease risk tolerance.
- If a ratoon crop is planned, disease not suppressed in the first crop may cause significant damage in the second crop.
- Plan to scout the fields frequently to assess the disease intensity, especially if the weather is conducive to disease development.

Rice disease control using a single fungicide application can be difficult because of fungicide resistance and multiple diseases requiring different timings for effective control. Rice producers are encouraged to use full labeled rates, rotate modes of action when possible, and use multiple fungicide applications when justified to effectively and economically manage rice diseases.

Fungicide timing is critical for disease control (Table 1 and Figure 1). Some growth stages are difficult to detect, and plant development may be uneven in the field, so scouting for disease and growth stages should be done frequently and throughout the entire field. Also, consider the logistics for fungicide application. Allow time to obtain a fungicide, schedule the application, and the chances for poor weather conditions that can prevent the application at the correct time.

Table 1: Rice variety reactions to common diseases in Louisiana.

Table Legend

Rating	Abbreviation
Very Susceptible	VS
Susceptible	S
Moderately Susceptible	MS
Moderately Resistant	MR
Resistant	R
Unknown	-

Varieties labeled "S" or "VS" for a given disease may be severely damaged under conditions favoring disease or disorder development.

Variety	Blast	Sheath Blight	Narrow Brown Leaf Spot	Bacterial Panicle Blight	Straighthead
Addi Jo	R[1]	S	MR	MR	MR
Aroma22	S	MS	MR	MS	MS
Avant	S	S	MR	S	MR
Cheniere	MS	S	S	MS	MS
CL111	R[1]	VS	S	VS	MS
CL151	VS	S	S	VS	VS
CL153	R[1]	S	MS	MS	MS
CLJ01	MS	MS	MS	S	MS
CLL16	R[1]	S	MR	S	MR
CLL18	MS	MS	MR	-	MR
CLL19	R[1]	S	MS	S	S
CLM04	MS	MS	MR	MR	S
Della-2	MS	S	MS	MS	R
DG-263L	MR	S	R	MS	MR
Frontiere	-	S	S	-	S
Jazzman	MR	MS	S	S	MS
Jupiter	S	MS	S	MR	S
Mermentau	S	S	S	S	S
PVL03	R[1]	S	MS	MR	MR
PVL04	– [1]	S	MR	-	S
RT7301[2]	MR	MS	MR	MS	R
RT7302[2]	-	MR	MR	-	MR
RT7331MA[2]	-	MR	MR	-	MR
RT7421FP[2]	-	MR	MR	-	MR
RT7431MA[2]	-	MR	MR	-	MR
RT7521 FP[2]	MR	MS	MR	MR	R
RT7812	-	MR	MR	-	MR
Taurus	S	MS	MS	S	MS
Titan	S	S	MS	MS	S

[1] Varieties with Pita-2 gene, known to confer resistance to most common blast races.

[2] Marker data not available for RiceTec products.

Table 2: Efficacy of fungicides in managing rice diseases.

Table Legend

Rating	Abbreviation
Poor	P
Fair	F
Good	G
Very Good	VG
Not Labeled for use against this disease.	NL

Varieties labeled “S” or “VS” for a given disease may be severely damaged under conditions favoring disease or disorder development.

Class and Mode of Action Group[1]	Active Ingredient	Product(s)[2]	Rate (fl oz) [3]	Blast	Sheath Blight	Sheath Blight Qol Resistant	Cercospora	Kernel Smut
Qol Strobilurins Group 11	Azoxystrobin	Quadris 2.08 SC	9-15.5	G	VG	P	P	P
Qol Strobilurins Group 11	Generic	Others						
Qol Strobilurins Group 11	Trifloxystrobin	Flint Extra	3.1-4.7	VG	G	P	NL	NL
Carboxamides Group 7	Flutolanil	Elegia 3.8 F	12-32	NL	G	G	NL	NL
Demethylation Inhibitors (DMI)	Propiconazole	Tilt 3.6 EC	6-10	NL	F	F	G	G
Group 3	Generic	Others						
Mixed[4]	Azoxystrobin	Quilt Xcel 2.2 SE	14-27	G	VG	P	G	G
Mixed[4]	Propiconazole	Others						
Mixed[4]	Azoxystrobin	Amistar Top	10-15	G	VG	G	G	G
Mixed[4]	Difenoconazole	Other						

[1] Mode of action groups are determined by the Fungicide Resistance Action Committee (FRAC).

[2] Reference to commercial or trade names is made with the understanding that no discrimination is intended nor endorsement of a particular product by LSU or the LSU AgCenter is implied. Many products have specific use restrictions about the amount of active ingredient that can be applied within a period of time or the amount of sequential applications that can occur. Please read and follow all specific use restrictions prior to fungicide use. This information is provided only as a guide. It is the responsibility of the pesticide applicator by law to read and follow all current label directions. Members or participants in the CDWG assume no liability resulting from the use of these products.

[3] Rates are the amount of formulation (product) per acre unless otherwise indicated.

[4] Refer to product label for the fungicide class and mode of action group.

The rice section was revised October 2023 by Felipe Dalla Lana.