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# Some Common Diseases of Rice in Florida[1]

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Production of rice in Florida is primarily located in the Everglades Agricultural Area, south of Lake Okeechobee in southern Florida. During the months of February to April, rice is planted on about 16,000 acres and is harvested from June to early November. After the main crop is harvested, rice regrowth occurs and this is known as a ratoon. In any given season, 50 to 100 percent of the rice crop in Florida is ratoon harvested. Rice is usually grown in rotation with sugarcane and vegetables on muck soils (Histosols) with organic matter contents in excess of 80 percent.

Diseases may seriously limit the production of rice. Effective control is based on accurate diagnosis of these diseases. This fact sheet describes the symptoms of several commonly observed diseases found in rice fields of southern Florida and provides some suggestions for control.

## Blast

Blast is caused by the fungus *Magnaporthae grisea* (also known as *Pyricularia grisea* and formerly known as *Pyricularia oryzae*). It occurs in most rice growing areas of the world. It is considered to be one of the most important diseases of rice because of its wide distribution and destructiveness. Under conducive environmental conditions, blast may cause severe yield losses. Frequent rainfall, heavy dews, and relative humidities of 89 percent or greater, coupled with warm weather favor the development of blast. The optimum temperature for development of blast is 82°F, but portions of the life cycle are active at temperatures near 48°F. Rain may influence panicle infection by increasing sporulation and extending dew periods. A minimum of 9 hours of leaf wetness is sufficient for infection to occur. Older plants and older tissue tend to be more resistant to blast.

Blast may be found on rice in the seedling stage or on the leaves, nodes, sheath, and panicle of mature plants. Symptoms on young leaves of tillering plants initially appear as small whitish, grey or dark to reddish brown spots which can be confused with brown spot. However, lesions or spots caused by blast develop more rapidly, and are narrowly elongated and spindled-or diamond-shaped with pointed ends (Figure 1). In addition, these spindled-shaped lesions have gray or white centers surrounded by brown to reddish-brown margins. However, the size, shape and color of the spots may vary depending upon environmental

**Figure 1**. Diamond-shaped blast lesion with ashen center and bronze border.

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conditions, age of the spots, and the degree of susceptibility of the rice cultivar.

In severe cases, leaves with numerous spots will be killed, followed by the drying up of the leaf sheath. Leaves then may defoliate and plants will be stunted or die. Leaves are susceptible from the seedling through the early-tillering growth stage. However, under flooded conditions leaves are less susceptible in the late-tillering growth stage and at heading.

Disease symptoms also may occur at the nodes of stems appearing as dark-brown to black lesions. Infection at the node may cause the stem to break easily and cause death of the stem and panicle.

The most commonly observed stage of this disease occurs when the fungus infects the base or neck of the panicle. The infected portion will often break over to produce the **rotten-neck** symptom (Figure 2). Dark-brown lesions may also be found in the panicle. These affected panicles will be prevented from filling. Consequently, quality and quantity of grains are drastically reduced.

**Figure 2**. Rotten-neck symptom of blast (left) and healthy plant (right).

The fungus over seasons as mycelia and spores on infected seed or straw. Spores are produced on stalk-like structures known as conidiophores. Spores may be washed down into the boot leaf sheath. Thus, the disease may be spread rapidly within and among plants by these spores. Spores are easily wind disseminated from field to field. Upon landing on rice leaves, the spore germinates and the fungus penetrates the leaf surface or enters the leaf through the stomata. After penetration, the fungus grows in the leaf and forms spots or lesions in four to five days at temperatures from 78 - 82°F. At temperatures from 48 to 52°F, lesion formation may require 13-18 days.

Control of blast is done best by using a sequence of tactics which tend to complement each other for effect. Resistant varieties are available, but be aware that different pathogenic races exist and therefore, a given variety may have resistance to certain races and not all races. Knowing what races prevail in your area should be beneficial in choosing a variety. Increasing silicon within the rice plant is beneficial in reducing blast. A pre-plant application of basic slag with silicon has been used successfully in Florida, but in the future, other forms of silicon may be available. Fungicidal sprays have been used successfully when needed. High levels of nitrogen can increase susceptibility of rice plants, but on the organic soils, nothing can be done to adjust for the naturally high levels of nitrogen. Inadequate amounts of soil water can predispose rice to blast, so maintain adequate levels of water.

## Brown Spot

Brown spot is caused by the fungus *Cochiobolus miyabeanus* (also known as *Bipolaris oryzae* and formerly known as *Helminthosporium oryzae*). This fungus is seedborne and initial infection occurs on young seedlings. This fungus infects plant parts including the leaves, leaf sheath, panicle, glumes and grain. This pathogen can survive on infected rice straw and stubble. It is spread from plant to plant and in the field by airborne spores. Disease development is favored by high relative humidities (86-100 percent) and temperatures between 68 to 78°F, but temperatures between 61 and 97°F will support development of the disease. Leaves must be wet for 8-24 hours for infection to occur. Brown spot can be more prevalent in soils deficient in potassium, manganese, magnesium, silicon, iron, and calcium.

Symptoms initially appear as small circular to oval spots on the first seedling leaves. Leaf spots are observed throughout the growing season and, as with blast, may vary in size, shape and color depending on the environmental conditions, age of the spots and the degree of susceptibility of the rice cultivar. Small spots are dark brown to reddish brown while large spots have a light reddish brown gray center surrounded by a dark to reddish brown margin (Figure 3). These older spots may have a bright yellow halo surrounding the

**Figure 3**. Circular lesions of brown spot.

lesion. Spots on the leaf sheath and hulls are similar to those on the leaves. Infected glumes and panicle branches have a black discoloration.

Severe leaf spotting is often associated with **weak** plants under stress conditions such as dense plant stands, inadequate fertilization or excess herbicides. Plants that grow in soils with nutritional deficiencies or in poorly drained soils, where nutrient uptake is hindered, are more susceptible to infection.

Severely infected leaves may die before maturity and these plants will produce lightweight or chalky kernels. Spots may also occur on the kernels. Therefore, quality of the grain and yields will be reduced.

For control, use resistant varieties, avoid nutrient-deficient soils, and avoid water stress. Also, some chemical seed treatments may be available to reduce the effects of brown spot on young plants and reduce some of the initial inoculum.

## Sheath Blight

Sheath blight is caused by the fungus *Thanatephorus cucumeris* ( also known as *Rhizoctonia solani*). Environmental conditions favoring rapid disease development are damp weather with humidities between 80 to 100 percent, and hot temperatures from 80 to 90°F. Overcast weather is highly favorable for sheath blight. Dense foliage caused by thick stands also favors disease development.

The fungus over seasons in the soil as either sclerotia (somewhat hard resting bodies of the fungus that consist of tightly bound masses of hyphae) or mycelia (masses of hyphae) in plant tissue or in the soil. When rice is flooded, the sclerotia become buoyant, float to the water surface, begin growing, and infect the plant usually after jointing begins. An oblong, water-soaked lesion first appears on the leaf sheath at or near the waterline. After a few days, the lesion will develop a grayish-white center surrounded by a dark purplish or reddish-brown margin. As the fungus grows upward, similar lesions may appear on the sheaths of the upper leaves and a wavelike band pattern may extend out on part or all of the leaf surface (Figure 4). Sclerotia will appear in the center of the spot and are easily detached. As the rice canopy closes, the fungus will continue to grow up the culm to the next leaf and eventually to the flag leaf and nearby plants.

Horizontal spreading to surrounding plants results in sunken round patches about one to three feet in diameter. When infection occurs early, plants are killed before grain matures or suffer from increased lodging or reduced ratoon production. This damage causes losses in quality and yield.

**Figure 4**. Elliptical lesions of sheath blight on flag leaf.

Control sheath blight by using resistant varieties, fungicidal sprays and the use of silicon.

## Sheath Blotch

Sheath blotch is caused by the fungus, *Pyrenochaeta oryzae*. Little is known about the environmental factors that favor the spread of this disease, but the spores are presumably dispersed by plant to plant or field to field by splashing or flowing water. Symptoms are large brown lesions or blotches on the leaf sheath (Figure 5). At first, a lesion starts from the margin of a sheath as a dark reddish-brown oblong blotch. The lesion or blotch may continue to enlarge, finally covering the entire sheath. Lesions may reach up to four inches in length. Often, lesions appear at the junction of the sheath and leaf blade just below the collar without causing the collar to break. Finally, the sheath turns greyish brown with or without distinct reddish-brown margins. This disease usually attacks the leaf sheath but can occasionally infect the leaf blade and glumes.

**Figure 5**. Oblong enlarged sheath blotch with tan center and bronze border.

## Black Sheath Rot (Crown Sheath Rot, Brown Sheath Rot)

Black sheath rot or crown sheath rot is caused by the fungus *Gaeumannomyces graminis* var. *graminis*. The

fungus survives as mycelia and perithecia in plant residues of rice and weed hosts. The spread of this disease is by ascospores that are windborne during periods of wet and humid conditions. The fungus also has been reported to be seedborne.

Symptoms usually appear late in the season after heading, but can appear during internode elongation. Sheaths on the lower part of the rice plant are discolored brown to black (Figure 6). Reddish-brown mycelial mats are found on the inside of the infected sheaths. Dark perithecia are produced within the outside surface of the sheath with beaks of the perithecia protruding through the epidermis. This disease can be confused with stem rot.

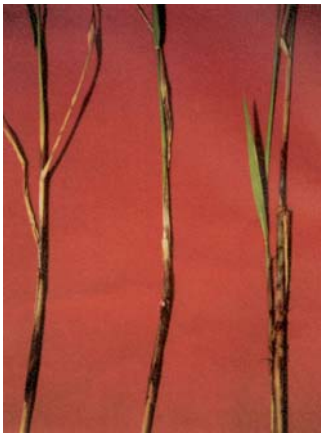

**Figure 6**. Dark purple lesions of black sheath rot on leaf sheath and collar.

Little is known about how to control this disease, but it has been observed that varieties differ in susceptibility.

## Stem Rot

Stem rot is caused by the fungus *Sclerotium oryzae (Magnaporthe salvinii)*. This fungus over seasons as sclerotia in the top two to four inches of the soil or on plant residue. When rice is flooded, the sclerotia become buoyant, float to the water surface, begin growing, and infect the plant usually after jointing begins, which is when the rice plant is most susceptible. The first symptoms are irregular black angular lesions on leaf sheaths at or near the water line on plants. The outer sheath may die as the fungus penetrates into the inner sheaths and culms. Symptoms on sheath and culms at this stage of infection are dark brown to black (Figure 7). Dark fungal mycelium on the surface and gray mycelium inside the culm and rotted tissue may be apparent. At maturity, the culm often breaks, infected plants lodge, and many small, round black sclerotia are found in the dying tissue.

**Figure 7**. Dark brown to black lesions of stem rot vertically progressing up the plant.

Control is achieved by destroying or burying old crop debris. Some varieties have been observed to be less susceptible than others.

## Narrow Brown Leaf Spot (Cercospora Leaf Spot)

Narrow brown leaf spot is caused by the fungus *Cercospora janseana (Cercospora oryzae)*. Several races have been reported. Although little information is available on how the disease spreads, the optimum temperature for growth of the fungus occurs between 77 to 82°F.

Symptoms include short, linear brown lesions most commonly found on the leaf blades (Figure 8). Symptoms also develop on the leaf sheaths, pedicels and glumes. Lesions may be narrower, shorter and darker in resistant cultivars. Symptoms appear just prior to flowering. Some premature ripening, yield reduction and lodging may occur.

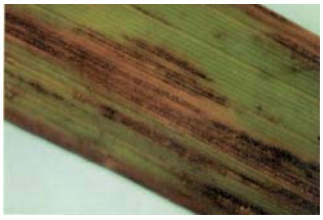

**Figure 8**. Narrow, elongated reddish-brown leaf lesions of narrow brown leaf spot.

For control, use resistant varieties if available.

## Leaf Smut

Leaf smut is caused by the fungus *Entyloma oryzae*. The fungus is spread by airborne spores and may over season on leaf debris. The fungus produces black, raised, spot-like or elongated pustules (sori). Within each sorus are teliospores that are angular-globose and black in mass. Sori occur on the upper and lower leaf surface (Figure 9). Many distinctive spots can be found on the same leaf. Teliospores survive in old crop debris. When they germinate, they produced a

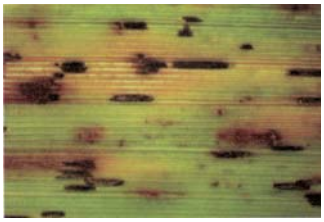

**Figure 9**. Slightly raised black linear sori of smut on leaf.

germ tube-like structure on which spores called sporidia are formed which serve as inocula for infection.

This disease normally occurs late in the growing season. Its affect on yield and maturity are not known, but generally it is considered a minor disease and thus, no control has been needed in Florida.

## Grain Discoloration

Grain discoloration is believed to be caused by numerous fungal species including *Bipolaris, Fusarium, Neovossia, Alternaria, Curvularia,* and *Nigrospora*. This disease also is associated with feeding activities of the rice stink bug, *Oebalus pugnax*. Rainfall or high humidity during grain production favor this disease. A characteristic red to brown discoloration is apparent on developing grain (Figure 10). Discolored grain is often chalky, brittle and shrunken. These factors detract from grain quality and appearance, thereby affecting its marketability.

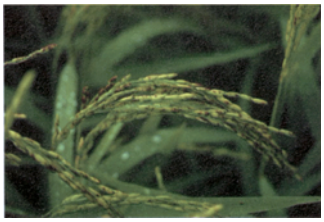

**Figure 10**. Characteristic red to brown discoloration of developing grains (grain discoloration).

Control of grain discoloration includes reduction of insects, particularly stink bugs, prevention of lodging, harvesting as soon as grains are ready for harvest, drying the harvested grains as soon as possible, and the use of silicon as in the case of blast.