Rice Diseases Atlas

TEXAS AGRICULTURAL EXTENSION SERVICE
THE TEXAS A&M UNIVERSITY SYSTEM
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Rice Diseases Atlas

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INTRODUCTION

Leaves manufacture food components that are essential for development of all plant structures, such as leaves, stems, roots and kernels. Photosynthesis is the process by which a leaf acts as a solar panel, converting light energy into organic compounds. For maximum production a plant must have healthy foliage throughout the growing season. The photosynthetic activity of the top three leaves of a rice plant is extremely high. When disease organisms attack these leaves and cause lesions an effective leaf surface for producing food material is reduced, thus decreasing yields. Several disease organisms also prevent normal grain development. Kernel smut, for example, completely replaces the endosperm with black smut spores. Other fungi may enter the flower during flowering and kill the developing endosperm. The blast fungus attacks the panicle cutting off some or all of the food supplied to developing grain, thus reducing yield. Straight head, sometimes called blight, is a nonparasitic disease of rice, which also limits grain development.

Disease losses in rice are estimated at 12 percent. This represents a net profit loss to growers since production costs remain constant with or without disease damage. Most suggested disease control techniques require changes only in cultural practices or selection of a resistant variety at little or no extra production cost. New techniques including use of foliar fungicides for disease control require proper identification of diseases to obtain maximum returns. Disease symptoms result from pathogen interaction with susceptible host

plants. Pathogenic organisms are classified as fungi, bacteria, viruses, nematodes and mycoplasma. Abnormal plant responses resulting from damage other than from pathogens are referred to as nonpathogenic diseases. Select practices to control diseases which match the most vulnerable point in the organism's life cycle. Crop rotation controls some disease organisms while other practices such as seed treatment and foliar fungicides control others. Some disease problems are solved with proper fertilization or by planting resistant varieties. No single practice solves all rice disease problems.

Correct identification of rice diseases is the first step in planning a control program. Fortunately, plant symptoms are used to identify most diseases. For example, the fungus that causes brown leaf spot produces characteristic dark brown spots surrounded by a yellow halo which are distinctly different from those produced by other organisms. This publication was developed to help growers identify rice diseases by observing symptoms. Variations in disease symptoms occur under different growing conditions and on different rice varieties. Variation usually does not cause an incorrect diagnosis if the observer considers differences in symptoms within the field. If signs or symptoms differ considerably from what is considered normal, submit a plant sample to the Plant Disease Diagnostic Laboratory for study and microscopic examination. New diseases occur and some diseases become more common. Give special attention to diseases that occur consistently and cause heavy losses, since growers benefit economically from control. Correct disease identification is essential for selecting effective cultural or chemical control practices.

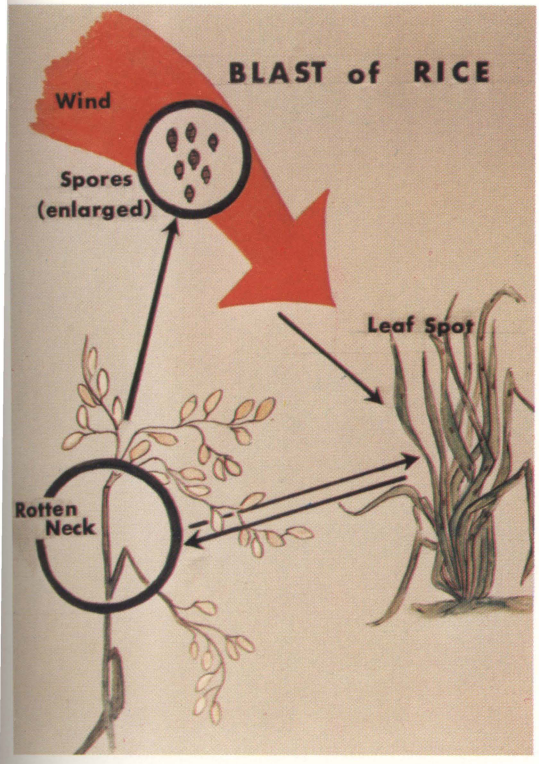
SEEDLING DISEASES

Seed decay caused by soil organisms and seedlings produced by weak or damaged seed result in poor stands. Soil contains numerous organisms capable of attacking rice seed especially when soil conditions do not favor rapid germination and seedling growth. If seed are weak or damaged or if soil temperatures are cool, poor quality seed lack the vigor necessary to germinate and establish a healthy seedling. Poor quality seed germinate slowly and are killed by soil fungi before they can establish themselves.

Seedling Disease - *(Rhizoctonia* spp., *Pythium* spp., *Fusarium* spp. and others) - The base of the sheath and roots of diseased plants are dark colored and roots may be rotted. Infected seedlings show retarded growth followed by yellowing and withering leaves. The entire plant may die. This condition is common early in the growing season when soil temperatures are cool.

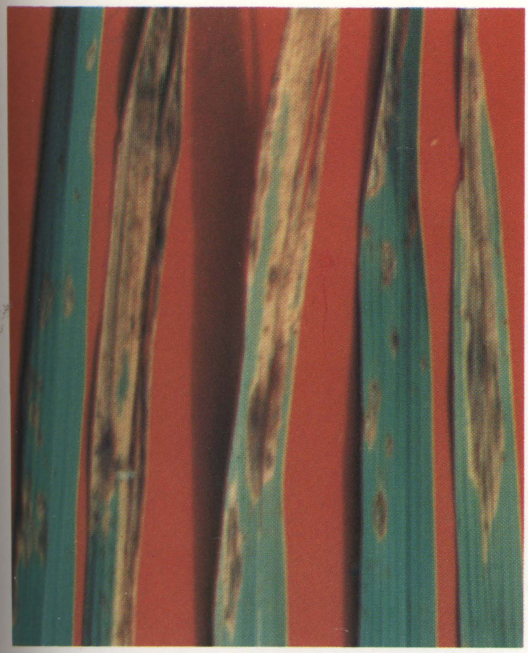
FOLIAGE DISEASES

Rice Blast - (fungus *Piricularia oryzae*) - Blast is one of the most important rice diseases in Texas. This disease varies in severity from year to year because of environmental conditions, race of the fungus and susceptibility of varieties being grown. Blast may be found on rice in the seedling stage, or it may be found attacking the nodes, sheath, leaves and panicle. Normally the fungal, organism-causing blast does damage as a leaf lesion on lower leaves during panicle initiation. If weather conditions are ideal, spores are produced on these lesions which then spread to other plants in the same or adjoining fields. Spores are windborne and can be carried considerable distances. This is known as secondary infection and is the critical stage in disease development. Once secondary infection takes place the disease spreads from the leaves to nodes, sheath and panicle. Weather conditions prevalent in most rice-producing areas favor disease development. However, periods of excessive cloudy or rainy weather result in more severe disease development. High nitrogen levels increase incidence and severity of rice blast.

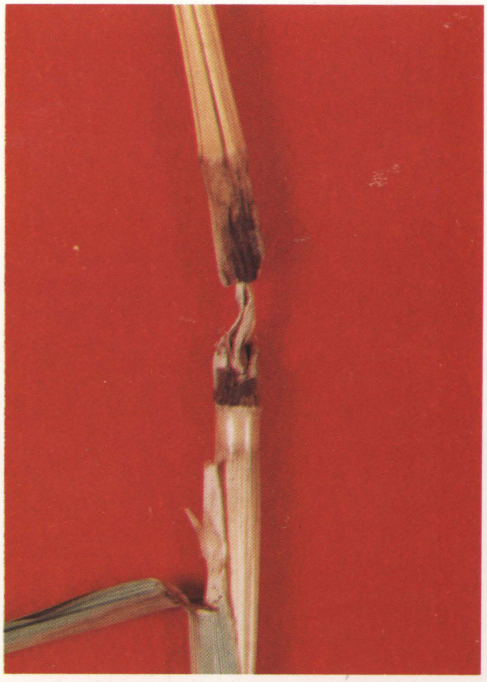


depending on environmental conditions, age of the spots and degree of susceptibility of the rice variety. Lesions usually begin as small water-soaked, whitish, gray or blueish spots. They enlarge quickly under moist conditions on susceptible varieties and remain grayish for some time. Fully developed lesions range from 3/8 to 3/4 of an inch long and from 1/8 to 1/4 inch wide and usually develop a brown margin. Numerous spots may occur on a leaf which may soon be killed. This is followed by drying up of the leaf sheath. Seedlings or plants in the tillering stage are often completely killed in the field.

- *Leaf Blast* - Leaf spots are typically elliptical in shape with more or less pointed ends. The center of the spots usually is gray or white and margins are brown or reddish-brown. Both the shape and the color of the spots vary



- *Nodal Blast* - Nodes at or near the flood level, generally the second and third node from the soil line may be attacked. When these nodes are attacked they weaken and break easily.



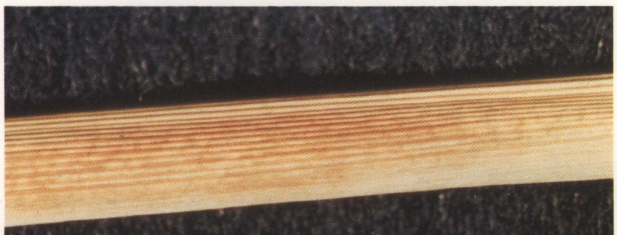
During high wind, extensive lodging may occur. When nodes are infected the base of the sheath rots and turns black. The node often breaks apart, remaining connected by a few vascular strands. Numerous black spores may occur in these areas. All plant parts above the infected node may be killed.

- *Sheath Blast* - The race of the blast fungus attacking Labelle and Lebonnet may attack late in the season causing infection at the base of the flag leaf where it attacks the sheath. As the disease progresses, lesions move upward on the leaf and downward on the sheath with a grayish discolored area developing at the point of attachment. As the disease progresses the flag leaf may break off and become completely detached from the plant.

- *Panicle Blast* - Any portion of the panicle may be infected. Small to large, light to dark lesions may occur anywhere along the panicle. Panicle branches as well as glumes are attacked. If the area at the base of the panicle is infected, the rotten neck condition may occur. Then as the rice nears maturity, the panicle breaks over, becomes weak and falls off the plant in many instances.

Brown Leaf Spot - (fungus *Helminthosporium oryzae*) - The disease is found on leaves, leaf sheath, panicle branches, glumes and grain. The fungus causes brown circular to oval spots on the first leaf sheath while it is still below ground. As the seedlings emerge, symptoms of spots appear on the first seedling leaves. This generally is known as primary or systemic infection. Leaf spots are found throughout the season and vary in size and shape from small dark spots to large oval spots up to 1 inch long. Smaller spots are dark brown to reddish brown; larger spots have a dark brown margin and a light to reddish brown gray center. Generally spots have a bright yellow halo surrounding the lesion. Spots on the leaf sheath and hulls are similar to those on the leaves; however, the fungus may attack the glumes and cause a black discoloration from abundant spore production. The Helminthosporium fungus also attacks grain either completely destroying it or causing dark spots which lower yield and grade. *Helminthosporium oryzae* is a seedborne fungus and initial infection occurs on young seedlings. Disease development is likely during high humidity with temperatures between 68° and 78° F.

Narrow Brown Leaf Spot - (fungus *Cercospora oryzae)* - The disease appears most commonly on leaves; however, it also appears on leaf sheaths, pedicels and glumes. Disease severity varies from year to year and usually becomes most severe as rice approaches maturity. Leaf spots are long, narrow shaped and tan or brown colored.



Generally the spots are restricted to interveinal areas. Lesions, which generally are ordered by leaf veins, range from 1/16 to 1/8 inch wide and from 1/8 to 1/2 inch long. Lesions occurring on panicle branches and glumes generally are smaller and darker than leaf lesions. Symptoms appearing on the sheath are completely different from those on leaves and panicles. Lesions are light to dark brown areas from 1/4 to more than 2 inches long that may completely encircle the plant. These spots have indefinite borders and often are mistaken for other diseases. Disease development occurs within a wide range of environmental conditions.

Leaf Smut - (fungus *Entyloma oryzae)* - Leaf smut generally occurs late in growing season and causes little or no economic loss. The fungus causes small black, slightly raised spots on both sides of the leaves. The spots generally are rectangularly shaped. Numerous spots may be found on the same leaf, but they remain distinct from each other. Heavily infected leaves turn yellow and die. Spots are covered by the epidermis, or outer cells of the leaf tissue, but after soaking in water for a few minutes the epidermis ruptures, revealing a black mass of spores beneath the epidermis. The disease generally becomes more severe as the rice approaches maturity.

White Tip - (nematode *Aphelenchoides besseyi*) - Leaf tips of susceptible varieties turn white or chlorotic before becoming dark and frayed. At times nematodes attack the basal or middle portion of the leaves. Symptoms are most conspicuous on the flag leaf just before heading. Diseased plants have less vigor and height and produce smaller panicles. On severely diseased plants the flag leaf and sheath become twisted and hold the panicle within the sheath. Heads of severely infected plants are stunted and produce abnormal grain. The nematode-causing white tip is seedborne, and when infected seeds are planted the nematode leaves the seeds and attacks the leaves.

SHEATH AND STEM DISEASES

Brown · Bordered Leaf and Sheath Spot - (fungus *Rhizoctonia oryzae*) - The disease is characterized by reddish-brown spots which first appear on the sheath near the water line. Spots enlarge rapidly and assume an elliptical to irregular shape. Lesions have a broad reddish brown to dark brown border. As the disease progresses the center of the spots bleach out and become straw colored. Under severe conditions the disease kills the leaves and causes lodging. The disease first appears during late tillering or the early heading stage. While the spots are confined almost entirely to the sheath, they sometimes occur on the leaves. The disease is most severe in dense stands during high humidity and temperatures of 85° to 90° F.

Sheath Blight - (fungus *Rhizoctonia solani*) - This disease often is confused with brown-bordered leaf and sheath spot caused by *Rhizoctonia oryzae* because symptoms appear to be similar. However, a comparison of symptoms reveals that sheath blight begins as elliptical or ovoid grayish-green lesions. These lesions enlarge and may encompass the whole sheath. The center of the spot is grayish-white with a yellow to light tan margin. As the lesion enlarges, the entire leaf is killed. Sclerotia may form in the center of the spots, but are detached easily. Sclerotia are the fungus' overwintering or resting bodies which have hard covers that protect tightly woven fungal strands filled with food and material. These structures can withstand adverse weather conditions and germinate when environmental factors are favorable for fungal growth. Dense stands and periods of high temperature and humidity favor disease development.

Sheath Rot - (fungus *Acrocylindrium oryzae*) Sheath rot occurs on the upper most leaf sheaths enclosing the young panicles. Lesions start as oblong or irregular spots with brown margins and

gray centers. Lesions also may be uniformly grayish brown. Lesions enlarge and coalesce and may cover most of the leaf sheath. If the disease occurs during early booting, the panicle may remain within the sheath or partially emerge. Kernels which do not fill out are grayish-white in color. An abundance of white powdery growth may be found inside affected sheaths. High insect populations which cause sheath wounding facilitate development and spread of the disease.

Stem Rot - (fungus *Sclerotium oryzae)* - The disease usually appears in the field during later growth stages of the rice plant, generally within a week after the field has been drained. It starts with small, blackish, irregular lesions on the outer leaf sheaths near the water line. The lesion enlarges as the disease progresses, the fungus penetrates into the inner leaf sheath and finally the leaf sheath is partially or entirely rotted. Soon after the fungus reaches the inner leaf sheath it comes in contact with the culm or stem. Numerous sclerotia may be formed in this area. As the disease progresses, the

inner portion of the stems rot and collapse with only the epidermis remaining intact. Upon splitting infected stems, dark grayish mycelium may be found in the hollow stem, and small black sclerotia can be seen all over the inner surface. Sclerotia are extremely small and round, about the size of pepper grains. Early infected plants yield poorly, most losses are incurred by the second crop, since many plants are killed and no regrowth occurs. High nitrogen levels contribute to disease severity.

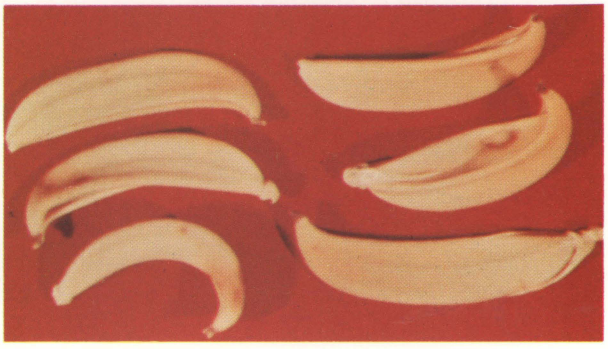
DISEASES ATTACKING THE KERNEL

Kernel Smut - (fungus *Neovossia horrida*) - Kernel smut is a major disease of rice. Smut is detected easily after a rain or in early morning following a heavy dew. Moisture causes the black mass of spores to swell and break out of the hull. Spores that do not break out can be seen through the wet hulls. The embryo is not destroyed by the smut, and diseased seeds generally germinate even if all the endosperm has been replaced by the smut spores. Smut spores give milled rice a grayish color. Producers with a high incidence of smutted rice will be severely docked in price. Spores of the fungal organism overwinter in the soil. Frequent rains during the flowering period cause more severe disease infestations.

Kernel Spots - (fungi *Helminthosporium* sp. *Alternaria* sp. *Curvularia* sp.) - Rice grains may be affected by several fungal organisms before harvest-causing discoloration, the severity of which varies according to the season. Kernel spots increase during periods of high humidity. Usually the second rice crop is more severely affected. Discoloration may appear internally on grain or externally on glumes or both. Stink bug or mechanical injury to developing kernels will predispose the kernel to fungal infection. Kernel spots, commonly called "peck" by rice buyers, reduce grade and yield of head rice.

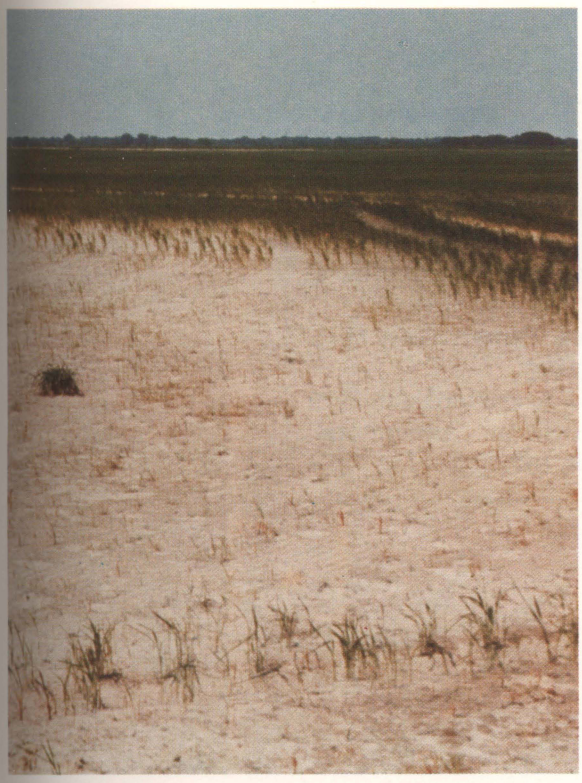
PHYSIOLOGICAL DISORDERS

Straighthead - This physiological disorder generally appears during heading. The disease usually is spotty although some fields may be damaged severely. The disease is frequently found on sandy soils, but seldom on clay soils. Old cotton fields with arsenic residues usually have a severe incidence of straighthead. The disease is characterized by upright heads at maturity due to unfertile seeds. Hulls may be distorted into a crescent shape or "parrot beak." One or both hulls may be missing. Affected plants continue to grow, are a darker green and often produce shoots from lower plant portions. Seeds from affected fields may have low or abnormal germination. In severe cases, panicles are smaller than normal and often fail to emerge from the boot.



Cold Weather Injury - Cold weather affects rice development in several distinct ways. When temperatures are cool early in the growing season, seedling development may be retarded severely predisposing the young seedling to attack by fungal organisms which cause seedling disease. A combination of high winds and cold temperatures damages the chlorophyll at the soil line causing a yellow banding effect often confused with herbicide injury. Temperatures below 50° F later in the growing season cause "cold weather shock." During panicle development temperatures below 60° F cause panicle blanking if it occurs during the cold sensitive stage.

Alkalinity or Salinity - Injury is characterized by stunted, yellow areas in the field. These spots vary in size from a few to several 100 feet in diameter.



Affected areas have dead or dying rice in the center followed by dwarfed and yellowing rice towards the periphery. In some instances injury occurs along the levies. When this happens a salt deposit may be seen along the side of the levy. Injury in fields generally occurs on high areas or knolls and in the seedling stage which may be confused with seedling blight. A knowledge of field history and the pattern in which the problem occurs enables one to distinguish it from common seedling disease. The problem is more severe following unusually dry fall and winter seasons.

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ADDITIONAL DIAGNOSTIC ASSISTANCE

If an unfamiliar disease is encountered that is not adequately described in available material, contact the county Extension agent. If the disease has occurred previously in the county, he can probably diagnose it accurately. If he is unable to identify it, he will send the specimen to the Plant Disease Diagnostic Laboratory or the Plant Nematode Detection Laboratory for analysis. Accurate diagnosis is essential to the selection of effective disease control practices.

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