

DISEASES



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Bacterial leaf streak and black chaff

Pathogen: *Xanthomonas campestris* pv. *translucens*

Symptoms and occurrence: Bacterial streak is one of the most common bacterial diseases of cereal crops. The pathogen attacks wheat and other grasses. All of the above-ground parts of the plant may be affected, but the disease occurs most commonly on the leaves and glumes. The early symptoms appear as small, light-brown, water-soaked spots or streaks. The lesions tend to develop between the veins early but eventually expand and coalesce, producing irregular gray-brown blotches. Under high humidity, droplets of yellow bacterial exudate form with the lesions. Small yellowish granules or shiny scales form on the surfaces of leaf blades when the exudate dries. As the disease progresses to the leaf sheaths and adjacent culms, the stems darken and become weak.

Conditions for development: The bacterium persists on plant residues in soil and on host plants and tolerates relatively wide ranges of temperature and moisture conditions. Wheat is invaded through natural openings and wounds and supports the bacterium intercellularly. It is spread by splashing rain, plant contact and spike-visiting insects.



Field view



Foliar symptoms



Foliar and head symptoms

Barley yellow dwarf virus

Latin name: *Luteovirus* and/or *Polerovirus*

Symptoms and occurrence: This viral disease is common and often severe. Several strains of viruses may cause this disease, and all are transmitted by several species of cereal grain aphids. The virus survives in winter grains and often is introduced into northern wheat production areas with cereal aphid flights from the southern states. Barley yellow dwarf symptoms include a golden yellow to reddish discoloration of the leaves, often from the leaf tip downward. If plants are infected early, severe stunting and yield loss may occur.

Management options: Disease management often relies on correct identification of the pathogen; therefore, consult with a LSU AgCenter county agent or specialist. Some sources of genetic resistance (varieties) may be available, and adhering to recommended planting dates may reduce incidence and severity. Timely aphid control through insecticidal seed treatment or foliar insecticides may reduce incidence and severity but may or may not be economical.



Field view



Stunted plant (left)

Downy mildew (crazy top)

Latin name: *Sclerophthora macrospora*

Symptoms and occurrence: Downy mildew usually is associated with wheat plants that are grown in poorly drained areas. Plant symptoms produced by downy mildew are variable. Some diseased plants tiller excessively and are severely dwarfed, with many tillers growing only a few inches tall. Other plants have thickened leaves that are yellow striped, fleshy, twisted, curled and stiff. These plants rarely produce heads, and those heads that are produced are distorted and abnormally large. The stem below the affected heads may be thick and deformed. In bearded varieties, the beards can be distorted and abnormally long. Diseased heads produce no viable grain.



Field view

Management options:

Proper soil preparation to improve surface drainage and remove debris will reduce disease incidence. Avoid planting fields that are prone to flooding. Rotation with noncereal crops and use of clean seed may provide some control. Control of grassy weeds that serve as alternative hosts may reduce disease incidence.



Stunted plant as a result of downy mildew

Leaf rust

Latin name: *Puccinia triticina*

Symptoms and occurrence: This fungal disease is widespread in Louisiana and probably is the most destructive wheat disease. Leaf rust begins in Louisiana during the late winter or early spring and is produced by reddish-orange spores. The leaf rust fungus produces small, yellowish-orange pustules filled with spores on the lower leaves and proceeding upward. Each pustule produces about 2,000 spores daily that are capable of reinfecting wheat. Infected leaves turn yellow and die. Later in the season, as the plants mature, teliospores are produced in dark gray to black flat pustules under the epidermis. Conditions necessary for infection include virulent spores, susceptible wheat



Urediniospore formation



Teliospore formation

plants, several hours of moisture on the leaves (six to eight hours of dew or light rain) and proper temperatures (60-80 F).

Management options: Resistant varieties are the best and least expensive method of control; however, the fungus can rapidly overcome resistance in current wheat varieties. In addition, follow recommended planting dates, maintain fertility and apply fungicides, if warranted.



Leaf rust "hotspot"



Heavy infection

Loose smut

Latin name: *Ustilago tritici*

Symptoms and occurrence: This fungal disease is easily recognized at the time of heading by the characteristic dusty black appearance of diseased heads that emerge from the boot slightly earlier than those of healthy plants. Usually, all grain in a smutted head is completely transformed to black powder made up of microscopic smut spores. The smutted grains shatter easily and only a bare stalk remains at harvest time.

Maximum infection of wheat occurs during flowering. Wind, rain, insects, and other agents carry the spores from smutted heads to the flowers of healthy heads. The spores quickly germinate under moist conditions and infect the young embryo (seed). The smut fungus becomes dormant in seed until an infected kernel is planted. After planting, the fungus becomes active again and grows systemically within wheat plants, where head infection occurs and the cycle continues. Consequently, the amount of infection that occurs in any one year is the result of infection taking place the previous year.

Management options: Effective controls include the use of certified disease-free seed. Registered seed treatment fungicides may be effective. Resistant varieties may be available, but use the latest information because new races of the fungus may arise, rendering previously resistant plants susceptible.



Smutted wheat heads



Head colonization



Rain-washed, infected head

Powdery mildew

Latin name: *Erysiphe graminis* f. sp. *tritici*

Symptoms and occurrence: Powdery mildew is not a major problem of wheat in Louisiana, but the disease may reduce plant vigor, cause lodging and reduce yield, kernel size and test weight. In areas where powdery mildew is severe, losses up to 40 percent have occurred. Leaves may be heavily infected, and entire plants may be killed prematurely. Damage is most



Field symptoms

severe when heavy infection occurs during periods of rapid growth, tillering, stem elongation and head development. Powdery mildew is associated with dense plant growth and cool, moist conditions. Powdery mildew is characterized by a white to light gray, powdery fungal growth on the leaves, leaf sheaths, culms and floral bracts.



Foliar symptoms



Foliar symptoms

Management options: The disease is effectively managed by growing resistant varieties. Crop rotation, deep plowing and volunteer wheat control will reduce the chances of severe infection by removing or avoiding inoculum sources

of the fungus. Mildew is most severe on wheat grown on soils with high nitrogen content. Consequently, maintain balanced soil fertility based on a soil test to avoid conditions of excessive nitrogen. Fungicide sprays rarely are justified.

Scab (*Fusarium* headblight)

Latin name: *Fusarium* spp.

Symptoms and occurrence: Scab, also referred to as *Fusarium* head blight, is a disease of wheat that is distributed worldwide and causes significant yield and quality losses. Spikelets are affected by the fungus resulting in bleaching, sterilization or shriveled grain. Pink to orange spore masses and/or dark-colored perithecia (reproductive structures) may appear on affected heads. In addition, there are persistent mycotoxins produced by the pathogens that may negatively affect humans and livestock. Warm (75-85 F), humid conditions favor infection at or near flowering.

Management options: The pathogens may survive within seed, grass residue, corn debris or wheat chaff. Consequently, corn as the previous crop may increase disease incidence and severity. Management of wheat scab requires an integrated approach, with the development of resistant varieties as the most important measure. Fungicide seed treatments may reduce seed infection, and fungicide applications may reduce disease, but these treatments generally are not economical. Crop rotation and burying previous crop or wheat chaff residues also may be effective in managing scab.



Diseased head (top)



Diagnostic sporulation



Head "bleaching" caused by scab



Perithecia on kernels

Septoria/Stagonospora leaf and glume blotches

Latin name: *Septoria tritici* and *Stagonospora nodorum*

Symptoms and occurrence: Leaf and glume blotches may significantly reduce seed set and seed fill in wheat in Louisiana. Losses are increased when disease initiates prior to heading. Leaf and glume blotches may affect all aerial parts of wheat. Leaf blotches generally begin with water-soaked spots and progress to chlorotic areas that turn reddish-brown to ashy in the centers. Pycnidia, reproductive structures of the fungus, usually will appear as black dots aligned in rows within the lesions. Symptoms on glumes appear as reddish-brown discolorations, and the fungal species that causes glume blotch may cause symptoms on leaves, as well. The pathogens may survive on straw, seed and volunteer wheat, which are sources of primary inoculum. The disease is spread by rain and wind and is favored by wet conditions (minimum of six hours of leaf wetness). Leaf blotches usually occur at lower temperatures (59-68 F) than glume blotch (68-81 F).

Management options: Earlier maturing varieties generally are more susceptible, and risk of disease is increased in minimum-tillage operations. Planting pathogen-free seed and reducing primary inoculum (crop rotation, tillage, volunteer management) may be helpful. Fungicides applied from flag leaf to flowering may provide adequate control and economic benefit.



Field view



Foliar symptoms



Pycnidia formation within lesions

Stem rust

Latin name: *Puccinia graminis*

Symptoms and occurrence: Stem rust is a fungal disease found in Louisiana wheat fields nearly every year, with significant damage occurring only in a few isolated fields. The early maturing winter wheat varieties grown in Louisiana usually escape serious losses caused by stem rust but provide inoculum that blows north and infects later-maturing wheat fields. As the name implies, stem rust can be found on the stem but is not confined there. It also may be found on leaves, sheaths, glumes, awns, peduncles and even the



Field view of stem symptoms



Wheat stem rust symptoms

kernels. The infection first appears on wheat as reddish-brown elongated pustules that produce urediniospores. The urediniospores are the repeating spores that can be easily transported by the wind and continue to reinfect wheat. As the wheat plant matures, the pustules begin to produce the black spores known as teliospores.

Management options: Since the barberry is involved in the complete life cycle of the fungus, destruction of the alternate host is one method of control. Growers should rely on resistant wheat varieties as a control measure, and fungicides may be used to control stem rust when economically feasible.

Stripe rust

Latin name: *Puccinia striiformis*

Symptoms and occurrence: Stripe rust, also called yellow rust, is a fungal disease in Louisiana wheat that occurs during cooler conditions. Primary infections develop from wind-borne urediniospores that can travel long distances. The pustules of stripe rust form narrow strips on the leaves and occasionally on leaf sheaths, necks and glumes. These pustules contain large numbers of light colored yellowish-orange urediniospores. The disease is favored by cool (50-70 F), moist conditions. Above 78 F, production of urediniospores slows, and black teliospores occasionally are produced. Under favorable conditions, large numbers of pustules are produced on leaves in Louisiana. Severe infections may cause reduced numbers of kernels, shriveled seeds and lowered test weights.



Foliar symptoms of stripe rust

Management options: The use of resistant varieties usually is the best and least expensive control method. Other methods include following recommended planting dates,



Magnified view of stripe rust symptoms

maintaining fertility and foliar fungicide applications, if warranted. It is important to protect the flag leaf from infection until after the kernels have filled.

Tan spot

Latin name: *Pyrenophora tritici-repentis*

Symptoms and occurrence: Tan spot of wheat may significantly affect wheat alone or in conjunction with other leaf-spotting complexes in Louisiana, particularly when infection occurs during heading. The disease may occur on upper and lower leaf surfaces causing tannish-brown, elliptical lesions with yellow margins. Pseudothecia, fungal reproductive structures, may be evident as dark, raised specks on stems. The pathogen survives on wheat debris, which is the source of primary inoculum. Infection is favored by humid conditions at temperatures of 64-82 F, and the pathogen is dispersed when spores produced in lesions are moved by dew, rain and/or wind.

Management options: Cultivars may be available that have resistance to tan spot. Similar cultural practices to those recommended for Septoria/Stagonospora leaf and glume blotches (such as crop rotation, reducing residue and increased tillage) may be effective at reducing disease incidence and severity. Fungicide applications from boot to flowering may be effective and provide economic returns.



Foliar lesions associated with tan spot

Wheat soil-borne mosaic virus

Latin name: *Furovirus*

Symptoms and occurrence: Soil-borne wheat mosaic virus usually occurs only on fall-planted wheat. Losses due to this disease may vary with variety, virus strain and prevalent environmental conditions. Symptoms include mild green to prominent yellow mosaic patterns on leaves, with evident stunting of plants. The virus is introduced to plants by a soil-borne fungus that is more prevalent in low-lying or wet areas. Cool (50-68 F), wet conditions favor infection in the fall, and disease progression is halted above 68 F. The virus survives in the soil along with the vector and may be spread by cultivation, wind, water and/or equipment.

Management options:

Varietal resistance is the most effective means of managing this disease. Crop rotation or late planting also may be effective management tools.



Discoloration of wheat leaves caused by wheat soil-borne mosaic virus

OAT DISEASES



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Barley yellow dwarf virus

Pathogen: *Luteovirus* and/or *Polerovirus*

Symptoms and occurrence: More than 150 species of grasses are susceptible to the barley yellow dwarf virus, and at least 25 different species of aphids vector the phloem-limited pathogen. Stunted plants with reduced root masses are one result of infection. Reduced head emergence and grain yield may result from severe infections. Barley yellow dwarf virus in oats may cause water soaking and discoloration of oat leaves to tan, orange, red or purple. Cool temperatures (59-65 F) favor symptom expression.

Management options: Disease management often relies on correct identification of the pathogen; therefore, consult with a LSU AgCenter county agent or specialist. Some



Discoloration and stunting caused by barley yellow dwarf virus

sources of genetic resistance (varieties) may be available, and adhering to recommended planting dates may reduce incidence and severity. Timely aphid control through insecticidal seed treatment or foliar insecticides may reduce incidence and severity but may or may not be economical.

Crown rust

Pathogen: *Puccinia coronata* var. *avenae*

Symptoms and occurrence: Crown rust, also called leaf oat rust, is a disease common to susceptible varieties grown in Louisiana. In most years, this is the most widespread disease affecting oats in Louisiana. Disease development is favored when temperatures are 60-77 F and moisture is present. Initial symptoms occur during early spring as yellowish-orange round to oval raised pustules (blisterlike) on the upper and lower leaf surfaces. Each pustule contains hundreds of yellowish-orange spores that are spread to adjacent plants and fields by the wind. When disease is severe, pustules can develop on the leaf sheaths. When pustules are several weeks old, a black ring may be present on the margin. This ring consists of black spores of the fungus that are capable of surviving



Field symptoms of crown rust



Urediniospores (top) and teliospores (bottom) of oat crown rust

during moderate summers. Severely affected plants can be stunted and have reduced root systems. If not properly managed, yield loss can occur.

Management options:

This disease is managed using resistant varieties. Plant as early as possible.

Downy mildew (crazy top)

Pathogen: *Sclerophthora macrospora*

Symptoms and occurrence: Downy mildew is a fungal disease that affects more than 140 species of plants and usually occurs in poorly drained or flooded areas in oats. Infected plants will display excessive tillering and severe stunting and may die. Plants that survive the infection will be deformed, with twisted or curling leaves. If infected plants produce heads, panicles will be deformed and have no viable grain.

Management options: Proper soil preparation to improve surface drainage and remove debris will reduce disease incidence. Avoid planting fields that are prone to flooding. Rotation with noncereal crops and use of clean seed may provide some control. Control of grassy weeds that serve as alternative hosts may reduce disease incidence.



Healthy oats (left) and oats with downy mildew (right)

Loose smut

Pathogen: *Ustilago avenae*

Symptoms and occurrence: Loose smut is a fungal disease that is evident at heading. Black powdery spore masses are present where kernels should have been. These spore masses are easily dispersed by wind, rain, or any other physical movement. Infection occurs at germination. The fungus lives systemically within plants throughout the entire season and replaces oat kernels with spores, which, in turn, come in contact with healthy panicles.

Management options: Effective controls include the use of certified disease-free seed. Registered seed treatment fungicides may be effective. Resistant varieties may be available, but use the latest information because new races of the fungus may arise, rendering previously resistant plants susceptible.



Healthy oats (left) and smutted oats (right)

Pyrenophora (Helminthosporium) leaf blotch

Pathogen: *Pyrenophora chaetomioides*
(*Helminthosporium avenae*)

Symptoms and occurrence:

Pyrenophora leaf blotch is a fungal disease that potentially can cause losses up to 40 percent in oats. The pathogen is seedborne, surviving superficially on seed coats or within seed as mycelia. Foliar symptoms begin with small spots with white centers and brown to red margins. Lesions elongate and become dark with olive/gray centers. Plants affected by Pyrenophora leaf blotch also may have a discoloration of the stem at the nodes called "black stem." Mycelial masses may be evident within stems, and the fungus may cause lodging between the third and/or fourth internodes. Infected grain will have a darkened surface. The fungus may survive on and within infected grain and on crop debris.

Management options: Any operation that decreases previous crop debris may reduce inoculum. Crop rotation and destruction of volunteer oats will reduce chances of pathogen survival. Seed treatments may be somewhat effective.



Early foliar symptoms



Infected oat seeds

Septoria leaf blotch

Pathogen: *Septoria avenae*

Symptoms and occurrence: Septoria leaf blotch is a fungal disease that may affect all above-ground parts of oats. Foliar symptoms begin with yellowish to brown, round to diamond-shaped lesions with brown margins. Leaves may be yellowed outside of the lesion margins. Black dots (pycnidia or fungal reproductive structures) scattered throughout the lesion centers usually will be evident. Lesions may coalesce, causing premature leaf death. This fungus also causes black stem, where gray to black discoloration occurs on culms at the upper joints. Infections may cause lodging, and grayish mycelial growth may be evident within stems. Kernels may be affected, as well, resulting in a darkened appearance. The fungus survives on crop debris and usually is not seedborne.

Management options: Any operation that decreases previous crop debris may reduce inoculum. Crop rotation and cultivation may reduce chances of infection. Seed treatments may be somewhat effective, and foliar fungicide application may be warranted.



Diamond-shaped lesions of Septoria leaf blotch

Stem rust

Pathogen: *Puccinia graminis* var. *avenae*

Symptoms and occurrence:

Stem rust is a disease that occurs occasionally on susceptible varieties grown in Louisiana. This disease is not as common as crown rust, but when it occurs, it is more prevalent in the southern part of the state.

Disease development is favored when temperatures are 68 -77 F and moisture is present. Initial symptoms occur during early spring as reddish-brown, elongated raised pustules (blisterlike) on the stems, leaf sheaths and the leaf surfaces. Each pustule contains hundreds of



Field view of oat stem rust



Stem rust symptoms

reddish-brown spores that are spread to adjacent plants and fields by the wind. If not properly managed, yield loss can occur.

Management options: This disease is managed using resistant varieties.