

## DIAGNOSIS AND MANAGEMENT OF SORGHUM DISEASES

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Seedling Disease: Cause: A fungus, *Pythium* spp.

*Symptoms:* Seedling root rot may result in sparse or irregular stands. Roots are rotted, with a brown to black appearance, and may also be missing.

*Management:* The disease is favored by wet to saturated soils, along with cool soil temperatures that are unfavorable for plant growth. Under these conditions, fungicides normally applied to seed have limited effectiveness, particularly if poor quality seed is planted. Plants are vulnerable to seedling disease before emergence and only in the first 2-3 weeks after emergence.



**Fig. 1. Root rot symptoms of seedling disease.**

Sorghum Downy Mildew: Cause: A fungus, *Peronosclerospora sorghi*

*Symptoms:* Systemic infection of seedlings is first noticeable 1-2 weeks after emergence and occur because of an earlier infection of roots by spores in soil. Usually the first leaf with symptoms appears lighter green or yellow on only the lower part of the leaf. Later, leaves become more chlorotic (Fig. 2).



**Fig. 2. Chlorosis, an early systemic symptom of sorghum downy mildew.**

Abundant, downy white growth (spores of the fungus known as conidia) is produced at night on the under surfaces of infected portions of leaves during rainy or humid weather (Fig. 3).



**Fig. 3. Downy appearance on the underside of leaves, a symptom of sorghum downy mildew.**

Later, leaves emerging from the whorl are more bleached, sometimes in streaks or stripes of green and white tissue and sometimes over the entire leaf surface (Fig.4).



**Fig. 4. Advanced symptoms of systemic infection by the sorghum downy mildew fungus.**

The bleached leaf tissues are packed with a different type of spore (oospore) that survives in soil. As the infected bleached leaves mature, the white tissue dies and the leaf tissues between the veins disintegrate and become shredded, releasing oospores to soil, where they overwinter (Fig. 5). Systemically-infected plants usually do not form a head.





**Fig. 5. Late-season symptom of systemic sorghum downy mildew infection.**

Early in the spring, the short-lived conidia will be blown to other leaves, resulting in dark, blocky lesions that do not develop further (Fig. 6). These localized infections are usually confined to lower leaves and require cool, wet weather to occur. Occasionally, these conidia can initiate a systemic infection in the shoot, which will affect only new growth. Leaves may show partial systemic symptoms and heads may be partially barren.



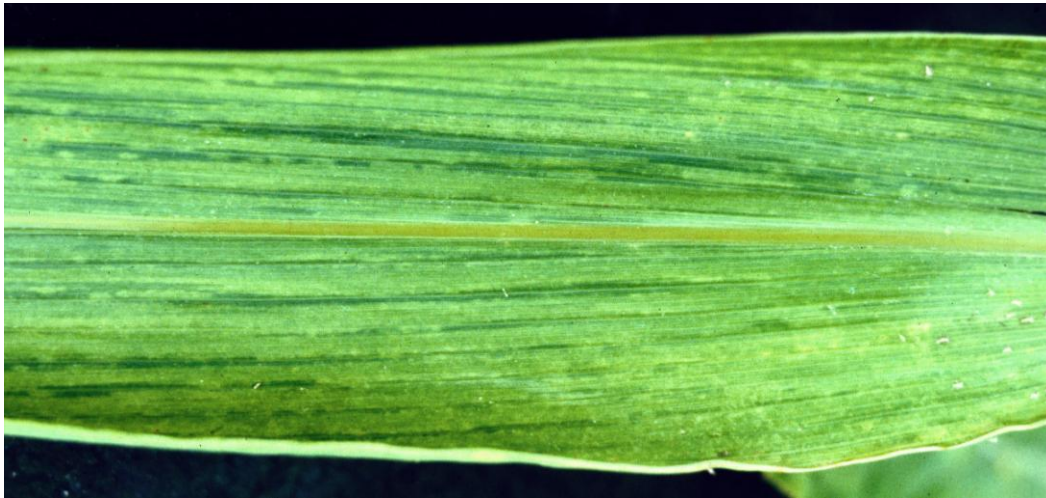
**Fig. 6. Localized infections of the sorghum downy mildew fungus.**

*Management:* Seed is routinely treated with Apron XL or Allegiance fungicide, which protects germinating seedlings from oospore infection. However, in the area between Houston and Victoria, some fields have isolates of the fungus resistant to the fungicide. Seed treatment is used in combination with resistant hybrids, but this area of Texas has isolates of the fungus that overcomes hybrid resistance. A crop rotation with corn, which can become infected, but does not support oospore development, can help reduce populations of oospores in soil. Other crops, such as cotton or soybeans, are not susceptible. If sorghum downy mildew is prevalent in a field, the field should be kept out of sorghum for at least two years. Johnsongrass is also susceptible and should be controlled to prevent carry-over of the fungus.

Maize Dwarf Mosaic Cause: Maize dwarf mosaic virus

*Symptoms:* The mosaic symptom is most prominent on the upper two or three leaves as an irregular mottling of dark and light green (Fig. 7), often interspersed with longitudinal white or yellow streaks. In red-pigmented sorghum cultivars, a "red-leaf symptom" may occur with elongated red stripes that develop necrotic centers and red margins. The earlier the infection, the more severe the symptoms. In severe cases,

plants may be stunted or die, flowering may be delayed, and the plants may fail to form panicles or set seed. Delayed maturity predisposes infected plants to infestation by sorghum midge. Tolerant hybrids may develop mosaic symptoms, which disappear eventually and have no apparent effect on yield.



**Fig. 7. Leaf mottle symptom caused by maize dwarf mosaic virus.**

**Management:** This virus also infects johnsongrass, sugarcane, and other grasses, which can serve as reservoirs for the virus. Aphids can move the virus from these reservoirs into the crop. Early in the season, johnsongrass within the field or along field borders should be controlled to reduce the amount of virus spread from these plants. Sorghum hybrids susceptible to this virus should not be grown in areas where the disease is endemic.

**Head Smut:** Cause: A fungus, *Sporisorium reilianum*

**Symptoms:** A large whitish gall produced by the fungus either completely or partially replaces a sorghum panicle (Fig. 8).



**Fig. 8. Gall of the head smut fungus.**

The whitish-gray membrane that covers the gall ruptures, often before the panicle emerges from the boot, and releases a mass of brown-black spores that blow away (Fig. 9). Diseased plants are stunted and may tiller excessively.





**Fig. 9. Ruptured gall of head smut fungus exposing black spores.**

*Management:* This disease is managed through the use of resistant hybrids. Crop rotation is not effective, as the spores survive years in soil. Monoculture will increase the incidence over the years.

Loose Kernel Smut: Cause: A fungus, *Sporisorium cruentum*

*Symptoms:* In comparison with healthy plants, diseased plants are shorter, have thinner stalks, often tiller more, and may flower as much as two weeks earlier than healthy plants. Diseased panicles are looser than healthy ones. Black masses of fungal spores are seen on the floral parts, as well as a long, black, pointed structure (Fig. 10).



**Fig. 10. Symptoms of loose kernel smut.**

*Management:* This disease is not common because standard seed-applied fungicides prevent infection.

Charcoal Rot: Cause: A fungus, *Macrophomina phaseolina*

*Symptoms:* External symptoms of charcoal rot are lodging and poor grain filling. The lower stalks of infected plants disintegrate internally and the small, black resting structures (microsclerotia) of the fungus are found in the rotted area of the stem (Fig. 11).

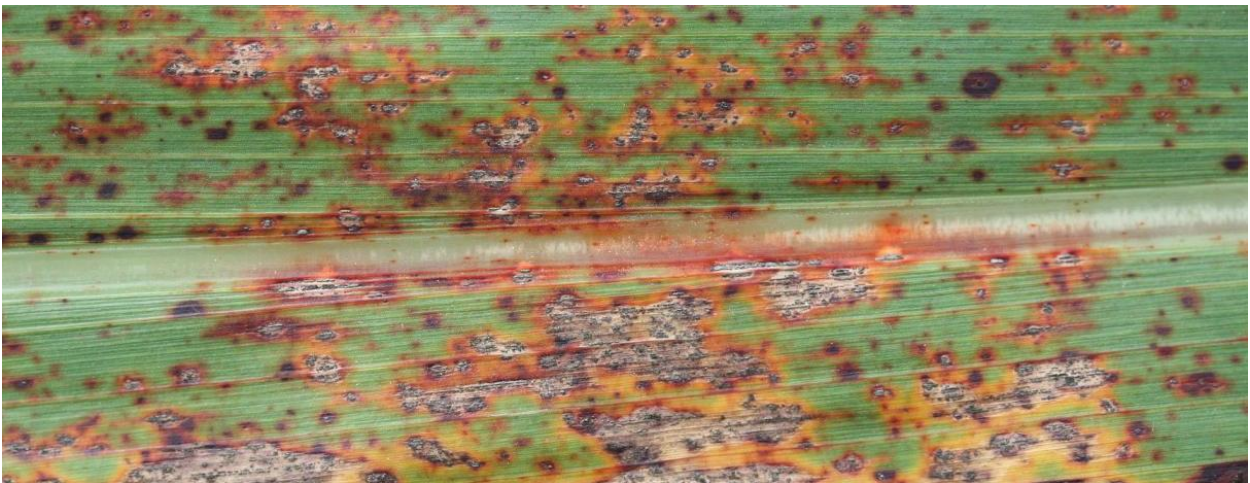


**Fig. 11. Small, black structures (microsclerotia) of the charcoal rot fungus, inside a rotted stem.**

**Management:** Charcoal rot is not a problem in irrigated sorghum. The disease develops only when temperatures are hot and plants are under drought stress. A high plant density or previous cropping with cotton may predispose plants to charcoal rot. Sorghum grown under rain-fed conditions rarely develops charcoal rot if plant density is low. Plants that develop a good root system in response to dry conditions early in the season and then exposed to a prolonged dry period are less likely to become diseased than those with a shallow root system promoted by numerous, light rainfalls.

**Anthraxnose:** Cause: A fungus, *Colletotrichum sublineolum*

**Symptoms:** This fungus causes both leaf spots and stalk rot. The leaf spots are oval to circular, red, orange, blackish purple, or tan, with small black spots, the fruiting bodies of the fungus, in the centers (Fig. 12). Numerous leaf spots can coalesce, killing all or large portions of a leaf. Growth may be reduced or the plants may die before maturity.



**Fig. 12. Leaf symptoms of anthracnose, showing black structures of the fungus.**

Stalk rot starts with water-soaked, discolored elliptical areas on the panicle, which later become tan to



blackish purple. When infected stalks are split open, they have a marbled, discolored appearance with embedded, small, black fungal structures (microsclerotia) (Fig. 13).



**Fig. 13. Inside a stalk infected with the anthracnose fungus, showing marbling and black fungal structures.**

Panicles from infected plants usually are smaller and mature earlier. The seeds are smaller and may be infected.

*Management:* This disease may be a problem in the coastal areas of Texas, particularly in warm, wet years. If the disease occurs, the field should not be cropped to sorghum for two years, to eliminate the fungus, which survives in soil. Resistant sorghum hybrids could also be planted.

Zonate Leaf Spot: Cause: A fungus, *Gloeocercospora sorghi*

*Symptoms:* Leaf spots are circular, reddish purple bands alternating with light brown or tan areas, forming a concentric, or zonate, pattern with irregular borders (Fig. 14).

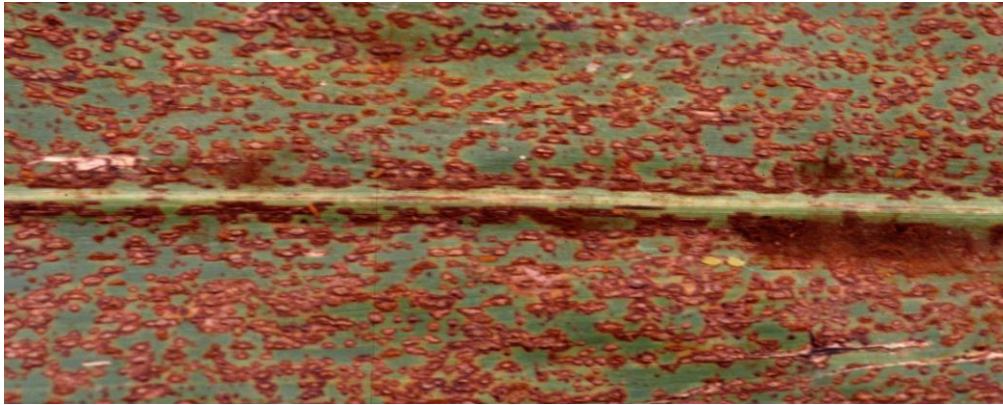


**Fig. 14. Symptoms of zonate leaf spot.**

*Management:* This disease is not a problem in Texas. It is prevalent in the coastal areas of Texas, particularly in warm, wet years.

Rust - A fungus, *Puccinia purpurea*

*Symptoms:* Small, purple, red, or tan, slightly-raised flecks appear on both surfaces of leaves, which may coalesce (Fig. 15). Powdery, reddish-brown spores are produced from these flecks.

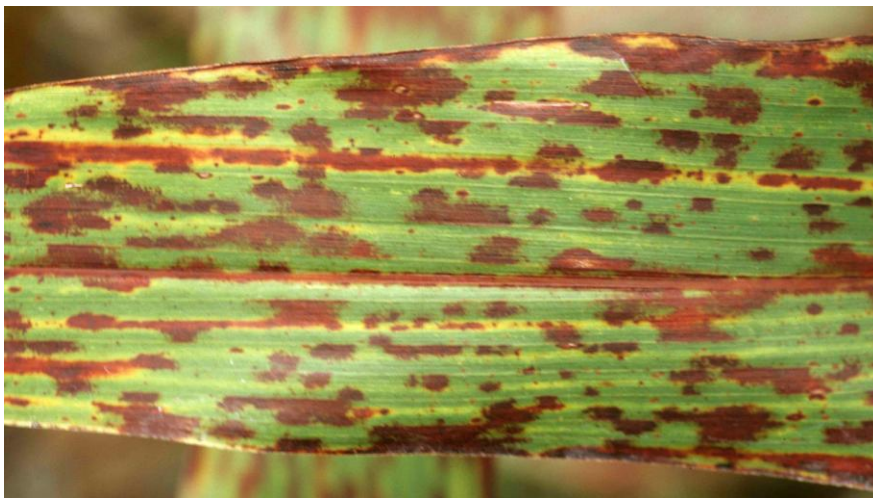


**Fig. 15. Symptoms of rust**

*Management:* This disease is not a problem in Texas. It is prevalent in the coastal areas of Texas, particularly in cool, wet years.

Target Leaf Spot - A fungus, *Bipolaris sorghicola*

*Symptoms:* Large, reddish, oval spots are formed on leaves (Fig. 16).



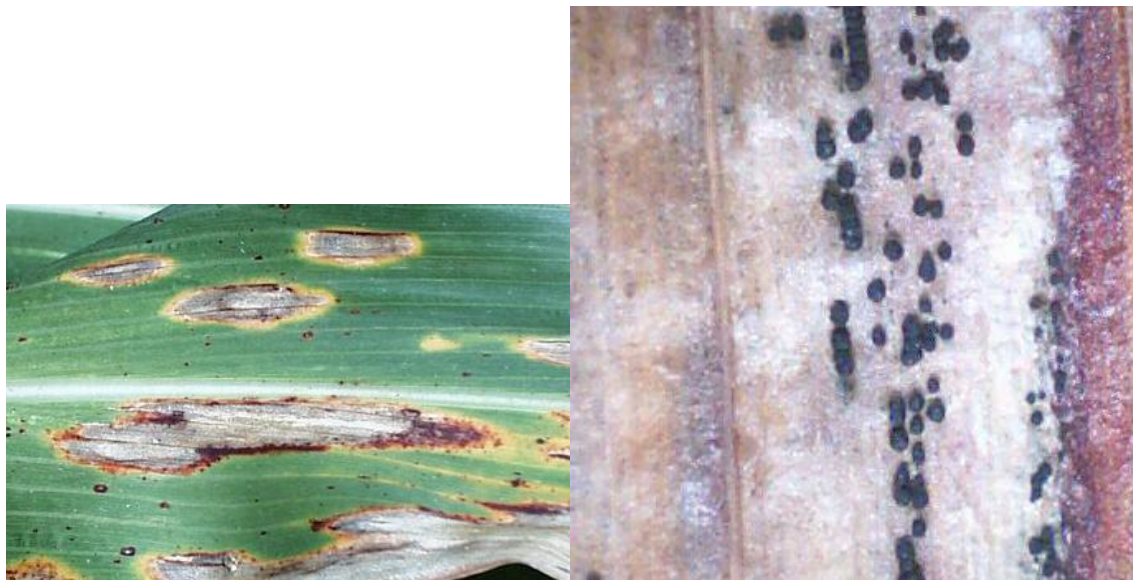
**Fig. 16. Symptoms of target leaf spot.**

*Management:* This disease is not a problem in Texas. It is prevalent in the coastal areas of Texas, particularly in warm, wet years. Hybrids can differ in their susceptibility.

Sooty Stripe - A fungus, *Ramulispora sorghi*

*Symptoms:* Elongated spots with light brown centers and reddish purple or tan margins. The interior of spots become grayish, then black or sooty (Fig. 17a), and later, small, black, raised resting structures (sclerotia) of the fungus will form (Fig. 17b).



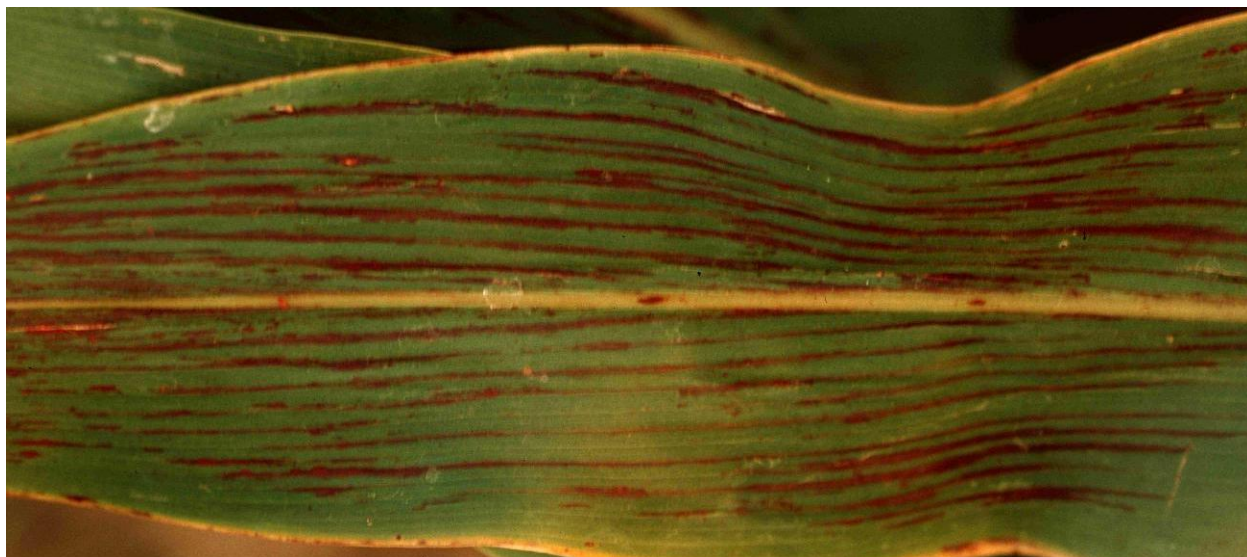


**Fig. 17. A. Symptoms of soot stripe. B. Detail of black fungal structures (sclerotia),**

*Management:* This disease is not a problem in Texas. It has been observed in the coastal areas of Texas and may be a potential problem there in wet years. The pathogen survives on leaves, so affected fields should be rotated out of sorghum.

Bacterial stripe - A bacterium, *Burkholderia andropogonis*

*Symptoms:* Long, reddish streaks that run parallel to the leaf rib (Fig. 18). The streaks may coalesce. Lesions may also occur on other plant parts.



**Fig. 18. Symptoms of bacterial leaf stripe.**

*Management:* This disease is not a problem in Texas. It can be carried in seed, but the levels of contamination are usually very low. The climate of the coastal areas of Texas would favor disease development, particularly in wet years. Fields should be rotated out of sorghum if the disease is present.

Leaf blight - A fungus, *Exserohilum turcicum*

*Symptoms:* Elongated, elliptical lesions with reddish margins and tan centers. Under moist conditions which favor spore production by the fungus, the center of lesions may have a powdery, black appearance. (Fig. 19)



**Fig. 19. Symptoms of leaf blight.**

*Management:* This disease is not a problem in Texas. It is prevalent in the coastal areas of Texas, particularly in cool, wet years.

Ergot: Cause: A fungus, *Claviceps africana*

*Symptoms:* Infection occurs only in the ovary of the flower and only prior to its fertilization. The initial symptom is a white, swollen fungal structure that is formed between the glumes, where the seed normally develops. This structure, the sphacelium, exudes a sweet, sticky liquid that contains sugars and spores. (Fig. 20)



**Fig. 20. Honeydew symptom of ergot.**

The liquid may be colorless to honey brown, or opaque white. It will drip onto other portions of the plant or onto soil and will turn white when it dries (Fig. 21).





**Fig 21. Sporulation (white) of the ergot fungus.**

Later, saprophytic fungi will grow on honeydew, giving it a dark, moldy appearance.

**Management:** Ergot is endemic in south Texas, but rarely causes losses in hybrids. Extensive stickiness interferes with harvest. Fall-grown hybrids in the Lower Rio Grande Valley have the highest risk of ergot because they have the greatest chances of encountering cool, rainy weather conditions that interferes with pollen production or pollination. Hybrids differ in ergot severity when grown under either of these environmental conditions.

**Grain Mold:** Cause: Several fungi, including *Fusarium thapsinum*, *F.semitectum*, *Curvularia lunata*, *Colletotrichum sublineolum*, and *Alternaria* spp.

**Symptoms:** Fungal growth is seen on the surface of the grain. The growth can be pink, orange, gray, white or black, depending upon the fungal species involved (Fig. 22). Seed size and weight are reduced, as well as seed quality and germinability.



**Fig. 22. Grain mold.**

*Management:* Prolonged humid weather favors grain mold and it commonly occurs when sorghum kernels are maturing. Sorghum grown in the Gulf Coast region are more likely to encounter these conditions. Little can be done to prevent this disease unless sorghum is grown when conditions do not favor the development of grain mold. Hybrids differ in their resistance.

Grain Weathering: Cause: Several fungi

*Symptoms:* Fungal growth on the surface of the grain, which occurs after maturation of the seed, under conditions of high humidity and extended dew periods. Fungi that cause grain mold can also cause grain weathering. In addition, many species of saprophytic fungi can cause grain weathering.

*Management:* A timely harvest is important to minimize the length of time that the mature crop is exposed to high humidity. Hybrids differ in their resistance.