Corn Diseases in Alabama

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Corn diseases cost Alabama producers about 10 percent of their yield each year. Some producers have lost more than 50 percent of their expected yields.

Corn diseases are caused by fungi, bacteria, viruses, and nematodes (called pathogens). Often two or more of these pathogens may be involved in a disease complex, causing more damage to corn than either pathogen alone. To make discussion easier, diseases will be grouped according to pathogen type.

Fungal Diseases
(Leaf Blight, Ear Rot, Stalk Rot)

Diseases caused by fungi can be extremely destructive on corn, resulting in leaf blights, ear rots, and stalk rots. Long periods of humid weather followed by intermittent dry periods are when fungal diseases are most likely to begin and spread. When these conditions are coupled with stress factors, including insufficient light, drought, hail injury, mechanical injury, and insect borers, fungal diseases are most damaging to corn.

Stalk rot, the most destructive phase of fungal diseases, damages corn that has been weakened by stress. A high nitrogen-low potassium imbalance in the soil can also make corn more susceptible to stalk rot damage.

To minimize damage caused by fungal diseases, adhere to the following cultural practices:

- Plant resistant cultivars or hybrids adapted to your area. Many cultivars now available have some tolerance to many fungal disease ear and stalk rots.
- Soil test and follow soil test recommendations. Avoid applying excessive levels of nitrogen and maintain an adequate level of potassium in the soil.
- Do not exceed the recommended seeding rate or plant rows too closely. During wet weather, overcrowding creates a humid environment in the canopy. This increases the length of the infectious period for pathogenic fungi. During dry weather, overcrowding hastens the onset of drought, stressing the plant and increasing stalk rot damage.
- Rotate corn with alternate non-grass crops and turn under corn residues to hasten destruction of pathogenic fungi.
- Control insects with insecticides, crop rotation, or insect-tolerant cultivars.
- Harvest infected corn early.

This circular includes a brief description of the more common fungal blights, ear rot, and stalk rot diseases. Disease symptoms in the field may differ slightly from those described in the section below since corn may be infected with more than one pathogen under actual field conditions.

**DIPLODIA ROT** (Diplodia maydis) can develop in fields when the weather is dry early in the growing season, then turns warm and wet about 2 to 3 weeks after the plants start silking. With Diplodia rot, corn leaves turn grayish-green and then wilt and dry out. Within a short time, affected plants die. The lower internodes on the stalk of an infected plant are brown, spongy, and easily crushed. Internally, the pith is discolored and usually shredded. As Figure 1 shows, a characteristic sign of Diplodia rot is the presence of small, dark, spore-like fruiting bodies (pycnidia) which are grouped in clusters and embedded in the surface of the stalk near the nodes. Often, a white fungal growth may appear on the stalk's surface.

Diplodia infects corn ears within 14 days of silking. The infected ear turns light brown, dries out, and rots completely. Diplodia-infected ears tend to stand upright. The inner husks are bound tightly to each other and to the corn ear by the fungus which is growing between them. Tiny fruiting bodies can be seen on the husks, cob, and sides of the kernels.

Later, infected ears show no outer signs of the disease, but when the ears are broken, a white fungal growth can be found between the kernels and at the tips of the cobs.
Gibberella stalk rot or “red ear rot” (*Gibberella zeae*) can be identified by the red fungal growth at the tip of the ear and between the husks and the ear. Superficial perithecia may occasionally be found on the ear husks. The Gibberella fungus rots the infected ear completely. In addition to reducing yields, Gibberella-infected corn may contain mycotoxins which are toxic to swine and to other animals.

Fusarium stalk rot (*Fusarium moniliforme*) also occurs in Alabama and produces symptoms similar to Gibberella stalk rot except that it does not form the black speck-like fruiting bodies in the affected areas of the plant. Fusarium rot usually begins at roots and lower nodes (Figure 3). Like Gibberella stalk rot, Fusarium stalk rot causes premature ripening and stalk lodging.

Charcoal stalk rot (*Macrophomina phaseoli*) can be extremely destructive to corn following extended periods of hot, dry weather. In high temperature conditions (98°F and above), this soil-borne fungus attacks the roots of corn and moves through the cortical tissue of the stalk’s lower internodes. Infected tissue in the pith becomes shredded. Many black pepper-like specks can be seen on the surface of the shredded tissue and just under the epidermis, giving the tissue a charred appearance (Figure 4).
Damage results from premature ripening and stalk lodging. Adequate soil moisture discourages charcoal rot development, so it can be controlled in irrigated fields by keeping the soil moist after the corn tassels. In non-irrigated fields, control measures previously mentioned for the other fungal diseases are effective against charcoal stalk rot development.

**Figure 4.** Charcoal rot showing pepper-like fruiting bodies on shredded stalk tissue.

**PYTHIUM STALK ROT** (*Pythium aphanidermatum*) hits corn during extended periods of hot (90 °F and above), wet weather. It is most frequently seen in fields that have heavy soils and poor internal soil drainage.

Symptoms usually appear on corn just before or during tasseling. Unlike most other stalk rots, Pythium can infect corn before full blossom (anthesis). A rot develops on either the first or the second internode above the ground line. The affected area of the stalk is brown, soft, and water-soaked. The stalk collapses at the infected area and falls over but still remains attached. Fallen plants remain green and turgid weeks after they have fallen because the vascular tissue stays intact.

Pythium stalk rot damage can be reduced by avoiding planting corn in fields with poor soil drainage and aeration. Also, select corn hybrids and cultivars which have better tolerance to Pythium.

**ANTHRACNOSE** (*Colletotrichum graminicola*) causes stalk rot, top dieback, and leaf blight. Under favorable conditions, damage can be severe, causing yield losses up to 20 percent on susceptible cultivars.

Symptoms differ according to corn cultivar, age of corn plant when infection occurs, and environmental conditions. Small, oval spots first appear on leaves during all stages of development. These spots often enlarge up to 1/2 inch in diameter, turn tan in the center, and form reddish-brown or yellow borders. If the disease is severe, the spots may run together, causing the entire leaf to appear blighted (Figure 5). Symptoms appear on the lower leaves early in the season and on the upper leaves later in the season. Leaves infected late in the season die within a few days, causing a top dieback (Figure 6). On the stalk, symptoms appear after tasseling first as narrow, water-soaked lesions. Later they turn reddish-brown and finally turn black late in the season. Stalk lesions eventually coalesce and form shiny, black, sunken streaks (Figure 7). Upon close examination, tiny black fruiting bodies can be seen on the surface of the stalk. Inside the stalk, the infected tissue in the pith is soft and watery.

The anthracnose fungus survives on corn residue and stubble. The fungal spores can survive in the soil, so crop rotation in addition to deep plowing may be necessary to manage this disease.

**Figure 5.** Anthracnose lesions on corn leaf.
SOUTHERN CORN LEAF BLIGHT (*Bipolaris maydis*) was a relatively minor leaf disease of corn in Alabama until the late 60s and early 70s. In 1970, a new race called "race T" appeared. It attacked corn hybrids that contained "Texas male sterile" (TMS) cytoplasm, destroying up to 90 percent of the total crop in some fields. The original *Bipolaris maydis*, "race O" causes little damage to either normal corn hybrids or to hybrids with TMS cytoplasm.

Southern corn leaf blight race T attacks all parts of the corn plant (leaves, stalks, ear husks, ears, and cobs) at all stages of development, whereas race O attacks only the leaves. Race T causes foliage blight, ear rot, and stalk rot. The degree of damage depends upon the stage of development when infection occurs. Corn infected early in the season can be severely damaged and suffer substantial yield losses. Infection after corn reaches the milk dough stage causes little damage.

Initial symptoms of race T southern corn leaf blight appear as small yellow spots on the lower leaves. As the disease progresses, lesions enlarge, becoming elliptical with a brown center and a reddish-brown border (Figure 8). Later, lesions become numerous and eventually merge to form large dead (necrotic) areas on the leaves (Figure 9). Lesions on stalks, sheaths, and ears are much larger and elongate more rapidly, forming large, irregular, water-soaked areas several inches long. Internal stalk and ear rots may result from these infections.
Southern corn leaf blight usually occurs in humid weather and warm temperatures ranging from 55°F to 85°F. The fungus is spread by wind-blown spores and can survive the winter on corn stubble left in the field.

The most effective means of controlling southern leaf blight is to avoid corn varieties containing TMS cytoplasm. Plowing under corn residue and stubble after harvest will help prevent disease carryover to next year’s crop.

**GRAY LEAF SPOT** (*Cercospora zeae-maydis*) occurs sporadically in Alabama but rarely causes significant damage except in isolated fields. Tan, rectangular lesions (0.2 to 2 inches long) occur first on the lower leaves (Figure 10). When conditions are favorable, lesions will cover and kill entire leaves, causing stalk breakage and lodging.

The gray leaf spot fungus attacks barnyardgrass, Johnsongrass, and other *Sorghum* sp. and is usually more severe in no-till or minimum-till fields.

Use of resistant hybrids is the most effective means of controlling gray leaf spot.

**COMMON RUST** (*Puccinia sorghi*) is found worldwide on corn. In Alabama, yield losses have exceeded 50 percent in severely infected corn fields. Common rust pustules can be found on all parts of the corn plant, but most occur on leaves. The presence of pustules in equal numbers on both the upper and lower leaf surface distinguishes common rust from southern rust, which produces most of its pustules on the upper leaf surface. As corn matures, rust pustules turn from golden brown to almost black.

Common rust development is favored by relatively cool temperatures (60°F to 73°F) and humid conditions. Spores are blown into Alabama from tropical regions where the rust survives the winter months.

**SOUTHERN RUST** (*Puccinia polyspora*) occurs primarily in the southeastern United States but is found less frequently than common rust in Alabama. This rust can cause considerable damage, with yield reductions in certain fields in the Southeast as high as 45 percent. Several races of *Puccinia polyspora* are known to exist.

Southern rust is difficult to distinguish from common rust in the field, because the pustules are similar in size and shape. However, the two diseases can be differentiated—southern rust pustules are more abundant on the upper leaf surface than on the lower leaf surface (Figure 11), whereas common rust pustules occur in equal numbers on both the upper and lower leaf surfaces.
Like common rust, southern rust survives the winter in the tropics and is carried north by the wind or by infected plant material. Southern rust infects corn under humid conditions later in the season as temperatures rise above 80 °F.

Common rust and southern rust can be managed by selecting resistant hybrids and applying fungicides when rust pustules first appear on the leaves.

**COMMON SMUT** (Ustilago maydis) occurs wherever corn is grown in Alabama. Losses from this disease have been minimal, rarely exceeding 3 to 4 percent over the state. However, in corn fields adjacent to wheat fields, common smut has been particularly damaging. The corn smut damage is heaviest along the edges of corn fields where stink bugs have moved in from the nearby wheat fields.

The amount of damage caused by corn smut depends upon the stage of development at the time of infection, insect feeding activity, and plant parts affected. Plants infected when young may be killed outright. On older plants, the greatest damage results from infection of the corn ear or the stalk above the ear.

Corn smut is easily recognized by its distinctive symptoms. The smut fungus infects young, actively growing plant tissue and forms large tumor-like growths or galls on leaves, stalks, tassels, and ears (Figure 12). These galls, which range from pea-size to 5 inches in diameter, are filled with masses of black spores. Initially, smut galls are soft with a shiny surface but become hard and dry as they mature.

The corn smut fungus survives the winter in corn residue or in the soil. Smut spores are spread by insects, by wind, or in animal manure.

Dry conditions and warm temperatures ranging from 79 ° to 93 °F are favorable for infection and development of common smut. Plants grown in fields with high levels of nitrogen or with high organic matter are more susceptible to common smut. Mechanical injury resulting from hail, sand blast, feeding insects, or human causes increases the potential for smut infection.

Corn smut damage can be reduced by adopting the following practices:

- Plant corn cultivars tolerant to common smut.
- Maintain a balanced soil fertility. Avoid applying excessive nitrogen.
- Do not fertilize with manure from animals that may have been fed smut-contaminated corn.
- Avoid injury to plants during cultivation or spray application.
- Control stink bugs and other insects with insecticides or tolerant cultivars.
- Avoid planting corn next to wheat fields.

**CRAZY TOP** (Sclerophthora macrospora) rarely causes significant damage to corn in the state, but it attracts the attention of many Alabama corn producers because of its unique disease symptoms. This fungus, which is a downy mildew, causes excessive tillering and twisting of the upper leaves. The most distinctive symptom is the tassel that resembles a mass of leafy structures—often referred to as “crazy top” (Figure 13).

Crazy top occurs predominantly in low-lying areas of fields where water tends to accumulate. Spores of this downy mildew fungus are moved about the field primarily in ground and surface water, so infection is highest in parts of the field where water flows or stands.
The disease can be successfully managed by providing adequate soil drainage or by not planting in low, wet areas of the field.

**Bacterial Diseases**

Bacterial diseases are most destructive under warm, humid conditions. Most corn grown in Alabama is planted early and matures before the weather is hottest. For late corn, there is usually drier weather in mid-summer. Probably for these reasons, bacterial diseases are usually not a problem in corn produced in Alabama. Bacteria are most frequently spread by human beings or animals moving through the fields, contaminated plant material and soil, or splashing rain. The presence of free moisture is almost always required for these bacteria to spread and develop. Dry conditions and extremely high temperatures, on the other hand, retard disease development.

There are a number of bacterial diseases that attack corn, but only a few are worthy of mention.

**Stewart’s Bacterial Wilt** (*Erwinia stewartii*) is more of a problem on sweet corn but can cause considerable damage to a few extremely susceptible field corn hybrids. Infected seedlings may wilt and die. Leaves on plants infected after tasseling may dry and die. Yields may be reduced, and plants may become susceptible to other rots.

Initial symptoms appear on the leaves as linear, pale green streaks with wavy margins that run the entire length of the leaf (Figure 14). The streaks soon turn dry and brown. Cavities form in the pith of the stalk near the ground line. If the stalk or leaf is cut near the infected areas, yellow, moist beads of ooze may be seen flowing from the cut ends.

**Bacterial Stalk Rot** (*Erwinia chrysanthemi zeae*) is most destructive in corn fields exposed to extremely wet conditions or flooding and to high temperatures (above 86 °F). The first signs of the disease occur during midseason when green plants suddenly fall over, leaving collapsed, twisted...
stalks. Water-soaked, slimy, and rotted tissue can be found in one or several internodes of the stalk above the ground line (Figure 15). Often a foul smell can be detected. Vascular strands may remain intact and keep the infected plants green for days after falling over. A top rot may occur in fields irrigated overhead with water from lakes or ponds. The tips of leaves wilt first, followed by a slimy, soft rot at the base of the leaf whorl. The rot moves into the stalk rapidly, causing the plant to collapse.

Plant Viruses

More than forty virus-related diseases of corn are known worldwide, but only a few are of economic importance to Alabama corn producers. Viruses can be transmitted and spread to healthy plants by human beings or animals and through mechanical injury, fungal vectors, infected plant pollen, and insects. Insects, including aphids, and leafhoppers, are by far the most important vectors of the major viruses of corn in this state. Two of the most important corn virus diseases are discussed below.

MAIZE DWARF MOSAIC VIRUS (MDMV) can be found wherever corn is grown in the state. Losses from MDMV vary from year to year, but may exceed 30 to 40 percent under favorable conditions. MDMV infection first appears as a light green to dark green mottling on the base of the youngest leaves (Figure 16). These symptoms may develop into dark green “islands” with a light green to yellow background. Mottling may be observed on all leaves, sheaths, and corn husks that develop following MDMV infection. Corn infected early in its development may be slightly stunted.

MDMV is spread by aphids from MDMV-infected corn or grasses. More than 200 grass species host MDMV, but Johnsongrass is its principal weed host.

MAIZE CHLOROTIC DWARF VIRUS (MCDV) causes a distinctive chlorotic striping in the youngest leaves (Figure 16). MCDV retards the growth of internodes, severely stunting the plant (Figure 17). Infected leaves turn yellow or red. MCDV is especially damaging when it occurs in a mixed infection with MDMV. When mixed infections occur, corn plants may be severely stunted.

Figure 15. Bacterial rot on corn stalk.

The bacteria live in crop residue and infect corn through natural openings in the leaf of the plant during warm, humid conditions.

The best control for bacterial stalk rot is to avoid excessively wet fields and to use resistant hybrids.
MCDV is transmitted by leafhoppers. Alternate hosts for MCDV include Johnsongrass, grain sorghum, Sudangrass, wheat, crabgrass, foxtail, and milo.

Using tolerant corn cultivars and controlling Johnsongrass in and around the field may be the most practical control measures for these viruses. Also, using systemic insecticides to reduce the overall leafhopper population may be helpful.

Nematodes

Several species of nematodes are known to attack and cause damage to corn in Alabama. The lesion nematode (*Pratylenchus* sp.) and root-knot nematode (*Meloidogyne* sp.) are the two nematode species most widespread and damaging to corn in the state. Other nematodes reported to cause damage include the stubby root (*Trichodorpus* sp.), dagger (*Xiphinema* sp.), and sting (*Belonolaimus* sp.).

Losses in corn fields heavily infested with root-knot nematodes or lesion nematodes may exceed 30 percent of expected yield. In the field, nematode damage may be easily confused with other problems such as nutrient deficiency, compacted soils, or acid soils. Aboveground symptoms include stunting, nutrient deficiency, and unthrifty growth. Because of the restricted mobility of nematodes, most damage initially appears in localized areas of the field. This feature often distinguishes nematode damage from other problems whose signs are found generally throughout the field.

Actual nematode injury is restricted to the corn plant’s root system. A few nematode species produce distinctive symptoms on the root system. For example, root-knot nematodes produce characteristic galls when they feed on the roots, and stubby root nematodes kill the root tips as they feed, causing the distinctive stubby roots (Figure 18). Other nematodes produce no easily distinguishable symptoms on corn roots other than a sparse root system.

Since it is difficult to detect signs of nematodes, you should sample any field suspected of having nematodes. Nematode soil samples can be analyzed at the Plant Diagnostic Laboratory at Auburn University for $5.00 per sample. For further details on collecting and sending soil samples for nematode analysis, consult Circular ANR-114, “Collecting Soil And Root Samples For Nematode Analysis” (revised 1991).

Nematodes can be managed in corn with granular nematicides, by land fallowing, or by crop rotation.