



Kentucky Plant Disease Management Guide for Corn and Sorghum

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This guide contains information on the biology and management of the most important diseases of corn and sorghum in Kentucky. Fundamental information on symptoms, disease cycle, and management is provided. For some diseases, more extensive information on biology and management is also available in other Extension publications. Additional sources of information are listed under individual diseases.

Disease management in corn and sorghum relies heavily on using disease-resistant hybrids and employing sound agronomic practices. It is important to integrate both of these strategies into a comprehensive disease management program. Failure to consider one or the other will compromise the success of your efforts. The appropriate use of pesticides sometimes plays a significant role in managing certain diseases, but it is secondary to sound cultural practices and proper hybrid selection.

Resistance to one or more diseases is often incorporated into modern crop hybrids. Unfortunately, resistance is not available for some diseases. However, when available, disease resistance is often the foundation for economical disease control.

No one hybrid is resistant to all diseases present in Kentucky. Also, the importance and prevalence of crop diseases vary from one farm to the next, and from one year to the next. These facts can complicate the hybrid selection process. Nevertheless, an informed decision can be made by selecting hybrids with resistance to the diseases most likely to be a problem. Resistance to other diseases should be considered on a secondary basis.

While it is not possible to know with complete certainty which diseases will develop, the disease history of the farm and area will indicate which diseases are most likely to occur. A disease history for a farm is established by scouting fields and identifying disease outbreaks when they occur. Your county Extension agent, farm supply dealer, and neighbor can also be good sources of information. However, farm-specific information obtained through field scouting is the most reliable basis for developing a farm disease history.

When selecting a hybrid, recognize that there are different levels of disease resistance. If available, agronomically acceptable hybrids with high levels of resistance usually provide the best protection against a serious disease outbreak. Under reduced disease pressure, however, a moderate level of resistance may be enough to achieve acceptable results. For some diseases, low to moderate resistance is all that is available among current commercial hybrids, even though higher levels of resistance would be desirable. In these cases, use of a hybrid with even a low level of resistance is usually superior to planting a susceptible hybrid. However, recognize that using low to moderate levels of resistance may require you to pay greater attention to other disease management strategies in order to achieve good results. Hybrids can also be selected for tolerance — the ability to yield well even though symptoms develop. Information on disease-tolerant hybrids is limited, but tolerant hybrids can be useful when available.

Always use pesticides safely and according to the label. Misuse of pesticides can be hazardous to the farmer, farm workers, the growing crop, the consumers of the harvested commodity, and/or the environment. The label is the most reliable source of up-to-date information on a pesticide. ALWAYS READ THE LABEL BEFORE USING A PESTICIDE, AND FOLLOW LABEL INSTRUCTIONS.

CORN Anthracnose

CAUSE: *Colletotrichum graminicola*

SYMPTOMS: Tan to brown leaf spots surrounded by yellow halo, usually more abundant toward leaf tip. Lesions may coalesce, blighting entire leaves. Early in season, anthracnose symptoms are most common on lower leaves. Late in season, symptoms of anthracnose include blighting of upper leaves and possibly breakage of plant tops (see Top Dieback). Also causes a late-season lower stalk rot. Black spines may be visible in dead leaves with a hand lens.

KEY FEATURES OF DISEASE CYCLE: Fungus survives in undecomposed corn residue. Spores are spread by windblown rain and rainsplash. Early season leaf symptoms usually are not damaging, but indicate need to scout later for stalk rot.

MANAGEMENT: Use resistant hybrids, especially where corn is grown without rotation under reduced tillage. Rotate away from corn for 1-2 years.

Ear and Kernel Rots

CAUSE: *Diplodia*, *Gibberella*, *Fusarium*, *Aspergillus*, *Penicillium*

SYMPTOMS: Moldy growth on ears and kernels. Helpful distinguishing features:

Diplodia — white mold growth between kernels, usually progressing from base of ear.

Gibberella — pink to reddish mold growth, often progressing from ear tip.

Penicillium — green or blue-green powdery mold on and between kernels, often at the ear tip.

Aspergillus — greenish-yellow mold on and between kernels.

Fusarium — pink mold growing on individual kernels.

KEY FEATURES OF DISEASE CYCLE: Wounds made by birds and insects provide infection sites for these fungi, although infection may occur in unwounded tissues. Other factors that can aggravate ear and kernel rots include: lodging of stalks, bringing ears in contact with soil; incomplete coverage of ears by husks; and maturation of ears in upright position.

MANAGEMENT: Choose hybrids in which ears are well-covered by husks, and which mature with ears pointing downward. Control insects that feed on ears in the field. Clean bins before storage. Harvest at about 25% moisture for shelled corn to minimize kernel damage and field losses. Adjust harvesting equipment for minimum kernel damage and maximum cleaning. Avoid harvesting faster than drying facilities can operate effectively. Dry shelled grain below 15.5% moisture within 24-48 hours of harvest. Maintain dry storage conditions. Control insect infestations in storage. Periodically aerate and check for heating, crusting, or musty odors. Maintain stored corn uniformly as indicated in table below.

Average monthly temperature	Minimum grain temperature	Maximum grain temperature
Below 40°F	35°F	45°F
40° - 60°F	Within 5°F of average monthly temp	Within 5°F of average monthly temp
Above 60°F	55°F	65°F

SOURCES OF ADDITIONAL INFORMATION:

1. Principles of Grain Storage, AEN-20.
2. Aeration, Inspection and Sampling of Grain in Storage Bins, AEN-45.

Gray Leaf Spot

CAUSE: *Cercospora zeae-maydis*

SYMPTOMS: Gray to tan, narrow, rectangular lesions 1/4 to 2 inches long. Lesions are restricted by veins. Leaf symptoms usually do not appear until pollination. Older leaves are affected first; severely affected leaves can be killed when lesions coalesce. Weakening and lodging of stalks may occur if a severe outbreak causes leaves to blight during grain fill.

KEY FEATURES OF DISEASE CYCLE: The fungus survives in undecomposed corn residue. Spores are spread by air currents. Leaves become infected during prolonged (11-14 hours or more) periods of high (>95%) relative humidity and warm temperatures. The disease is more severe in fields with corn following corn under reduced tillage. Severe yield loss can occur when leaves become blighted during early grain fill.

MANAGEMENT: Use resistant hybrids, especially when grown without rotation under reduced tillage. Rotate away from corn for 1-2 years.

SOURCES OF ADDITIONAL INFORMATION:

1. Gray Leaf Spot of Corn, PPA-35
2. Annual Kentucky Hybrid Corn Performance Test, Progress Report 345.

Northern Leaf Blight

CAUSE: *Setosphaeria turcica* (*Exserohilum turcicum*, *Helminthosporium turcicum*)

SYMPTOMS: Elliptical, grayish-green or tan lesions 1-6 inches long with smooth margins. During damp weather, greenish black fungal sporulation is produced in lesions. Older leaves are affected first; severely affected leaves can be killed when lesions coalesce. On hybrids carrying an Ht₂ resistance gene, long, yellow to tan lesions with wavy margins and no sporulation are observed on leaves infected with *S. turcica*. These resistance-reaction lesions can be easily confused with Stewart's Wilt.

KEY FEATURES OF DISEASE CYCLE: The fungus survives in undecomposed corn residue. Spores are spread by air currents. Spores germinate and infect leaves during wet weather with moderate temperatures. Severe yield loss can occur when leaves become blighted during early grain fill. More severe in fields with corn following corn under reduced tillage. Also infects sorghum.

MANAGEMENT: Use resistant hybrids, especially when grown without rotation under reduced tillage. Hybrids with either single gene (Ht) or multiple gene resistance are available. Rotate away from corn and sorghum for 1-2 years.

Rusts

CAUSE: *Puccinia sorghi*, *Puccinia polysora*

SYMPTOMS: Pustules that are circular to oval, golden-brown to cinnamon brown, up to 1/8 long. Pustules become brown to black at harvest. Leaves turn yellow when severe. Pustules of Common Rust (*P. sorghi*) are

common on both leaf surfaces. Pustules of Southern Rust (*P. polysora*) are densely scattered on upper leaf surface, with few on lower surface.

KEY FEATURES OF DISEASE CYCLE: Spores of both fungi are carried on springtime winds from southern areas of the U.S. Common rust is active during cool (60° - 75°F), humid weather; Southern Rust is most active during warm (80°F), humid conditions. Both fungi infect leaves when spores are present and leaf surfaces are wet. Often more severe in late plantings. Greatest yield loss occurs in susceptible hybrids when outbreaks begin during early grain fill.

MANAGEMENT: Use hybrids resistant to common rust. Resistance to Southern Rust is limited in hybrids commonly grown in Kentucky. Avoid late planting.

Seed Rot & Seedling Blight

CAUSE: *Pythium*, *Diplodia*, *Fusarium*, *Penicillium*, *Rhizoctonia*

SYMPTOMS: Rotting of seed before or after germination. Yellowing, wilting, and death of leaves of emerged plants. Soft rot of stem tissues. Rotting of roots, which may appear brown, watersoaked, faintly pink, or greenish-blue. May result in uneven stand height later in season.

KEY FEATURES OF DISEASE CYCLE: Common fungi in Kentucky soils. Usually do not limit stands, but can do so when seedlings are stressed. Common stresses include planting in cool, wet soils and chemical injury.

MANAGEMENT: Use high-quality seed treated with fungicide (captan, thiram, or other fungicides). Plant in warm (above 50°F), moist soils. Place herbicide, fertilizer, insecticide, and seed properly to avoid stress or injury to seedling.

Southern Leaf Blight

CAUSE: *Cochliobolus heterostrophus* (*Bipolaris maydis*, *Helminthosporium maydis*)

SYMPTOMS: Elliptical, tan to light brown, small lesions (1/8 - 1/4 inch by 1/4 - 3/4 inch), often with somewhat parallel sides, and sometimes with a brown border. Older leaves are affected first; severely affected leaves can be killed when lesions coalesce.

KEY FEATURES OF DISEASE CYCLE: The fungus survives in corn residue. Spores are spread by air currents. Spores germinate and infect leaves during warm, wet weather. More severe in fields with corn following corn under reduced tillage. Greatest yield loss can occur when leaves become blighted during early grain fill.

MANAGEMENT: Use resistant hybrids, especially when grown without rotation under reduced tillage. Rotate away from corn for 1-2 years.

Stalk Rot

CAUSE: *Diplodia maydis*, *Gibberella zeae* (*Fusarium graminearum*), *Fusarium moniliforme*, *Macrophomina phaseolina*, *Colletotrichum graminicola*

SYMPTOMS: Lower stalk is spongy, and internal tissue (pith) shredded and often discolored. Stalks weaken and lodge. Plants sometimes turn grayish-green and dry during grain fill. Helpful distinguishing features:

Diplodia — Stalk and pith light brown. Small, dark-brown to black pimple-like fruiting structures develop just below epidermis near base of stalk.

Gibberella — Pith pink to reddish. Small black pimple-like fruiting structures develop superficially on stalk near nodes and can be easily scraped off with fingernail.

Fusarium — Pith whitish-pink to salmon-colored. Roots often rotted. Difficult to distinguish from *Gibberella*.

Charcoal Rot (*Macrophomina*) — Pith contains many tiny black fungal structures, giving charred appearance. Roots rotted and black.

Anthrachnose (*Colletotrichum*) — Dark brown to black discoloration on exterior of lower stalk. Dark spines may be visible with hand lens, especially near soil line. Pith light to dark brown.

KEY FEATURES OF DISEASE CYCLE: These fungi survive on corn residues. All but Charcoal Rot favored by warm, wet weather during grain fill. Charcoal Rot is favored by hot, dry weather during grain fill. Other aggravating factors: high plant populations; loss of leaves from disease, insects, or hail; high nitrogen combined with low potash. Early-season hybrids are often more susceptible than full-season hybrids. Several fungi also cause ear rots. *Colletotrichum* also causes Anthrachnose of leaves, as well as Top Dieback. *Macrophomina* also infects sorghum and soybeans.

MANAGEMENT: Use hybrids resistant to stalk rots and leaf diseases prevalent in the area. Avoid excessive plant populations. Maintain balanced soil fertility. Control leaf-, stalk-, and root-feeding insects. Scout for stalk rots by either pinching the lower 2 or 3 stalk internodes, or by pushing stalks 8-12 inches from vertical to check for lodging. Harvest early if 10-15% show disease. Avoid growing continuous corn. Consider avoiding soybeans and sorghum following severe outbreaks of Charcoal Rot.

SOURCES OF ADDITIONAL INFORMATION:

1. Corn Stalk Rots, PPA-26.

Stewart's Wilt

CAUSE: *Erwinia stewartii*

SYMPTOMS: Long (2-10 inches), linear (1/8 to 1 inch wide) leaf lesions with very wavy margins. At first, lesions are pale green to yellow, but become light brown when they dry. Severely affected leaves are killed. Lesions of Stewart's Wilt are easily confused with lesions on hybrids carrying an Ht₂ resistance gene to Northern Leaf Blight. To aid diagnosis, hold leaves to light and look in lesions for scratch-like feeding marks of flea beetle. Infection of seedlings causes rapid wilt and death.

KEY FEATURES OF DISEASE CYCLE: Overwinters in body of corn flea beetle, which also spreads the bacterium. Disease pressure is usually high in Kentucky, but can be low following a very cold winter, which kills flea beetles.

MANAGEMENT: Use resistant hybrids.

SOURCES OF ADDITIONAL INFORMATION:

1. Stewart's Wilt of Corn, PPA-33.

Top Dieback (Upper Stalk Rot)

CAUSE: *Colletotrichum graminicola*

SYMPTOMS: Plants turn yellow or red from top downward during grain fill. Leaves at ear level remain green. Lodging and breakage of stalks occur when severe. Internal stalk tissue has brown discoloration. Be sure to rule out stalk injury from European corn borer.

KEY FEATURES OF DISEASE CYCLE: The fungus survives in corn residue. Spores are spread by wind-blown rain and rainsplash. Also causes early-season Anthracnose on leaves, as well as Anthracnose Stalk Rot.

MANAGEMENT: Use resistant hybrids, especially when grown without rotation under reduced tillage. Rotate away from corn for 1-2 years.

Virus Complex

CAUSE: Maize Dwarf Mosaic Virus (MDMV), Maize Chlorotic Dwarf Virus (MCDV)

SYMPTOMS: Symptoms can be variable. MDMV typically causes stunting and irregular, light and dark green mosaic patterns in the leaves, especially the youngest leaves. MCDV typically causes stunting, yellowing, and sometimes reddening of the youngest leaves, and sometimes leaf tattering. Usually most severe around areas of fields highly infested with johnsongrass rhizomes.

KEY FEATURES OF DISEASE CYCLE: Both viruses overwinter in johnsongrass rhizomes. MDMV is spread by certain aphids, MCDV by certain leafhoppers. Late-planted fields have greater risk of serious disease outbreaks. Compared to corn planted on time, late-planted corn is at an earlier stage of crop development when insect vectors become active. Earlier infection usually results in more severe symptoms. MDMV also causes a disease of sorghum.

MANAGEMENT: Use virus-tolerant hybrids in fields with heavy infestations of johnsongrass rhizomes. Eliminate johnsongrass rhizomes to reduce disease pressure. Avoid late planting.

SOURCES OF ADDITIONAL INFORMATION:

1. Virus Diseases of Corn in Kentucky, PPA-40.
2. Annual Kentucky Hybrid Corn Performance Test, Progress Report 345.

SORGHUM

Bacterial Stripe

CAUSE: *Pseudomonas andropogoni*

SYMPTOMS: Long, narrow brick-red to purplish-red stripes, becoming tan when dry. Lesions are bounded by secondary veins.

KEY FEATURES OF DISEASE CYCLE: Bacteria survive in infected seed and in undecomposed sorghum residue. Infection is favored by warm, humid weather. Conspicuous but generally does little damage.

MANAGEMENT: Use clean seed. Rotate away from sorghum for 2 years. Control weeds. Use resistant hybrids, especially when grown without rotation under reduced tillage.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Fusarium Head Blight

CAUSE: *Fusarium moniliforme*

SYMPTOMS: Structures supporting grain in the head (panicles and rachis branches) become infected first, causing death of some or all florets in seedhead. Stalk tissue at and immediately below the head becomes infected later, turning reddish-brown to brown. Stalk lodging may follow. Cream to pink fungal growth may be produced on infected grain under moist conditions. Development of smaller, lighter grain that otherwise appears normal can occur when only rachis branches that hold the grain become infected.

KEY FEATURES OF DISEASE CYCLE: The fungus can occur in sorghum seed or crop residue, and sometimes in soil. Spores are spread by air currents. Infection of the grain head can occur during warm, wet conditions during heading. The seed mold phase can occur when warm, wet weather delays harvest. Hybrids with pigmented seedcoats usually exhibit partial resistance to grain mold.

MANAGEMENT: Timely harvest of grain at appropriate moisture content is important. Use hybrids with pigmented seedcoats. Hybrids with dense, compact heads may be affected more severely.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Head Smut

CAUSE: *Sphacelotheca reiliana*

SYMPTOMS: At heading, large galls appear in place of head. Head turns into mass of dark brown, powdery spores. Infected plants produce no grain.

KEY FEATURES OF DISEASE CYCLE: Infection occurs in seedlings from spores in soil, although no symptoms occur until heading.

MANAGEMENT: Use resistant hybrids.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Leaf Spots & Blights

CAUSE: *Setosphaeria*, *Colletotrichum*, *Cercospora*, *Gleocercospora*, *Ascochyta*

SYMPTOMS: Round, oval, or rectangular leaf spots. Spots are tan, yellow, reddish, or purple, sometimes with a darker margin. Older leaves are affected first; severely affected leaves can be killed when lesions coalesce.

KEY FEATURES OF DISEASE CYCLE: These fungi survive in undecomposed crop residue. Spores are spread by air currents or splashing rain and infect leaves under conditions of high humidity. In normal years, these diseases play a minor role in limiting sorghum yields. However, significant yield losses can occur if upper leaves become spotted early in growing season. *Setosphaeria* also infects corn.

MANAGEMENT: Use resistant hybrids, especially when grown without rotation under reduced tillage. Select resistant hybrids based on scouting to determine which specific diseases are present. Rotate away from sorghum and corn for 1-2 years. Control weeds which may act as a source of inoculum.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Maize Dwarf Mosaic

CAUSE: Maize Dwarf Mosaic Virus

SYMPTOMS: Irregular, light and dark green mosaic patterns in the leaves, especially the youngest leaves. "Red-leaf" symptoms (tan stripes with red borders occurring between veins) occurs under cool conditions.

KEY FEATURES OF DISEASE CYCLE: The virus survives in johnsongrass rhizomes and other perennial grasses. Spread by certain aphids. Late-planted fields have greater risk. MDMV also causes a disease of corn.

MANAGEMENT: Use tolerant hybrids. Eradicate johnsongrass rhizomes and other perennial grassy weeds in the field.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Root Rot

CAUSE: *Periconia*, *Pythium*, *Rhizoctonia*, *Fusarium*

SYMPTOMS: Stunting, sometimes leaf yellowing and/or wilting. Rotted roots are pink, reddish, brown, or black.

KEY FEATURES OF DISEASE CYCLE: Common fungi in soil, but not damaging unless plant is stressed. Common stresses include excessive dryness, cool soils, poor drainage, or inadequate fertility. Vigorously growing plants are able to produce new roots to replace infected roots. Plants growing under stressful conditions, however, remain weak and are unable to produce new roots, leading to reduced plant growth.

MANAGEMENT: Use adapted hybrids. Plant in warm (above 65°F) soils at rates and row spacings recommended for variety selected. Maintain proper soil fertility. Minimize injury from herbicides. Avoid soils with poor drainage, or improve surface and internal drainage of fields.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Seed Rot and Seedling Blight

CAUSE: *Pythium*, *Fusarium*, *Bipolaris*, *Rhizoctonia*

SYMPTOMS: Rotting of seed before or after germination. Yellowing, wilting, and death of leaves of emerged plants. Soft rot of stem tissues. Rotting of roots, which may appear water-soaked, faintly pink, reddish, or dark brown. Sometimes causes uneven stand height later in season.

KEY FEATURES OF DISEASE CYCLE: Common fungi in Kentucky soils. Usually do not limit stands, but can do so when seedlings are stressed. Common stresses include planting in cool, wet soils and/or chemical injury.

MANAGEMENT: Use injury-free, high-quality seed treated with fungicide (captan, thiram, or other fungicides). Plant in warm (above 65°F), moist soils at the proper depth and seeding rate. Place herbicide, fertilizer, insecticide, and seed properly to avoid stress or injury to seedling.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Sorghum Downy Mildew

CAUSE: *Peronosclerospora sorghi*

SYMPTOMS: Yellow-green stripes in leaves. "Downy" growth from fungal spores may occur on underside of leaf. Leaves become shredded as season progresses. Heads partially or completely sterile.

KEY FEATURES OF DISEASE CYCLE: The fungus survives for many years as spores in soil. Spores germinate and infect roots; fungus can then colonize plant internally. Infected plants can then produce air-borne spores that infect other plants under warm, humid conditions. Also infects corn and shattercane.

MANAGEMENT: Use resistant hybrids. Use seed treated with metalaxyl. Control shattercane to reduce inoculum. Long-term rotation to wheat, soybeans, or forages reduces numbers of spores in soil. Avoid corn-sorghum rotation where the disease occurs.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.

Stalk Rot

CAUSE: *Macrophomina phaseolina*, *Colletotrichum graminicola*

SYMPTOMS: Stalk is spongy, and internal tissue (pith) shredded and often discolored. Plants sometimes turn grayish-green after jointing. Helpful distinguishing features:

Charcoal Rot (*Macrophomina*) — Lower stalk is spongy. Pith contains many tiny black fruiting structures, giving charred appearance.

Stalk Red Rot (*Colletotrichum*) — Brown sunken lesions on stalk. Pith is brick-red.

KEY FEATURES OF DISEASE CYCLE: These fungi survive on undecomposed crop residue. Aggravating factors include high plant populations and high nitrogen combined with low potash. Charcoal Rot is prevalent during hot, dry weather. Stalk Red Rot is prevalent during warm weather with alternating wet and dry periods. *Colletotrichum* also causes leaf anthracnose and peduncle breakage in sorghum. Different strains of *Colletotrichum* infect sorghum than those that infect corn. *Macrophomina* also infects corn and soybean.

MANAGEMENT: Use hybrids resistant to Stalk Red Rot and tolerant of Charcoal Rot. Avoid excessive plant populations. Maintain balanced soil fertility. Rotate away from sorghum for two years or more following severe outbreaks of either disease. Consider avoiding soybeans and corn for two or more years following severe outbreaks of Charcoal Rot.

SOURCES OF ADDITIONAL INFORMATION:

1. Diseases of Grain Sorghum, PPA-29.