

## LATE SEASON CORN DISEASES IDENTIFICATION

Management options for corn diseases depend on the disease identified and the severity, extent, and anticipated spread of the disease in the field. The information below can help identify late-season corn diseases (leaf, stalk, and ear) based on plant symptoms and growth stages. Corn growth stages during which symptoms generally appear are listed following the disease name and are described below.

Early-season: Emergence to knee-high

Mid-season: Knee-high to tasseling

Late-season: Tasseling to maturity

## LATE SEASON CORN LEAF DISEASES

### Goss's Wilt and Leaf Blight



Figure 1. Goss's wilt bacterial exudate on leaf surface.

#### Symptoms

- Water-soaked lesions with wavy margins.
- Black freckles inside lesions.
- 'Ooze' or shiny appearance.

#### Growth Stage

- Early, mid, and late season

#### Causal Agent

- Bacteria

#### Management

- Genetic tolerance.
- Rotation away from corn.
- Control grass weeds.
- Use tillage to bury corn residue.

### Southern Corn Rust

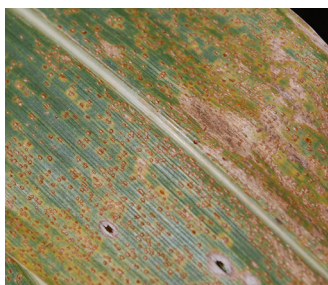


Figure 2. Southern corn rust.

#### Symptoms

- Small, circular, orange-to-light-red pustules occur on leaves, especially the upper leaf surface, and sheaths.
- Pustules are often dense in patches.

#### Growth Stage

- Mid, and late season.
- Occurs at the silking stage.

#### Causal Agent

- Fungus

#### Management

- Select resistant corn products.
- Fungicide applications.<sup>6</sup>

### Northern Corn Leaf Blight



Figure 3. Northern corn leaf blight lesions.

#### Symptoms

- Long (up to 6 inches), elliptical, gray-green lesions that become tan-brown.
- Infection typically spreads from lower to upper leaves.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Fungus

#### Management

- Select resistant corn products.
- Fungicide application.
- Manage residue.
- Crop rotation.<sup>3</sup>

### Gray Leaf Spot



Figure 4. Gray leaf spot.

#### Symptoms

- Long (up to 6 inches), elliptical, gray-green lesions that become tan-brown.
- Infection typically spreads from lower to upper leaves.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Fungus

#### Management

- Select resistant corn products.
- Fungicide application.
- Manage residue.
- Crop rotation.<sup>7</sup>

### Stewart's Bacterial Wilt and Blight



Figure 5. Late-season symptoms of Stewart's wilt on a corn leaf.

#### Symptoms

- Flea beetle feeding appears as scratches and scrapes on leaves.
- Early phase of blight appears as bleached, wavy leaf streaks running the length of the leaf.
- Internal tissues can be discolored and ooze bacteria.

#### Growth Stage

- Early, and late season

#### Causal Agent

- Bacteria vectored by flea beetles

#### Management

- Scout soon after emergence for bleached leaf streaks and flea beetles.
- Foliar insecticides can be applied when there are greater than 6 beetles per 100 plants (susceptible corn products) or 25% of plants have severe feeding damage with 2 beetles/plant (tolerant corn products).<sup>8</sup>
- Select corn products with genetic tolerance to the bacterium.
- Treated seed or in-furrow insecticides can protect young corn plants from flea beetles.

### Anthracnose Leaf Blight



Figure 6. Anthracnose leaf blight.

#### Symptoms

- Oval, spindle-shaped water-soaked lesions on youngest leaves that turn tan-brown and yellow-reddish brown on borders.
- Often observed in seedling but typically outgrows infection.
- Heavily infested leaves can wither and die.
- Small, hair-like fungal structures called setae can be seen in the middle of lesions.

#### Growth Stage

- Early, and late season

#### Causal Agent

- Fungus

#### Management

- Selection of disease-tolerant products.
- Fungicide application before the fungal pathogen spreads in the corn canopy. Fungicides are rarely needed for Anthracnose Leaf Blight control.
- Tillage.
- Crop rotation.

### Northern Leaf Spot (*Helminthosporium* Leaf Spot)

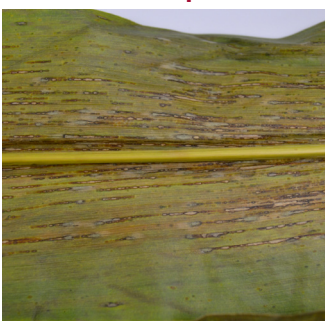


Figure 7. Northern leaf spot of corn.

#### Symptoms

- Lesions of pathogen races 2 and 4 tend to be oblong to blocky, and tan to brown in color.
- Race 1 pathogen produces a host toxin which may cause a black, charred-appearing ear rot.
- Lesions of race 3 are small or oval spots in lines between veins resembling a "string of pearls".

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- not an important disease in corn.
- In susceptible corn products, use of crop rotation, tillage of corn debris, and foliar fungicides are some of the ways to manage this disease.<sup>2</sup>

### Common Corn Rust



Figure 8. Corn rust on the underside of a corn leaf.

#### Symptoms

- Cinnamon-brown, powdery, circular-to-elongated pustules can occur on both sides of leaves.
- Pustules rupture and rusty powder can be rubbed off with fingers.

#### Growth Stage

- Mid and late season

#### Causal Agent

- Fungus

#### Management

- Fungicide application before the fungal pathogen spreads in the corn canopy.
- Tillage.
- Crop rotation.
- Selection of disease-tolerant products.

### Eye Spot



Figure 9. Eye spot on upper side of leaf.

#### Symptoms

- Small (less than ¼ inch), circular, translucent lesions surrounded by a yellow to purple margin.
- Has a yellow halo effect when the leaf is held up to light.
- Lower leaves are usually infected first.
- Disease is favored with cool and moist weather.

#### Growth Stage

- Mid and late season

#### Causal Agent

- Fungus

#### Management

- Crop rotation.
- Clean plow-down of corn residue.
- Select resistant corn products.

### Southern Corn Leaf Blight

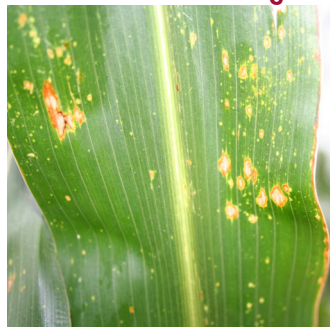


Figure 10. Southern corn leaf blight.

#### Symptoms

- Small, elongated (up to 1 inch long), parallel-sided to round lesions that are tan with brownish borders.
- This blight primarily attacks leaves.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Fungus

#### Management

- Fungicide applications.
- Select resistant corn products.
- Tillage to break down the crop residue.
- Crop rotation.<sup>5</sup>

#### References:

- 1 Wise, K. 2010. Gray leaf spot. Diseases of corn. Purdue Extension- Knowledge to Go. Purdue University. BP-56-W. <https://www.extension.purdue.edu/extmedia/bp/BP-56-W.pdf>
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## LATE SEASON STALK DISEASES IN CORN

Stalk diseases or rots become apparent as plants reach maturity and tend to be caused by a complex of several disease-causing fungi and sometimes bacteria. Plants with rotted stalks almost always have rotted roots too, usually caused by the same organism. Visual identification is sometimes difficult. Wilting is typically the first sign of stalk rot. In a few days, leaves turn a “frosted” gray, ears droop, and the outer rind of the lower stalk turns brown. Deteriorated stalk pith tissues usually can be determined from pinch and push tests. Fields where stalk rot is developing should be harvested early to reduce grain losses.

### Gibberella stalk rot



Figure 11. Gibberella stalk rot.

#### Symptoms

- Affected plants wilt, leaves turn dull gray-green, and the lower stalk softens and becomes straw colored as the plant dies.
- Pith tissue disintegrates, leaving only vascular strands.
- The inside of a rotted stalk is pink to red in color. Dark, small bodies are superficial on the lower stalk surface and can be scraped off easily.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Crop rotation and tillage can help reduce the inoculum.
- Good fertility and tillage practices are essential.
- If >10-15% of stalks are observed to be rotted 40-60 days after pollination, the field should be scheduled for earliest harvest.<sup>1</sup>

### Diplodia (*Stenocarpella*) Stalk Rot



Figure 12. Diplodia stalk and ear rot.

#### Symptoms

- Lower internodes are straw-brown, spongy, and dry.
- The pith disintegrates, leaving vascular strands intact.
- White fungal growth may appear on the stalk surface.
- Dark, minute bodies embedded just under the stalk rind surface are difficult to remove.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Tillage, crop rotation, stress reduction, planting proper populations, rotation of crop genetics in continuous corn, and balanced soil fertility.<sup>2</sup>

### Fusarium Stalk Rot



Figure 13. Fusarium stalk rot.

#### Symptoms

- Rotting of roots, crown, and lower internodes leads to premature ripening and stalk lodging.
- Split stalks may show a whitish-pink to salmon color.
- Disintegration starts at the nodes.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Genetic resistance.
- Fungicide applications.
- Good fertility and tillage practices are essential.
- Plant density should not exceed 28,000-32,000 plants/acre in field.
- Reduce plant stress.<sup>3</sup>

### Charcoal Rot



Figure 14. Charcoal rot root split.

#### Symptoms

- Lower internodes are affected, causing premature ripening, shredding, and crown disintegration.
- Vascular strands remain intact but are black or “charred” in appearance due to the formation of small fungal structures called microsclerotia.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Good water management to avoid stressing plants particularly as the plants approach tasseling.
- Good fertility and tillage practices are essential.
- Crop rotation to non-host crops can help as well.<sup>4</sup>

### Red Root Rot



Figure 15. Red root rot split.

#### Symptoms

- Seminal roots are most damaged and adventitious root damage increases with their age.
- The root color of affected plants ranges from pink to royal red, with higher soil temperature resulting in darker pigmentation.

#### Growth Stage

- Late season

#### Causal Agent

- A complex of soil fungi.

#### Management

- Crop rotation with a non-host such as soybean.
- Good fertility, moisture, and tillage practices.
- Environmental stress during the season may contribute to disease infection and severity.<sup>6</sup>

### Crazy Top



Figure 16. Crazy top.

#### Symptoms

- Plants can have excessive tillering with rolling or twisting of newer leaves.
- The tassel and ear can become a mass of leaves developing on when infection occurs.
- Leaves can be narrow, thick, and strap-like in severely infected plants.
- Sometimes over-sized plants will develop.
- This disease occurs more frequently in low-lying wet areas.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Fungus

#### Management

- Provide adequate soil drainage, control grassy weeds, don't plant corn in low and wet spots
- Good fertility, and tillage practices are essential.<sup>7</sup>

### Corn Lethal Necrosis



Figure 17. Corn lethal necrosis.

#### Symptoms

- Mosaic pattern appears on leaves and husk.
- Infection is systemic.
- Symptom severity depends on the growth stage of plants at time of infection.
- It is caused by a synergistic interaction when plants become infected by maize chlorotic mottle virus and a potyvirus like maize dwarf mosaic or wheat streak mosaic virus.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Virus spread by greenbugs.

#### Management

- Crop rotation, control green bugs, and genetic tolerance.<sup>5</sup>

### Maize Chlorotic Dwarf Virus

#### Symptoms

- Younger leaves are yellow and finely striped.
- Most affected leaves show yellowing and reddening and affected plants are stunted.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Virus spread by leafhoppers from infected Johnsongrass and other host species.

#### Management

- Control Johnsongrass, apply herbicide to eradicate Johnsongrass, use insecticides to control vectors, genetic tolerance, seed treatment with systemic insecticides.<sup>8</sup>

### Maize Dwarf Mosaic Virus



Figure 18. Maize dwarf mosaic virus in field.

#### Symptoms

- Infection is systemic.
- Mottling of younger leaves progresses into narrow, light-green to yellowish streaks along leaf veins.
- Leaves, sheaths, and husks may show symptoms.
- Plants developing from infected seedlings are stunted, and ear size and seed set are reduced.

#### Growth Stage

- Mid, and late season

#### Causal Agent

- Virus spread by aphids.
- Most prevalent in areas with Johnsongrass.

#### Management

- Control Johnsongrass, apply herbicide to eradicate Johnsongrass, use insecticides to control vectors, genetic control, seed treatment with systemic insecticides.<sup>8</sup>



## Common Corn Smut (Boil Smut, Blister Smut)



Figure 19. Common corn smut.

### Symptoms

- Galls are first silver-white, then become gray to black powdery masses of smut spores that are released when the galls break open.
- Galls on leaves seldom develop beyond pea-size and tend to harden and dry without rupturing. Fungus can infect various plant parts depending on what is actively growing when infected (ears, tassels).

### Growth Stage

- Early, mid, and late season

### Causal Agent

- Fungus

### Management

- Plant resistant corn products, crop rotation, and maintain proper soil fertility.<sup>10</sup>

## Physoderma Node Rot and Brown Spot



Figure 20. Physoderma node rot.



Figure 21. Physoderma brown spot.

### Symptoms

- Small yellow spots first appear at the base of the leaf.
- These spots become brown and can combine to form chocolate-brown to reddish irregular-shaped blotches, sometimes as bands of infection across leaf blades.
- Sheath, husk, tassel, stalk, and leaves may exhibit symptoms late in the season.
- Infected stalks may break at a lower node.

### Management

- Fungicide application, research is underway to determine how fungicides could be used to manage this disease.
- Genetic tolerance.
- Crop rotation, and tillage such as high yielding, high moisture conditions, prioritize fields for early harvest if nodes are infected.<sup>4</sup>

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## LATE SEASON EAR DISEASES IN CORN

These rots can affect ears, kernels, or cobs and reduce test weight and grain quality. Some fungi produce mycotoxins which may contaminate grains. Rotting observed in the field is often due to a complex of causal organisms, not just one. Ear rots can be favored by late-season humidity. Infections are increased by ear damage from birds or insects and by stalk lodging that allows ears to come into contact with the soil.

### Gibberella Ear Rot



Figure 22. Gibberella ear rot.

#### Symptoms

- Reddish kernel discoloration, usually beginning at the ear tip.
- Husks may rot and be cemented to the ear.
- The pathogen is favored by cool, humid weather, particularly 2-3 weeks after silking.
- Multiple mycotoxins are produced such as deoxynivalenol, and Zearalenone.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Cultural practices such as the use of crop rotation, tillage, irrigation timing, or grain drying prior to storage may reduce disease.
- Corn products vary in their resistance/susceptibility to gibberella and resistance to insects that feed on ears can reduce damage and disease severity.
- Sometimes management practices may not be necessary, practical, or possible.<sup>4</sup>

### Diplodia (*Stenocarpella*) Ear Rot



Figure 23. Diplodia ear and stalk rot.

#### Symptoms

- Bleached husk, white mold over kernels, and rotted ears with tightly-adhering husks are the main symptoms.
- Early infection leads to complete ear rotting.
- Infection can come from either the base or tip of the ear.
- Pycnidia (fungal structures) may appear as small black specks at the base of kernels or on cobs.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Cultural practices such as the use of crop rotation, tillage, irrigation timing, or grain drying prior to storage may reduce disease.
- Corn products vary in their resistance/susceptibility to diplodia and resistance to insects that feed on ears can reduce damage and disease severity.
- Sometimes management practices may not be necessary, practical, or possible.<sup>4</sup>



### Fusarium Kernel or Ear Rot



Figure 24. Fusarium ear rot.

#### Symptoms

- Scattered individual or groups of kernels show whitish-pink to lavender fungal growth.
- Infected kernels may also have a “starburst” pattern of white streaks on the cap of the kernel or along the base.
- Infections are more common on damaged ear tips and are favored by dry weather.
- Fusarium rot may produce mycotoxins such as fumonisins.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Reduce insect damage to ears. Corn products with Bt traits to control earworms and European corn borer usually have less Fusarium rot.
- Foliar fungicide and planting products that are resistant to the disease are some management options.<sup>3</sup>

### Aspergillus Ear and Kernel Rot



Figure 25. Aspergillus ear rot.

#### Symptoms

- Greenish or yellowish-tan discoloration occurs on and between kernels, especially near the ear tip.
- Symptoms are more evident if the husk does not cover the ear tip.
- Aflatoxins may be produced.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- An important factor in preventing ear rot is to reduce stress on the corn plants.
- Provide adequate nitrogen and maintain balanced fertility.
- A combination of preventative management tactics and good grain management at harvest can lessen the disease impact.<sup>1</sup>

### Cladosporium Ear Rot



Figure 26. Cladosporium ear rot.

#### Symptoms

- Dark gray to greenish black fungal growth causes kernels to appear blotched or streaked.
- Initial discoloration appears where kernels are attached to the cob.
- Infection eventually progresses upwards and infected kernels can be scattered over the ear.
- If completely colonized, ears are dark and lightweight.
- This disease is often associated with damage due to insects, hail, or frost.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Plant corn products with ear rot resistance.
- Avoid harvest delays and planting corn-on-corn mainly under conservation tillage.
- Reduce stress on plants with adequate fertilization and good pest management.<sup>2</sup>

### Trichoderma Ear Rot



Figure 27. Trichoderma ear rot.

#### Symptoms

- Dark green fungal growth is found between kernels and husks, often covering the whole ear.
- The disease usually occurs on ears with mechanical or insect damage.
- Infected plants tend to be widely distributed within a field.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Cultural practices such as the use of crop rotation, tillage, irrigation timing, or grain drying prior to storage may reduce disease.
- Sometimes management practices may not be necessary, practical, or possible.<sup>4</sup>

### Penicillium Ear Rot



Figure 28. Aspergillus ear rot on left and Penicillium ear rot on right.

#### Symptoms

- Powdery green to blue-green mold develops on and between kernels.
- Infection begins at ear tips due to mechanical injury or insect damage.
- Infected kernels may become bleached or streaked.
- “Blue eye” occurs when the embryo becomes discolored due to the presence of blue-green fungal spores and can occur if infected grain is stored at high moisture levels.

#### Growth Stage

- Late season

#### Causal Agent

- Fungus

#### Management

- Cultural practices such as the use of crop rotation, tillage, irrigation timing, or grain drying prior to storage may reduce disease.
- Sometimes management practices may not be necessary, practical, or possible.<sup>4</sup>

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