BULLETIN 802

Corn Disease Management In Ohio

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THE OHIO STATE UNIVERSITY EXTENSION

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Introduction

Although more than 30 different diseases affect corn in Ohio, only about half cause economic losses. Approximately 5 percent to 15 percent of the state's corn crop is lost to disease each year, which amounts to nearly $100 million in lost farm income. Many factors determine the severity of disease in a particular year or a specific field. Weather affects dissemination of disease agents and rate of disease spread. Crop rotation and tillage practices are important in determining pathogen survival. Plant nutrition strongly influences hybrid susceptibility to certain diseases. Soil type and soil moisture influence many diseases, and hybrid resistance is the single most important factor in the preservation of plant health.

The major diseases affecting corn in Ohio are listed in Table 1. These are leaf blights, stalk rots, ear and kernel rots, seedling diseases, and viral diseases. Some miscellaneous diseases occur, such as common smut and crazy top, but they usually cause little economic loss. Disease can occur on the corn plant during any stage of growth, from germination to maturity. For identification purposes, a 0-to-9 scale has been developed to describe the different growth stages of corn (Figure 1). The cornerstone to successful disease control is correct identification of specific disease problems. Disease samples can be submitted to the Plant and Pest Diagnostic Clinic for diagnosis at the following address:

C. Wayne Ellett Plant and Pest Diagnostic Clinic
The Ohio State University
110 Kottman Hall
2021 Coffey Road
Columbus, OH 43210

Clinic forms and information on proper packaging of plant materials can be obtained from your county Ohio State University Extension office.

The Ohio Field Crop Disease web site:
http://www.oardc.ohio-state.edu/ohiofieldcropdisease/

We strongly recommend crop producers visit the Ohio Field Crop Disease web site for up-to-date information on disease diagnosis and management options. This web site is updated regularly to include new research and pesticide information. Additionally, color pictures are presented to help in diagnosis of the more important diseases.

Table 1. Diseases Affecting Corn in Ohio

Leaf Blights	Stalk Rots	Ear and Kernel Rots	Seedling Diseases	Virus	Miscellaneous
*Northern corn leaf blight race 0, 1 *Southern corn leaf blight race T, O Northern leaf spot race 1, 2, 3 *Stewart's bacterial wilt and leaf blight *Anthracnose *Eyespot *Common Rust *Gray leaf spot Yellow leaf blight Holcus spot Bacterial stripe Physoderma brown spot Southern Rust	*Gibberella *Anthracnose *Fusarium Diplodia Bipolaris Bacterial Nigrospora	*Gibberella ear rot *Diplodia ear rot *Fusarium kernel rot Nigrospora ear and cob rot Penicillium rot Aspergillus rot	*Pythium *Fusarium *Gibberella Bipolaris	*Maize dwarf mosaic *Maize chlorotic dwarf Wheat streak mosaic	Common smut Crazy top Nematode diseases

*Major diseases causing yield losses.

Seedling Diseases

Treating corn seed with a fungicide is a highly effective means of preventing or reducing seed decay and seedling blight diseases (Figure 2). These diseases are caused by fungi that reside in or on the seed or in the soil. Seed treatment is especially important when the corn is planted early. Research trials in several Corn Belt states have shown an average yield loss of 10 percent when untreated seed has been planted in cold, wet soils. These conditions favor seedling diseases that cause loss of stands or reduce the vigor of young seedlings. Seed and seedlings are more vulnerable to infection when the soil is cold, but early planting usually is desirable because it generally results in a higher yield. In most cases, seeds treated with fungicides will germinate and begin to grow once the soil warms to temperatures above 50°F. Corn will grow slowly anytime the soil temperatures are below 60°F, and seedling diseases are most prevalent during this time. Kernels that have been cracked or damaged during harvesting or handling are more susceptible to seed rot diseases and must be removed from the seed lot prior to treating the seed with a fungicide. Most seed corn

Figure 2. Seedling blight is generally more severe under cold, wet, soil conditions. Affected plants are usually stunted with yellow or brown leaf tips. Plants die if the fungi attack the crown and growing point. Most affected plants do not fully recover even with improved weather conditions.

Figure 1. GROWTH STAGES OF CORN

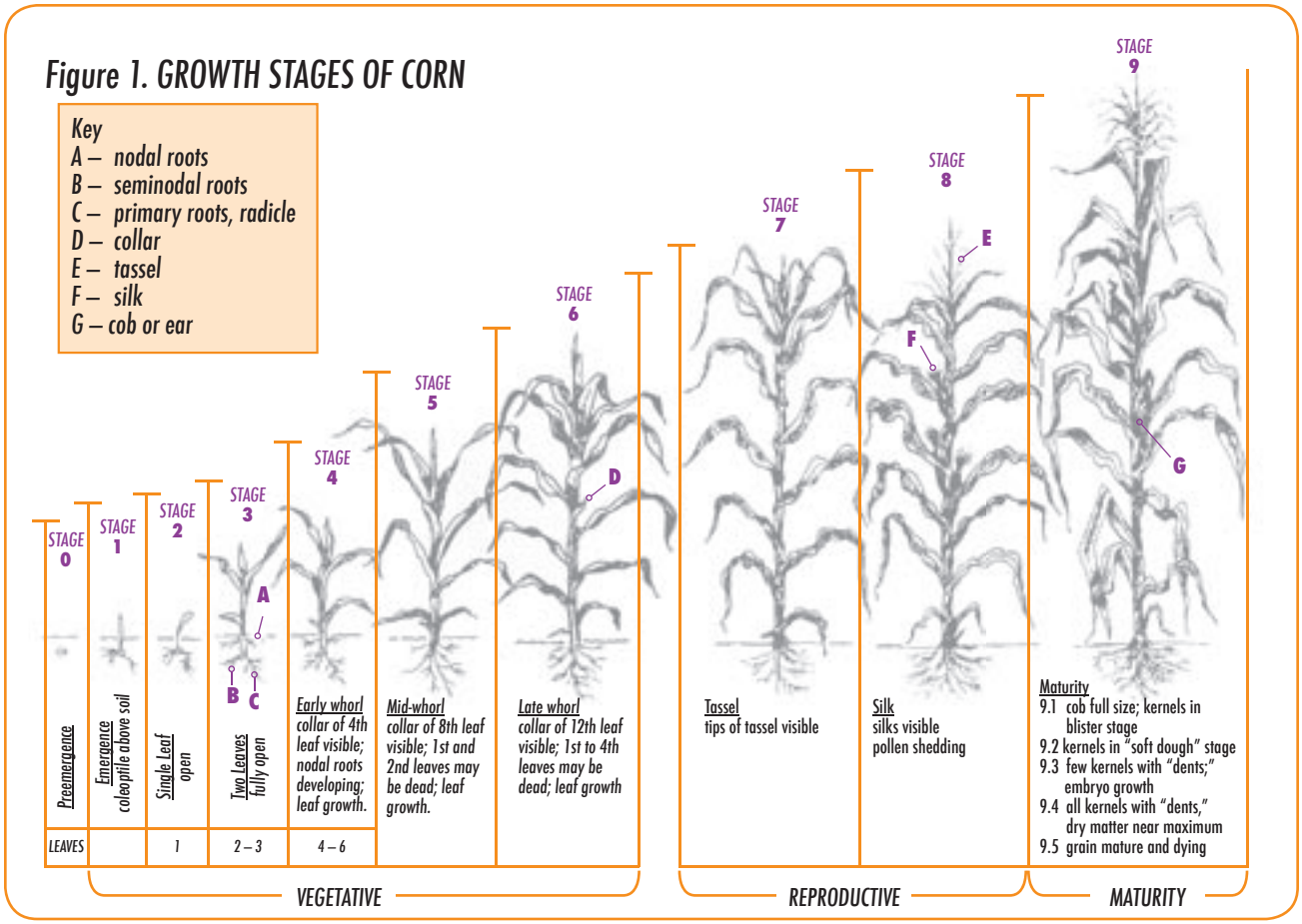

Figure 3. Gray leaf spot is a disease associated with continuous corn, especially when reduced tillage is used. The elongate rectangular lesions, gray in color, are characteristic of this severe leaf blight disease.

Figure 4. Northern corn leaf blight lesions are elongate, necrotic areas, somewhat spindle shaped, and usually with straight or smooth margins.

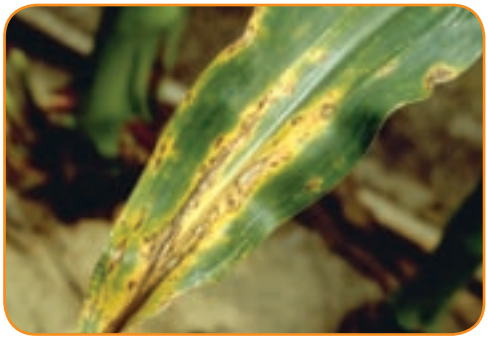

Figure 5. Anthracnose leaf blight is most devastating in fields continuously cropped to corn. Anthracnose lesions appear blotchy with dark tan centers and yellowish-orange borders. Lesions appear first near the leaf tip and at the mid-rib.

is treated with a fungicide or fungicide-insecticide combination by the seed producer or seed processor. If not, several planter box seed treatment materials are available. Captan, metalaxyl, mefenoxam, and fludioxonil are the fungicides most commonly used on corn seed, but other materials are available. Obtain a copy of Ohio State University Extension Bulletin 639A, *Seed Treatment for Agronomic Crops*, at **http://ohioline.osu.edu/b639/index.html** or **http://www.oardc.ohio-state.edu/ohiofieldcropdisease/** for a more complete listing of registered materials. Seed treatment is one of the best ways to ensure a good stand, and all corn seed should be treated.

Leaf Blights

Fungi cause the majority of leaf blights. Gray leaf spot (Figure 3), northern corn leaf blight (Figure 4), and anthracnose leaf blight (Figure 5) are currently the most common and yield-limiting leaf blights in Ohio. The source of spores for these fungal leaf blights is old corn residue within, or adjacent to, corn fields. Of the economically important diseases listed in Table 1, only Stewart's bacterial wilt and leaf blight (Figure 6) is caused by a bacterium. The bacterium overwinters in the gut of the flea beetle, and in the spring the flea beetle carries the bacterium to the young corn plants. Severe outbreaks of this leaf blight occur following mild winters which the beetle vector survives in high numbers. Warm sunny days favor flea beetle activity and spread of the disease. Symptoms of bacterial leaf blight are similar to northern corn leaf blight (Figure 4).

Resistance

The first step in management of corn leaf diseases is use of disease-resistant hybrids. Although no single hybrid is resistant to all diseases, hybrids with

Figure 6. Stewart's bacterial leaf blight can be found on leaf surfaces that have been damaged by feeding of the adult flea beetle. Lesions are usually elongate, necrotic areas with wavy margins initiated at beetle feeding spots.

Figure 7. Lesions of southern corn leaf blight – race 0 are much smaller than those of northern corn leaf blight. Lesions are usually 1 to 2 inches long with limited parallel borders that are buff to brown in color.

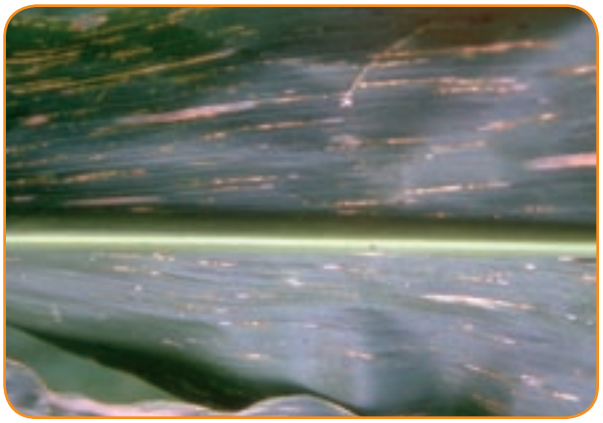

Figure 8. Northern leaf spot, caused by Bipolaris zeicola race 3, can be recognized as narrow linear lesions that run parallel with veins of the leaf. These small lesions are usually grayish-tan surrounded by a dark pigmented border.

resistance to most major leaf blight, stalk rot, and viral diseases are available. Disease resistance does not necessarily mean immunity to disease. Resistance is commonly seen as a reduced number or size of leaf spots and/or a reduction of spread of the pathogen in the field. Some hybrids are resistant to one or several races of a pathogen, but are very susceptible to other races of the same pathogen. The pathogens causing northern corn leaf blight, southern corn leaf blight (Figure 7), and northern leaf spot (Figure 8) exist as several different races. Therefore, it is sometimes important to know the race(s) of the pathogen prevalent in your area. When a new race develops and becomes widespread, previously resistant hybrids appear susceptible.

It is especially important to suppress leaf diseases until 4 to 5 weeks after tasseling so that leaves above the developing ear do not become blighted, because the ear leaf and upper leaves contribute to filling the grain. A great deal of blighting may occur on leaves below the ear without reducing yield. Additionally, when severe leaf blight occurs after the beginning of kernel dent stage, yield losses are generally low. Figure 9 presents a commonly used scale for assessing the level of disease on corn plants. Figure 10 illustrates a method of assessing differing levels of disease severity on individual leaves where data are expressed as a percentage of leaf area affected. The percentage leaf area affected on the ear leaf is commonly used to assess gray leaf spot severity using the scale in Figure 11. High-yielding hybrids should be selected that have resistance to the diseases most common and severe in your area. Hybrids with resistance to northern corn leaf blight, southern corn leaf blight, Stewart's bacterial leaf blight, anthracnose, and common rust

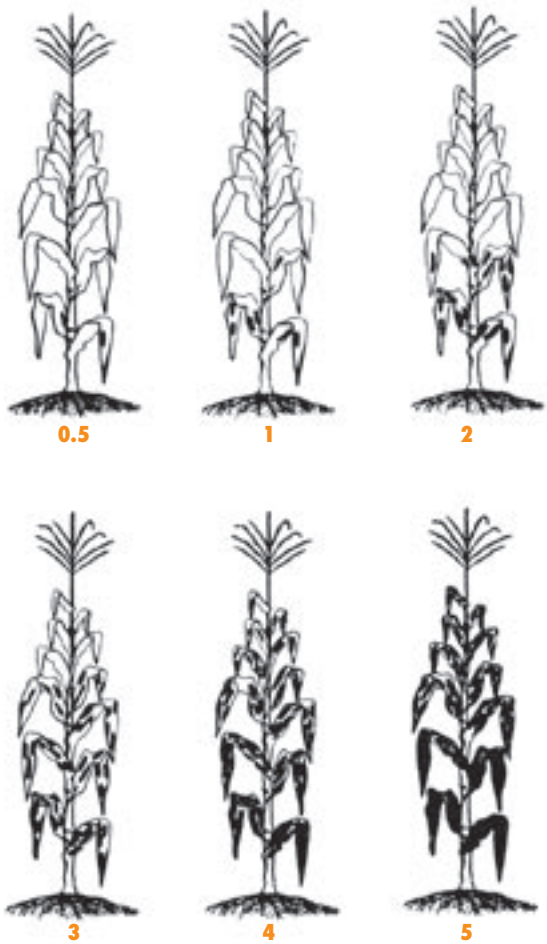

Figure 9. A 0-to-5 disease severity scale commonly used to evaluate hybrids for reaction to leaf blights. From: Elliott, C., and Jenkins, M. T. 1946. Helminthosporium turcicum leaf blight of corn. Phytopathology 36:660-666

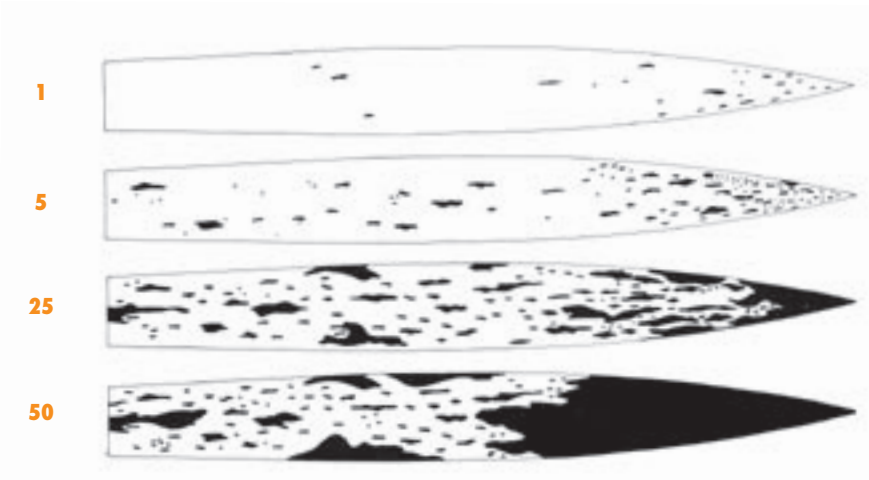

Figure 10. A diagramatic representation of the percentage of leaf area covered by lesions of southern corn leaf blight. Illustrations such as this are used to evaluate disease severity on corn leaves. From: James, C. 1971. A manual of assessment keys for plant diseases, The American Phytopathological Society, 3340 Pilot Knob Rd., St. Paul, MN 55121.

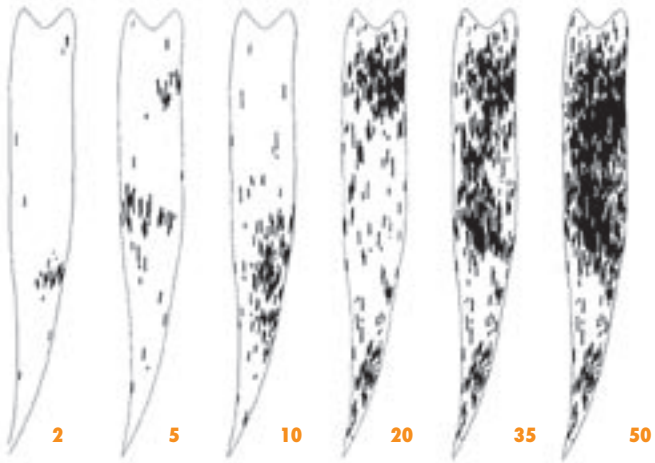

Figure 11. Scale used to assess the percentage of leaf area affected by gray leaf spot. From: Smith, K.I. 1989 Epidemiology of gray leaf spot of field corn caused by Cercospera zeae-maydis, Ph.D. thesis, University of Maryland.

Figure 12. Common rust is more important during cool summers with high relative humidity. Small, oval pustules filled with orangish-red spores are a distinctive sign of common rust.

(Figure 12) are needed across the state. Under reduced tillage, especially in continuous corn, resistance to gray leaf spot, anthracnose, northern leaf blight, eyespot (Figure 13), and northern leaf spot are needed. Hybrids with resistance to common smut (Figure 14) and several other less important diseases are also available.

Crop Rotation and Tillage

Many fungi that cause leaf blight diseases must overwinter on crop residues. Therefore, crop rotation and tillage practices that enhance residue decay before the next corn crop is planted will help reduce diseases such as northern and southern corn leaf blight, anthracnose, eyespot, gray leaf spot, and northern leaf spot. These control methods are generally not effective against the viral diseases or bacterial diseases that require insect vectors for their spread. Fungal diseases spread by wind over long distances also are less effectively controlled by rotation or tillage practices.

Crop rotation is effective only when the disease-causing organism cannot infect the rotation crop. Soybeans and forages are good rotation crops because pathogens that infect corn do not attack these crops. Small grains are also effective in a rotation sequence, although they have some common pathogens with corn. For instance, *Gibberella zeae* causes head scab and root rot of wheat and ear rot and stalk rot of corn.

When corn is planted year after year in fields maintained with reduced tillage, diseases frequently develop that are of minor importance under tilled and rotated production systems. When it is necessary to use reduced tillage and restricted rotation, it is especially important to select the best resistant hybrids to leaf blight

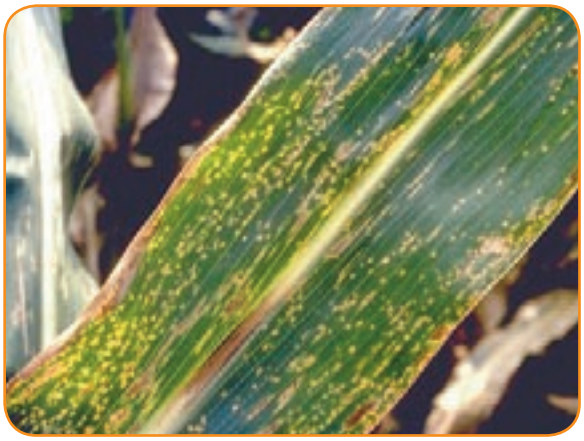

Figure 13. Eyespot lesions are very small and round with white centers and dark margins. Eyespot is important only in continuous corn under reduced tillage management.

Figure 14. Common smut or boil smut is a highly visible disease found in corn fields and in homeowner sweet corn gardens. The unsightly smut boils enlarge within days after infection of ears, tassels, stalks, or leaves. As the boils mature, the contents change into masses of black spores. Since no toxin is associated with this fungal disease, infected plants can be fed to livestock.

Figure 15. Stalk rot diseases result in poor quality grain and yield loss from unharvestable ears due to severe lodging. Several different stalk rot diseases occur in Ohio.

and stalk rot. Under reduced tillage, it will be almost impossible to control certain leaf blight diseases without a rotation away from corn for two to three years. Best control occurs when crop rotation and tillage are used together.

Fungicides

Foliar fungicides rarely are used to control leaf blight diseases of field corn. The cost of the fungicide plus application usually exceeds the profit from increased yield except under severe disease pressure when susceptible hybrids are grown. Foliar diseases can cause significant yield losses if infection occurs between two weeks before to three to four weeks after tasseling. The earlier the disease starts in the field the greater the yield loss. It is important to keep the upper leaves and husks of the plant as disease-free as possible during the grain filling growth stage. Large yield losses only occur when foliar diseases attack the leaves above the ear leaf before mid-dent growth stage. Sweet corn growers routinely use fungicides, and seed producers growing susceptible inbreds have shown large yield increases by controlling leaf diseases with fungicides.

Fungicides are registered for the control of northern corn leaf blight, southern corn leaf blight, northern leaf spot, common rust and gray leaf spot. Before spraying, consider the following factors: the developmental stage of the grain, the amount of disease in the field, the potential yield, the prevailing weather, and the market price of the grain. Spray applications should begin before the fungus attacks the ear leaf. Greatest yield responses occur when the plants become diseased before tasseling and the plants are protected with a fungicide through the first four weeks of grain fill. Generally, fungicides should be applied when diseases like gray leaf spot or northern leaf blight are detected on half the leaves below the ear leaf. Current fungicide recommendations for corn can be obtained at **www.oardc.ohio-state.edu/ohiofieldcropdisease/corn/glsfungicides.htm.**

Stalk Rots

Stalk rots are undoubtedly the most common corn diseases in Ohio (Figure 15). A number of fungi cause stalk rots. The most important in Ohio are caused by Gibberella (Figure 16), Colletotrichum (anthracnose) (Figure 17), Diplodia (Figure 18), and sometimes Fusarium. When stalk rot occurs late in the season after complete denting of kernels, it usually has no direct effect on yield. Certain stalk rots, like anthracnose and Gibberella, can cause premature death of plants and impact yield directly. However, the lodging of diseased corn plants has such an impact on harvest losses that

many consider stalk rots to be the most significant yield-limiting diseases of corn. Fields with severe stalk rot should be harvested as early as possible.

The severity of stalk rot is confounded by plant stress. In general, the greater the stress the plant endures, the greater the severity of stalk rot. This has been demonstrated very well with plant nutrition. Plants with excessively high levels of nitrogen or with an imbalance between nitrogen and potassium are very susceptible to stalk rot. Plants stressed by drought (especially late season drought), foliage disease, or insect injury generally have more stalk rot. Stresses that affect the ability of the plant to produce sugars in leaf tissue and move sugars to the ear for kernel fill or to lower stalks to keep them alive tend to impact the level of stalk rot in the field. Corn growers should follow an integrated approach to manage stalk rot diseases. Management is based on avoiding or lessening stress on the plants. Follow as many management practices for disease control, outlined later, as feasible, depending on the equipment available and feed needs of your operation.

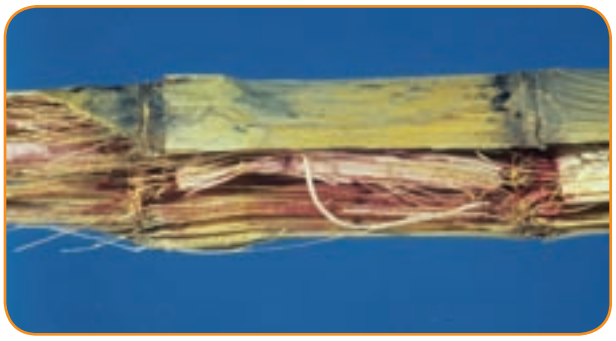

Figure 16. Giberella stalk rot is the most common cause of lodged corn in Ohio. Pink coloration and disintegration of pith tissue are characteristic symptoms of Gibberella stalk rot. Note the dark specks that are fungal spore-bearing bodies, located near stalk nodes.

Ear and Kernel Rots

Many fungi cause ear and kernel rots on corn especially when rainfall is above normal from silking to harvest or when insects or birds damage developing ears. The most common ear rots are Gibberella (Figure 19), Diplodia (Figure 20), and Fusarium (Figure 21) ear rots. Hybrids differ in their susceptibility to these ear diseases, and environmental conditions play a large role in determining the level of ear rots in the field. Some hybrids may escape infection or have ears that do not favor growth of the fungus. Several fungi, particularly *Penicillium* and *Aspergillus*, cause kernel rots that are important once the grain is placed in storage. Very little can be done to prevent infection of ears in the field; however, proper drying of grain and good storage conditions are important when these diseases are evident. Some fungi that cause ear and kernel rots produce mycotoxins that may cause problems when fed to livestock. Visit the web site titled "Moldy Grain, Mycotoxins, and Feeding Problems," at **www.oardc.ohio-state.edu/ohiofieldcropdisease/Mycotoxins/mycopagedefault.htm** for more information.

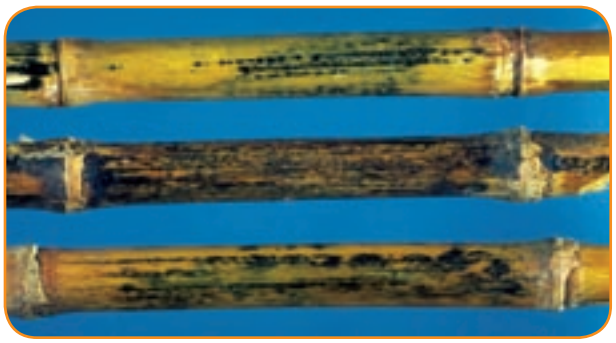

Figure 17. Anthracnose stalk rot can be recognized at corn maturity as shiny black streaks, specks, or blotches on the stalk rind. Internal stalk tissues have a dark gray coloration and pith tissues are rotted. Stalks of highly susceptible hybrids may turn entirely black.

Prevention is the best method to manage mold growth on kernels after harvest. Some preventive practices that will reduce damage from moldy corn are:

1. Allow corn to mature in the field to 23 percent to 25 percent moisture for shelled corn and 20 percent to 25 percent for ear corn.

Figure 18. Diplodia stalk rot is identified by having brown discolored nodes and very small black fungal bodies scattered over the internode surface. Diplodia stalk rot is more common in fields planted to continuous corn.

Figure 19. Gibberella or pink ear rot is caused by the same fungus that causes Gibberella stalk rot. The pinkish colored mold growth, usually located near the tip of the ear, is characteristic of this ear rot. The Gibberella fungus is responsible for producing several "mycotoxins" that are harmful to livestock if fed moldy grain.

Figure 20. Diplodia ear rot occurs most frequently in reduced tillage fields of continuous corn. The ear rot fungus produces a thick layer of mold growth over the kernels and husks. Hybrids vary greatly in their susceptibility to this ear rot.

Figure 21. Fusarium kernel rot is commonly associated with insect damage to ears. Affected kernels are white to pink in color and generally scattered over the ear. The Fusarium fungus is capable of producing a mycotoxin, fumonisin, that is toxic to livestock, particularly horses.

2. Adjust harvest equipment to minimize damage to kernels and allow maximum cleaning.
3. Clean all bins thoroughly before putting in the new crop.
4. Dry ear corn to 20 percent moisture and shelled corn to 13 percent to 14 percent moisture prior to storage.
5. Store grain at cool temperatures (36°F to 44°F) after drying.
6. Check condition of grain periodically for temperature, wet spots, and insects.
7. Have a mycotoxin analysis performed, if mold is evident, by a competent laboratory to determine if toxins are present.
8. Apply antifungal treatments to grain to reduce mold growth in storage. These products, such as proprionic acid, do not kill the mold already present nor do they reduce toxins already present in the grain. Do not use antifungal agents on stored grain unless you are certain the grain can be marketed after treatment.

Viral Diseases

The two most important viral diseases of corn in Ohio are maize dwarf mosaic (Figure 22) and maize chlorotic dwarf. The diseases are controlled by use of disease-tolerant hybrids. Virus-tolerant hybrids are those that maintain an acceptable yield although they are infected with the virus. Both diseases are transmitted by insect vectors, and the viruses overwinter in johnsongrass. These diseases rarely cause a problem in northern Ohio. However, since johnsongrass occurs primarily in southern Ohio, tolerant hybrids are highly recommended wherever johnsongrass is a problem.

Figure 22. Maize dwarf mosaic is a persistent problem in southern Ohio where johnsongrass is a weed problem. The virus that causes this disease overwinters in johnsongrass and is transmitted by aphids to the new corn crop in spring. Maize chlorotic dwarf, very similar to Maize dwarf mosaic, is another viral disease, but it is transmitted from johnsongrass to corn by leafhoppers.

Recommended Management Practices

To prevent or restrict loss from disease, it is necessary to follow a comprehensive corn disease management system. Once the disease has been identified, its control is dependent on an understanding of its cause, the factors that favor the disease, which plant parts are affected, and when the disease organisms are spread. The intent is to disrupt a stage of the normal progress of the disease or eliminate one of the factors necessary for disease development. Some diseases can be eliminated by a single practice such as using a resistant hybrid. However, most diseases require a combination of practices to "stack the deck" against their causing economic damage. Successful disease management requires the application of several control measures. These management decisions are usually made before the crop is planted and are manifest as a long-term reduction in disease losses.

Summary of Management Practices

1. Plant high-quality seed, treated with a seed-protectant fungicide, in a well-prepared seedbed. Sow seed at rates recommended by the seed company to ensure proper plant populations. When populations are too high, the stress caused by plant-to-plant competition may increase stalk rot.

2. Plant high-yielding hybrids with resistance to leaf blight, ear rots, and stalk rots. Several potentially destructive diseases now cause only minor losses due to widespread use of resistant hybrids.

3. Use balanced fertility, which is the key to vigorous, well-developed plants. High rates of nitrogen, especially when excess in relation to potassium, favor the development of stalk rot and some leaf diseases. Use recommended levels of N, P, and K, based on soil tests.

4. Rotate crops and destroy corn residues to effectively reduce the numbers of disease organisms surviving in the field. However, to conserve energy and to protect soil from loss through erosion, reduced tillage practices are being used increasingly. As a result, these disease-control practices are lost. Other disease management practices, such as use of resistant hybrids and longer crop rotation, become essential to make up for this loss.

5. Improve soil drainage in poorly drained soils. This reduces water stress and reduces losses from seedling blights, root rots, and stalk rots.

6. Control insects and weeds in and around fields. Insects such as root worm and stalk borer create wounds that serve as entry points for disease-causing fungi. Additionally, the corn flea beetle carries and spreads the bacterium causing Stewart's bacterial leaf blight. Some weeds act as reservoirs for overwintering of corn pathogens. In southern Ohio, eradicate johnsongrass to control viral diseases.

7. Scout fields for leaf blight diseases prior to and two weeks after tasseling. Fungicide application may be justified only if very susceptible hybrids or inbreds are used and the lower leaves are infected before or very soon after tasseling.

8. Survey fields 10 days to two weeks prior to harvest to determine the incidence of stalk rot. A rapid and easy technique to determine the incidence of stalk rot is the "squeeze" method. Grasp the base of the stalk above the brace roots and squeeze the stalk between the thumb and first two fingers. Stalks with significant rot will crush easily. Those fields with the greatest percentage of rotted stalks should be harvested first to avoid losses due to lodged corn.

9. Adjust and operate the combine or picker properly to reduce harvesting losses in the field with stalk-rotted, lodged corn. Some equipment companies have attachments for the combine header to help pick up lodged corn.

10. Dry shelled corn to 13 percent to 14 percent. Ear corn to be cribbed should be dried to 20 percent moisture. Maintain cool and dry storage conditions to prevent storage molds from developing.

Key to Major Corn Diseases in Ohio

Disease	Symptoms	Environmental Conditions Favoring Disease	Method of Infection & Transmission	Management
Seed rots Seedling blights	Poor emergence; killing of embryo before germination; rotting of seedling roots; yellowing, wilting, and death of seedling leaves.	Disease prevalent in poorly drained soil during periods of cold, wet weather: soil temperatures below 50°F to 55°F favor seedling blight.	Fungi persist in soil.	Use high-quality uncracked seed; chemical seed treatment; proper seed bed preparation.
Stewart's bacterial wilt and leaf blight	Leaf lesion are long, irregular in shape, with wavy margins and are yellow to pale brown in color; streaks may extend length of leaf.	Severe disease can be expected when the mean temperature for December, January, and February is above 33°F. Cold winters (mean <32°F) reduce corn flea beetle populations.	Corn flea beetle feeding on leaves; bacterium overwinters in beetle.	Resistant hybrids; seed-applied insecticide to control flea beetle may be helpful.
Common rust	Reddish-brown, oblong pustules on leaves; rust-colored spores rub off on fingers.	Cool temperatures (60°F to 70°F) and high humidity.	Spores are wind blown into the area; new infections, causing spread within field, occur every 7 to 14 days.	Resistant hybrids; fungicides.
Eyespot	Small (1/8 to 3/8 inch) circular spots with tan to gray centers; margin of spot is brown to purple and commonly surrounded by a yellow halo.	Eyespot is common in no-till fields or fields with corn residues left on soil surface. Moderate temperatures, high humidity, and abundant rainfall.	Spores produced on residues are rain splashed or wind blown onto nearby seedlings. Spots appear 4 to 10 days after infection.	Resistant hybrids; clean tillage and/or crop rotation; fungicides.

Key to Major Corn Diseases in Ohio

Disease	Symptoms	Environmental Conditions Favoring Disease	Method of Infection & Transmission	Management
Northern corn leaf blight	Large leaf lesions, generally ½ to 1½ in. by 2 to 6 in., grayish-green, later becoming tan to grayish black.	Favored by temperatures of 65°F to 78°F accompanied by heavy dews.	Fungus survives on corn residues and spores dispersed by wind. Spores are air-borne long distances.	Resistant hybrids; clean tillage of corn residues; crop rotation; fungicides.
Southern corn leaf blight - race 0	Small (1/4 x 1/2 to 1½ in.), tan, oblong lesions are generally parallel-sided but sometimes are spindle-shaped. Lesions usually develop reddish-brown borders.	Favored by temperatures of 70°F to 90°F accompanied by heavy dews.	Fungus survives on corn residues, and spores are spread by wind and rain.	Resistant hybrids; clean tillage of corn residues; crop rotation; fungicides.
Northern leaf spot	Lesions are variable in size and shape; may be circular, oval, or linear and range from flecks up to 3/4 in. long; tan to brown in color.	Favored by warm, humid conditions with heavy dews.	Fungus survives on corn residues, and spores are spread by wind and rain.	Resistant hybrids; seldom prevalent enough to depress yields except on inbreds or no-till continuous corn, fungicides.
Anthracnose	Leaf spots are oval to elongate, tan and 1/4 to 3/4 in. long. Some have brown or orangish borders. On resistant hybrids, lesions are smaller and yellow to brown in color. Spore bodies with black spines can be seen with a hand lens.	Favored by normal to above normal rainfall and moderate to warm temperatures (80°F to 85°F).	Fungus survives on corn residues and spores are spread by splashing rain.	Resistant hybrids; crop rotation; clean tillage of corn residues; balanced soil fertility.

Key to Major Corn Diseases in Ohio

Disease	Symptoms	Environmental Conditions Favoring Disease	Method of Infection & Transmission	Management
Yellow leaf blight	Leaf spots are oval to elongate, tan and 1/4 x 1/4 to 3/4 in., buff to tan colored, often with a darker border. Dark specks (pycnidia) can be detected in the lesion center with a hand lens.	Favored by cool, wet weather. Disease is more common in no-till fields with continuous corn.	Fungus survives on corn residues and some grassy weeds. Spores are spread by wind or splashing rain.	Resistant hybrids; clean tillage of corn residues; crop rotation; good weed control.
Holcus bacterial	Spots at first are dark green and water soaked, later turning brown or whitish with reddish-brown borders and are round, oval, or irregular in shape.	Warm temperature (75°F to 85°F), wet, windy weather early in season.	Bacteria survive on crop residues and are spread by splashing rain, blowing soil particles, and cultivation during heavy dews.	Resistant hybrids; clean tillage of corn residues; crop rotation.
Gray leaf spot	Leaf lesions are pale brown or gray, parallel-sided and 1/8 to 1/4 x 1/4 to 2 in. Usually occurring late in the season.	Warm, humid weather; July through September.	Fungus survives on crop residues and on barnyard grass and johnsongrass. Spread by wind and splashing rain.	Resistant hybrids; clean tillage of crop residues; crop rotation; fungicide application on susceptible hybrids.
Common smut	Galls form on all plant parts; first appear as shiny grayish green raised areas which enlarge forming gray galls containing black powdery spore masses.	Smut is favored by dry conditions and injuries caused by hail, machinery, etc. Excessive nitrogen increases susceptibility.	Smut spores overwinter on soil surface; infection caused by wind-blown spores.	Avoid mechanical injuries; use balanced soil fertility, resistant hybrids.

Key to Major Corn Diseases in Ohio

Disease	Symptoms	Environmental Conditions Favoring Disease	Method of Infection & Transmission	Management
Crazy top	Excessive tillering, rolling of leaves; tassels may develop ears; proliferation of husks.	Disease develops where soils have been saturated for 24 to 48 hr. before plants reach the 4th leaf stage.	Fungus survives in soil; new infections from soil-borne spores.	Avoid planting in low, wet areas; improve soil drainage.
Maize dwarf mosaic	Mottling or mosaic of light and dark green in young leaves and slight shortening of internodes.	Primarily in river-bottom fields where johnsongrass is a problem.	Several species of aphids vector MDMV and transmit it from overwintering johnsongrass to corn.	Virus-tolerant hybrids; eradicate johnsongrass.
Maize chlorotic dwarf	Primary symptom is the presence of very fine chlorotic strips adjacent to the small veins on the underside of leaves. Older plants become yellowed and reddened with severe stunting.	Primarily in river bottom fields where johnsongrass is a problem.	A leafhopper transmits MCDV from overwintering johnsongrass to corn.	Virus-tolerant hybrids; eradicate johnsongrass.
Root rot	Small yellowish-brown areas on primary roots and later on secondary roots. Affected roots later become black and die. Plants may show wilting, stunting, and yellowing.	Severe root rot usually occurs in heavy soils that are poorly drained; saturated soil conditions early in the season favor root rot development.	Fungi that cause root rot persist in the soil.	Improve drainage; avoid tillage when too wet.

Key to Major Corn Diseases in Ohio

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Nematodes	Feeding on roots can cause stunting, yellowing, and/or wilting. Roots are small with proliferation of secondary rootlets near tips of larger roots. Affected plants are usually in patches.	Corn is more prone to damage when young. Nematodes are generally more active in light sand soils that are well drained than in heavy clay soils.	Nematodes live in the soil and feed on numerous plant species.	Crop rotation; proper weed control.
Gibberella stalk rot	Sudden onset of grayish-green leaf color; lower stalk turns light tan; pith inside stalk becomes soft; pith has reddish or pinkish discoloration.	Stress; leaf diseases; insect feeding; extreme weather; unbalanced soil fertility; high plant populations.	Fungus survives on corn residues.	Hybrids with good standability and resistance to leaf blight; control insects; balanced fertility; proper plant populations; crop rotation; early harvest; incorporate crop residues.
Anthracnose stalk rot	Shiny black streaks, specks, or large blotches discolor the stalk surface; pith decays and turns brown. Stalks weaken and lodge.	Favored by high temperatures and extended periods of cloudy rainy weather.	Fungus survives on leaf and stalk debris left on the soil surface. Spores are spread by splashing rain.	Resistant hybrids; crop rotation; clean deep tillage of crop residues; balanced soil fertility.
Fusarium stalk rot	Lower internodes of stalk prematurely turn brown. Internodes soften and pith shreds. A light pink discoloration of pith may be evident; stalks weaken and lodge.	Present primarily in drier regions or during seasons of below normal rainfall.	Fungus survives on stalk residues. Spores are spread by wind or splashing rain.	Hybrids with good standability and resistance to leaf blight; control insects; balanced fertility; proper plant populations; crop rotation; early harvest; incorporate crop residues.

Key to Major Corn Diseases in Ohio

Disease	Symptoms	Environmental Conditions Favoring Disease	Method of Infection & Transmission	Management
Diplodia stalk rot	Lower internodes become brown near the nodes; internal pith darkens and disintegrates; stalks weaken and lodge. Small black bodies (pycnidia) develop near nodes and scattered over internodes.	Excessive rainfall in late summer with warm temperatures extending into early fall.	Fungus survives on stalk residues. Spores are spread by wind or splashing rain.	Hybrids with good standability and resistance to leaf blight; control insects; balanced fertility; proper plant populations; crop rotation; early harvest; incorporate crop residues.
Diplodia ear rot	Thick white mold begins at base of ear, becomes grayish-brown over husks and kernels; ear may be shrunken; kernels appear glued to husks; infected ears are lightweight; small raised black fruiting bodies on moldy husks later in the season.	Wet weather and mild temperatures from late whorl through early ear development; corn borer injury can cause entry wound.	Fungus overwinters on corn residue; spores spread by splashing rain.	Plant resistant hybrids; crop rotation; fall tillage; dry harvested grain to 15% and below.
Gibberella ear rot	A conspicuous pink to reddish mold starting on the ear tip and progressing toward the base of the ear.	Average temperatures below 72°F and 7 or more days of rain during the 3-week period after silking.	Infection from wind-borne spores usually follows injury to the ear from corn borer, earworm, birds, etc. Fungus survives in soil on crop residues.	Resistant hybrids; ears that dry in a declined position and those well covered with husks generally have less ear rot.
Fusarium kernel rot	Pinkish or discolored caps of individual kernels, sometimes with a pinkish mold growth.	Warm wet weather 2 to 3 weeks after silking.	Infection from wind-borne spores usually follows injury to the ear from corn borer, earworm, birds, etc. Fungus survives in soil on crop residues.	Resistant hybrids; ears that dry in a declined position and those well covered with husks generally have less ear rot.

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