

DISEASES OF CORN

Gray Leaf Spot

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Gray leaf spot on corn, caused by the fungus *Cercospora zeae-maydis*, is a perennial and economically damaging disease in the United States. Since the mid-1990s, the disease has increased in importance in Indiana, and now is the one of the most important foliar diseases of corn in the state. Hybrid susceptibility and weather strongly influence disease development, which is why gray leaf spot can be locally severe, but not cause widespread damage throughout the state.

This bulletin describes:

1. How to correctly identify the disease
2. Conditions that favor disease development
3. Impact of the disease
4. How to manage the disease

Identifying the Disease

Early gray leaf spot symptoms are observed on leaves as small, pinpoint lesions surrounded by yellow halos. At this stage, it can be hard to correctly identify the disease, but as lesions mature, they elongate into narrow, rectangular, brown to gray spots. Lesions expand parallel to leaf veins and may become 1.5 to 2 inches long.

On susceptible hybrids, lesions may also appear on leaf sheaths and husks.

The major leaf veins restrict lateral expansion of leaf lesions, giving the lesions a blocky shape (Figure 1). Under favorable conditions, lesions can coalesce to form large, irregular areas of dead tissue on the leaves (Figure 2).

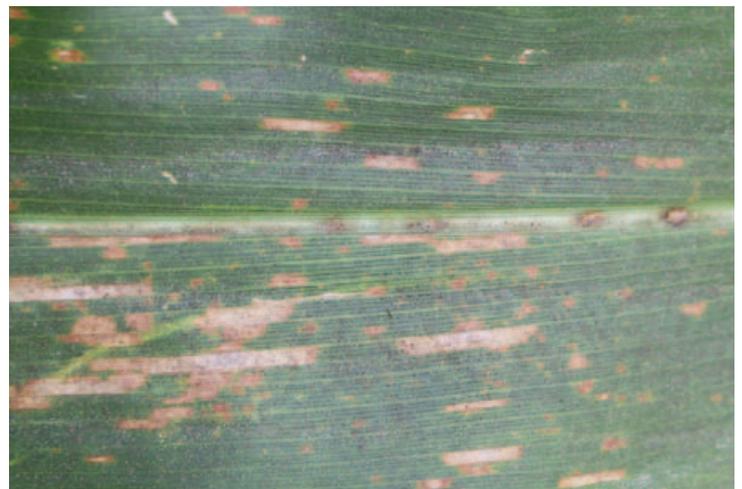


Figure 1. Leaf veins limit gray leaf spot lesions. As lesions mature, they expand to form long, rectangular areas of dead tissue.

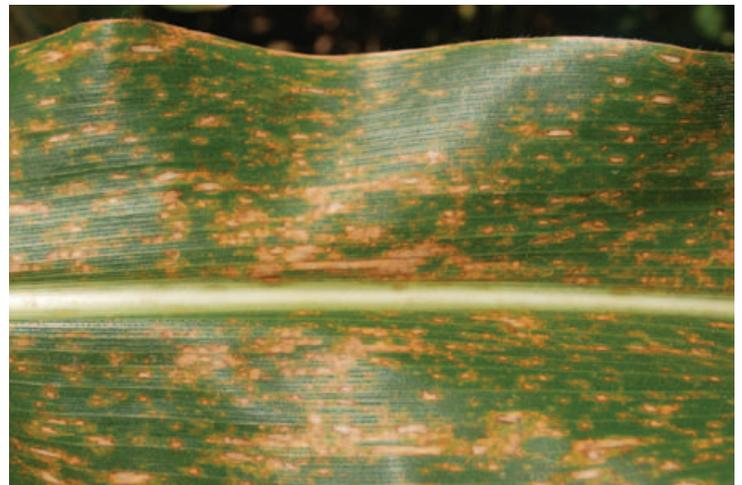


Figure 2. Severe leaf tissue blighting can occur and result in yield loss.

Photos by Kiersten Wise
and Greg Shaner

Symptoms vary by hybrid susceptibility. Hybrids with partial gray leaf spot resistance may not experience the characteristic lesion expansion. These hybrids restrict lesion growth, so they may have lesions that remain small and have a round or jagged shape — instead of the long, rectangular shape characteristic of lesions on more susceptible hybrids (Figure 3).

Gray leaf spot symptoms may be confused with symptoms of other foliar fungal diseases such as anthracnose leaf blight, eyespot, or common rust.

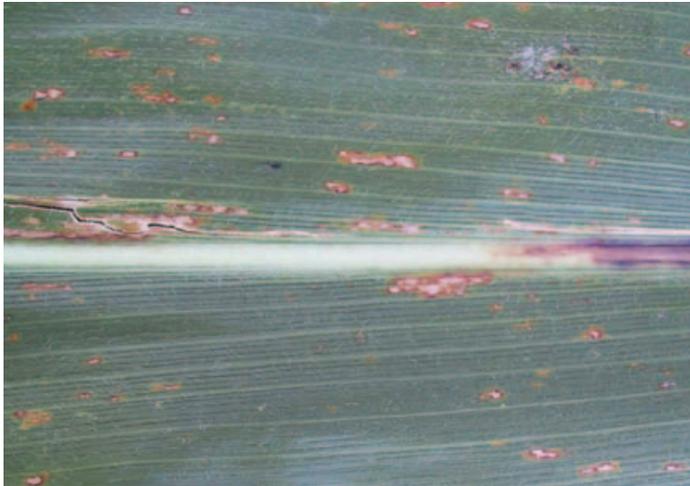
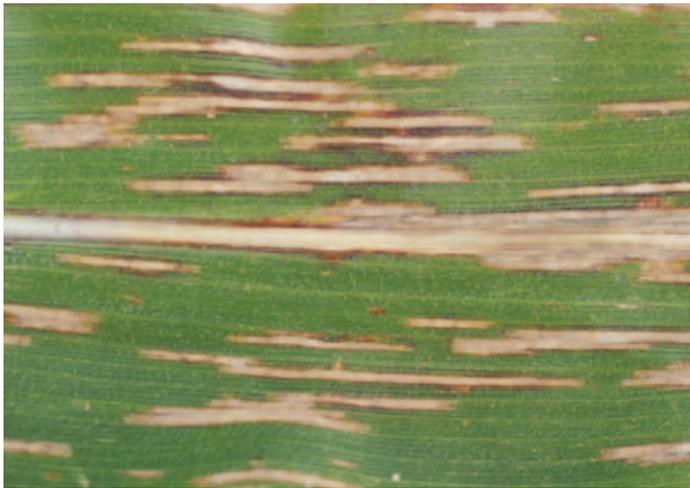


Figure 3. (Above) In partially resistant hybrids, gray leaf spot lesions may be smaller with jagged margins. (Below) On more susceptible hybrids, gray leaf spot lesions are long and rectangular.



Conditions Favoring Disease Development

The fungus survives the winter on infected corn residue at the soil surface. As temperatures rise in the spring, the fungus on corn residue produces spores that splash onto

young corn leaves, which is why symptoms are commonly observed first on the lower leaves of the plant. Wind may transport spores from a field with corn residue to neighboring fields.

Infection occurs during prolonged warm (75°F to 85°F), humid (more than 90 percent relative humidity) periods. Symptoms are commonly observed following long periods of heavy dew and overcast days and in bottomlands or fields adjacent to woods where humidity will be higher and dew will persist longer into the morning.

Cercospora zeaе-maydis spores can cease development during low humidity periods, and then resume the infection process once humidity rises. Each lesion can produce many spores, which are splashed or blown to the upper leaves or to other plants where they can survive until conditions are favorable for infection. This cycle makes it appear that the disease is moving up the plant.

Due to the length of the infection process, symptoms may not be noticeable for up to two weeks after infection, depending on weather conditions and hybrid susceptibility. Hot, dry weather will restrict disease development and spread.

Corn planted late will experience initial infection at earlier growth stages, which can result in higher levels of infection and increased yield loss.

Disease Impact

Gray leaf spot can have a substantial impact on yield under favorable conditions. The relationship between the amount of leaf tissue affected by gray leaf spot and the amount of yield loss is unclear. However, the lesions reduce the amount of photosynthetic areas on leaves available to contribute carbohydrates to the developing grain.

Yield loss may depend on the number of lesions and how far up in the canopy they occur as the plant enters tasseling and pollination. If lesions have reached the ear leaf or higher during the two weeks before and after tasseling, yield loss could occur. If lesions develop on upper leaves later in the season, the economic impact will be less.

While estimates are not available for all hybrid types and conditions, general estimates are available from Ohio State University (Table 1).

Reduced photosynthetic area from gray leaf spot lesions can also contribute to stalk rots and lodging.

Table 1. Estimated corn yield loss based on percentage of infected leaf tissue.

Percentage Ear Leaf Area Affected by Early Dent Stage (R5)	Approximate Yield Loss
5% or less	0-2%
6-25%	2-10%
25-75%	5-20%
75-100% (leaf death)	15-50%

Source: Patrick Lipps, 1998. Gray leaf spot and yield losses in corn. *Crop Observation and Recommendation network*. Issue 98-23.

Managing the Disease

Preventative management strategies can reduce economic losses due to gray leaf spot. In-season disease management options, such as fungicides, are also available. Susceptible hybrids planted in no-till or reduced-till fields are at high risk for gray leaf spot development, but weather is the primary influence on disease development. Still, preventative management is especially important for high-risk fields.

Select Resistant Hybrids

Choosing a hybrid moderately resistant to gray leaf spot is important in areas of Indiana that have perennial and severe problems with the disease — such as areas of southern Indiana. While no hybrid is immune to gray leaf spot, there are hybrids that have good levels of resistance. These hybrids may be described as tolerant to gray leaf spot, or marketed as “defensive” hybrids.

Careful hybrid selection is especially important in continuous corn and reduced-tillage systems. These systems have higher corn residue levels that host the fungus and are a source of disease for the following crop. Most seed companies publish gray leaf spot resistance ratings for their hybrids. When choosing a hybrid, pay particular attention to the rating scale — individual companies use different numerical values to indicate levels of resistance.

Some gray leaf spot-resistant hybrids may have lower yield potentials in the absence of disease, so it is important to consult with your local seed dealer, and place moderately resistant varieties in areas at high risk for gray leaf spot development.

Manage Residue

Production practices that encourage residue decomposition will reduce the amount of fungus present to infect the next corn crop. Continuous corn and no-till or reduced-tillage systems are at high risk for disease development because of the amount of residue they leave on the soil surface.

A one-year rotation away from corn, followed by tillage is recommended to prevent disease development in the subsequent corn crop. In no-till or reduced-till fields with a history of gray leaf spot, a two-year rotation out of corn may be needed to reduce the amount of disease in the following corn crop.

The fungus that causes gray leaf spot is able to survive on residue for more than one year, and economically damaging disease levels have been observed in Indiana fields with two-year-old corn residue.

Use Fungicides Effectively

Fungicides are available for in-season gray leaf spot management. It is important to remember that a fungicide application is an additional cost to corn production, so growers must consider economic factors (corn market price and fungicide application cost) and other disease factors before deciding whether to apply a fungicide to manage gray leaf spot.

Research in Indiana indicates that strobilurin and strobilurin/triazole premix fungicides are most effective at preventing yield loss when applied in response to disease presence, and at the tasseling to early silking (VT-R1) growth stage. Scouting fields around V14, or just prior to tassel emergence, can help determine the level of disease pressure in a field.

Iowa State University developed guidelines to determine when a fungicide may be necessary to prevent yield loss. These thresholds incorporate hybrid susceptibility ratings and disease levels prior to tasseling:

1. Consider a fungicide application if:

The hybrid is rated as susceptible or moderately susceptible

AND

50 percent of the plants in a field have disease lesions present on the third leaf below the ear leaf or higher prior to tasseling

2. Consider a fungicide application if:

The hybrid is rated as moderately resistant

AND

50 percent of the plants in a field have disease lesions present on the third leaf below the ear leaf or higher prior to tasseling

AND

Additional factors or conditions that favor disease development are present (residue present, favorable weather conditions)

Scout even resistant hybrids for disease problems, but in general, fungicide applications to these hybrids are not recommended and will not consistently result in increased yield.

The thresholds available for fungicide application decisions are not hard and fast rules. It is important to remember that *gray leaf spot severity can be unpredictable in Indiana, even when factors favoring*

disease are present. Therefore, consider threshold guidelines, cropping practices, planting date, predicted weather conditions, and economic factors when deciding whether to use a fungicide to manage gray leaf spot.

Fungicides currently available for use on corn are listed in Purdue Extension publication ID-179, *Corn and Soybean Field Guide* (available from the Purdue Extension Education Store www.the-education-store.com). You may also contact the Purdue Extension field crop disease specialist.

Fungicides vary in their chemical properties, restricted entry intervals (REI), and pre-harvest intervals (PHI). Always understand and follow all label directions and restrictions before applying fungicides.

Additional References

For more detailed information on the concepts presented in this publication, please refer to:

Bhatia, A., and Munkvold, G.P. 2002. Relationships of environmental and cultural factors with severity of gray leaf spot on maize. *Plant Disease* 86:1127-1133

Munkvold, G.P. Martinson, C.A., Shriver, J.M., and Dixon, P.M. 2001. Probabilities for profitable fungicide use against gray leaf spot in hybrid maize. *Phytopathology* 91:477-484.

Reference to products in this publication is not intended to be an endorsement to the exclusion of others that may be similar. Persons using such products assume responsibility for their use in accordance with current directions of the manufacturer.

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