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DISEASES OF CORN

Goss's Bacterial Wilt and Leaf Blight

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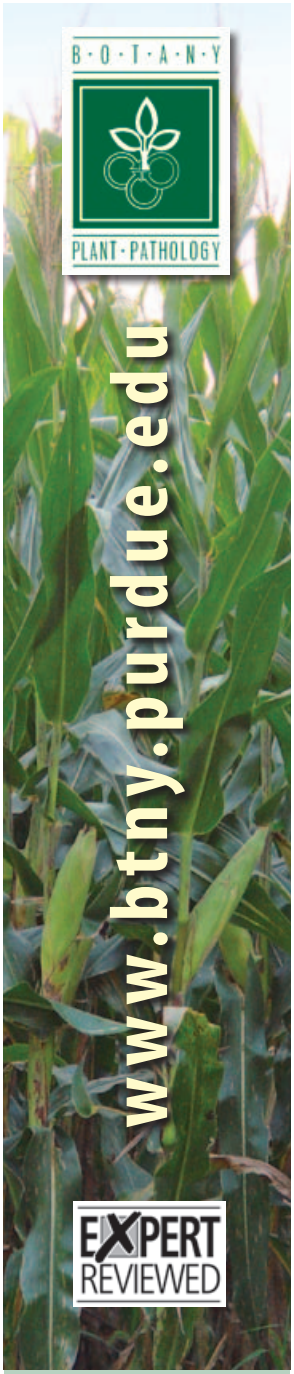

Photos by Kiersten Wise

Goss's bacterial wilt and leaf blight of corn (caused by the bacterium *Clavibacter michiganensis* subsp. *nebraskensis*) was first confirmed in northwestern Indiana in 2008 on dent corn and popcorn and was detected again in the same area in 2009.

The disease was first described in Nebraska in 1969 and has since been confirmed in several states throughout the Midwest, including Illinois, Wisconsin, and Iowa. In 2008, Goss's bacterial wilt and leaf blight caused yield losses of up to 60 bushels/acre in northwestern Indiana, proving that this bacterial disease can cause substantial yield loss in the state.

The bacterium can also infect food-grade corn, seed corn, and sweet corn, but popcorn is of particular concern in Indiana due to hybrid susceptibility, the high potential of yield loss, and phytosanitary restrictions on exported seed.

This publication describes:

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

Identifying the Disease

This disease can have two distinct phases: a leaf blight phase and a systemic wilt phase. Although the full name of the disease includes both phases, it is commonly referred to simply as Goss's wilt.

Figure 1. Goss's wilt lesions can be large and located on leaf margins. Dark flecks are noticeable throughout the lesion.

Figure 2. The dark flecks ("freckles") associated with lesions are diagnostic of Goss's wilt. The flecks are found primarily on the edges of lesions, but can be scattered throughout.

Leaf blight is the most commonly observed symptom, but is easily confused with other diseases and abiotic disorders. Corn plants with Goss's wilt exhibit long, large, tan lesions in the centers or on the edges of leaf blades (Figure 1). The margins of these lesions may have a water-soaked appearance. Black flecks ("freckles") can be observed within the lesions (Figure 2). These flecks can be large and cannot be rubbed off plant tissue.

If symptomatic leaves are observed early in the morning or after a rain, one can observe a bacterial ooze, or exudate, on lesion surfaces. Dried bacterial exudate is shiny, especially when observing leaves in direct sunlight (Figure 3). When it's dry, Goss's wilt symptoms are easily confused with drought stress or leaf scorch from chemical burn (Figure 4). Leaf blight symptoms can also be misidentified as nutrient deficiency, chemical injury, Stewart's wilt (caused by a different bacterial organism), or northern corn leaf blight.

In the systemic wilt phase of the disease, infected plants may exhibit drought stress symptoms and wilt or die prematurely. To correctly identify this phase of the disease, examine the vascular tissue of the stalk — infected tissue will have orange to brown discoloration (Figure 5). The discoloration is caused by bacteria moving within the plant's xylem tissue.

To confirm Goss's wilt, submit a sample to a diagnostic lab for testing that includes microscopy, culture isolation, and serology.

More information about sample collection and processing is available from the Purdue Plant and Pest Diagnostic Lab:

www.ppdl.purdue.edu

Conditions Favoring Disease Development

The bacteria that cause Goss's wilt survive the winter primarily in infested crop residue and, to a lesser extent, on the soil surface. Research indicates that under more arid conditions, the pathogen can only survive for 10 months on the residue at the soil surface.

The bacteria enter any part of the corn plant through wounds, such as those caused by hail and heavy winds. Wind-driven rain can spread the bacteria. Although the bacteria can enter wounds created by insect feeding, insects are not known to transmit the bacteria.

Figure 3. Dried bacterial exudate on the lesion surface gives the lesion a shiny appearance.

Figure 4. The upper canopy of this field in northwest Indiana has widespread and severe Goss's wilt symptoms. Goss's wilt symptoms can resemble drought stress or leaf scorch from chemical burn.

Figure 5. Discolored vascular tissue, caused by Goss's wilt bacteria, can indicate the systemic wilt phase of the disease.

Continuous corn production and reduced tillage practices increase the likelihood that disease will develop, because these practices allow crop residue (which the bacteria need to overwinter on) to persist. Hot, dry weather will slow disease development, making symptoms of Goss's wilt harder to distinguish from other disorders, such as drought stress.

The bacteria can also survive on and in seed, and can be transmitted from seeds to seedlings. Seed-to-seedling transmission is low (about 2 percent), but infested seed may introduce the disease into new areas. Grass weeds such as green foxtail and shattercane can also serve as perennial hosts for the bacteria, and be a reservoir from which bacteria spread to corn plants. Low levels of the disease may go undetected until environmental conditions favor widespread disease.

Managing the Disease

Preventing disease development is important in reducing economic losses from Goss's wilt. Hybrids with partial resistance to the disease are available, and producers in areas of Indiana that have experienced Goss's wilt problems should check with seed dealers and popcorn processors to find out more about the availability of resistant varieties. Currently, there is little replicated data on popcorn hybrid response to Goss's wilt in the Indiana environment, but ratings may be available from other states.

Adopting production practices that diminish disease pressure will also reduce economic losses. Rotating out of corn production for one year will allow residue to break down and reduce bacteria populations. Tillage and other practices that encourage residue decomposition will also reduce the amount of bacteria present to infect the following corn crop. Practice good weed management techniques to control grass weed species that can serve as a source of the disease.

Goss's wilt is caused by bacteria, so we do not recommend applying fungicides to prevent or manage the disease. Copper products have been used to control bacterial diseases in other crops; however, these are not economically viable options for large, field-scale use in corn production. The best management strategy for Goss's wilt is to use a combination of the previously discussed management practices to minimize economic losses.

Certain countries require phytosanitary certificates for corn seed exports. Certification simply requires an additional test or inspection to determine that the seedlot or seed source is free of the bacteria that causes Goss's wilt.

More information about the inspection process is available from the Indiana Department of Natural Resources Division of Entomology and Plant Pathology:

www.in.gov/dnr/entomolo/files/ep-PHYTO_REQUEST_PACKET.pdf

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