Goss's Bacterial Wilt and Leaf Blight of Corn

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Goss's bacterial wilt and leaf blight of corn, also known as bacterial leaf freckles and wilt, is an important disease of corn. The disease was first identified in Nebraska in 1969 and then in South Dakota in 1974. This disease is now found in several major corn producing states in the United States In years of heavy infection, it can lead to severe yield losses in susceptible corn hybrids (Fig. 1).

Identifying the disease

Although Goss's wilt and leaf blight has two phases: the systemic wilting stage and the leaf blight stage; the leaf blight stage is the most common. The leaf blight stage is characterized by long, tan-gray lesions with wavy margins, found in the center of the leaf or along the edges of the corn leaf blade (Fig. 2). These lesions can coalesce forming larger lesions resulting into typical

Fig.1 A corn field with severe Goss's wilt symptoms (Picture taken 09/01/2015, Moody County.)

Goss's wilt symptoms (Fig. 3 A). The Goss's wilt lesion has dark green to black, discontinuous, water-soaked spots (freckles) (Fig. 3A). When these "freckles" are observed against the light, transparent spots can be seen (Fig. 3 B). Observing symptomatic leaves after heavy dew can reveal bacterial ooze, another sign for bacterial infections. When this ooze dries up, a shiny patch (looks like varnish) can be seen when observed under direct sunlight. The freckles and bacterial ooze can help to distinguish Goss's wilt from other diseases such as northern corn leaf blight.

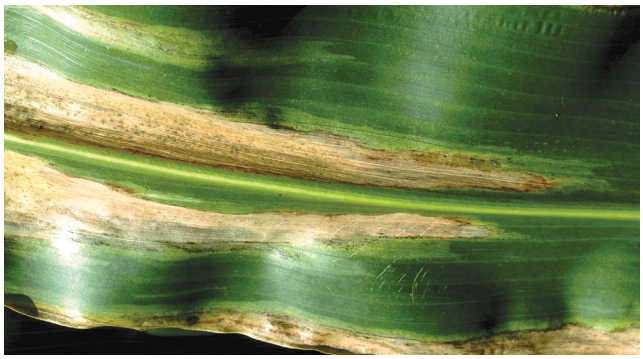

Fig. 2. A corn leaf can have several lesions that elongate and coalesce leading to the death of the leaf.

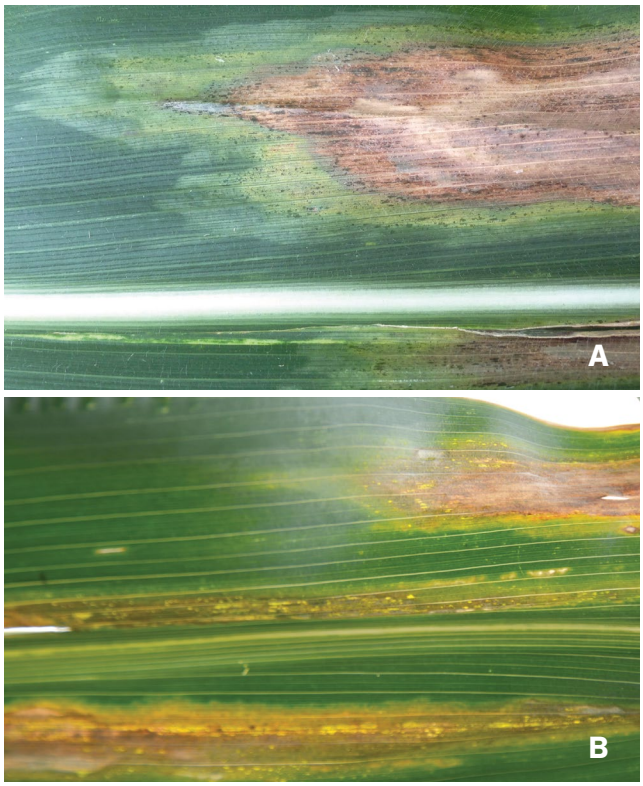

Fig. 3. (A) A corn leaf with typical Goss's leaf blight symptoms. Notice the dark water soaked spots (freckles) and the wavy margins at the edge of the lesion. (B) A corn leaf with Goss's wilt lesion held against light can reveal transparent spots within the lesion, an indication of bacterial infection.

The wilting stage occurs when seedlings or young corn plants (before V6) become infected, leading the entire plant to wilting and eventually dying (systemic infection) (Fig. 4A). Infected plants may be misdiagnosed as drought stress, root rot or chemical injury. The wilting stage can be diagnosed by observing the vascular tissues after a clean cross-sectional cut through the stem. Infected plants have discolored vascular tissue (Fig. 4B).

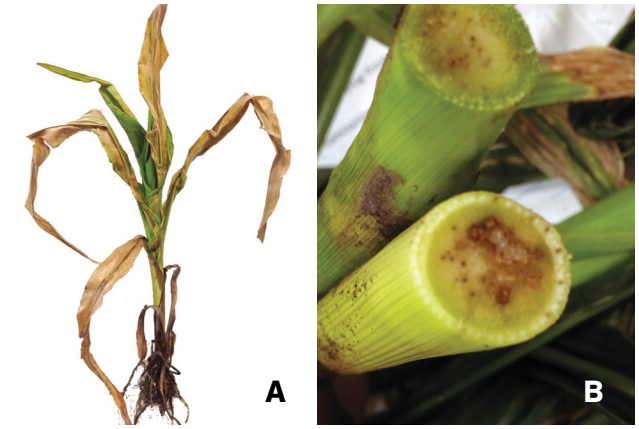

Fig. 4. (A) A corn plant showing wilting symptoms (systemic infection) caused by Goss's wilt. (B) A cross section of a corn plant with wilting symptoms reveals browned vascular tissue, a sign of Goss's systemic wilt infection.

The causal agent and life cycle

Goss's bacterial wilt and leaf blight is caused by the bacterial pathogen *Clavibacter nebraskensis*. The bacteria survive on infested corn residues (roots, stems, leaves) and also on several other hosts including grain sorghum, green foxtail, barnyard grass, shattercane, large crabgrass, annual ryegrass and Johnson grass. The pathogen can also survive on seed (very low levels, <0.5%) and therefore seed can serve as a source of inoculum, however, corn residues by far are the main source of the inoculum (Fig. 5). Goss's wilt bacteria are spread through rain splash but can also be carried by high winds for a considerable distance. The bacteria can enter any part of the corn plant through wounds and natural openings. Research shows that the bacteria can be found on the leaf surface without causing disease. It is thought that the bacteria population on the leaf surface must reach a certain threshold before initiating disease. Infection is favored by rainy weather especially where high winds, hail and sand blasting occur. Hot and dry weather conditions slow infection and progress of Goss's wilt. Research conducted under greenhouse conditions (high humidity) indicate some level of infection can take place even in non-wounded plants.

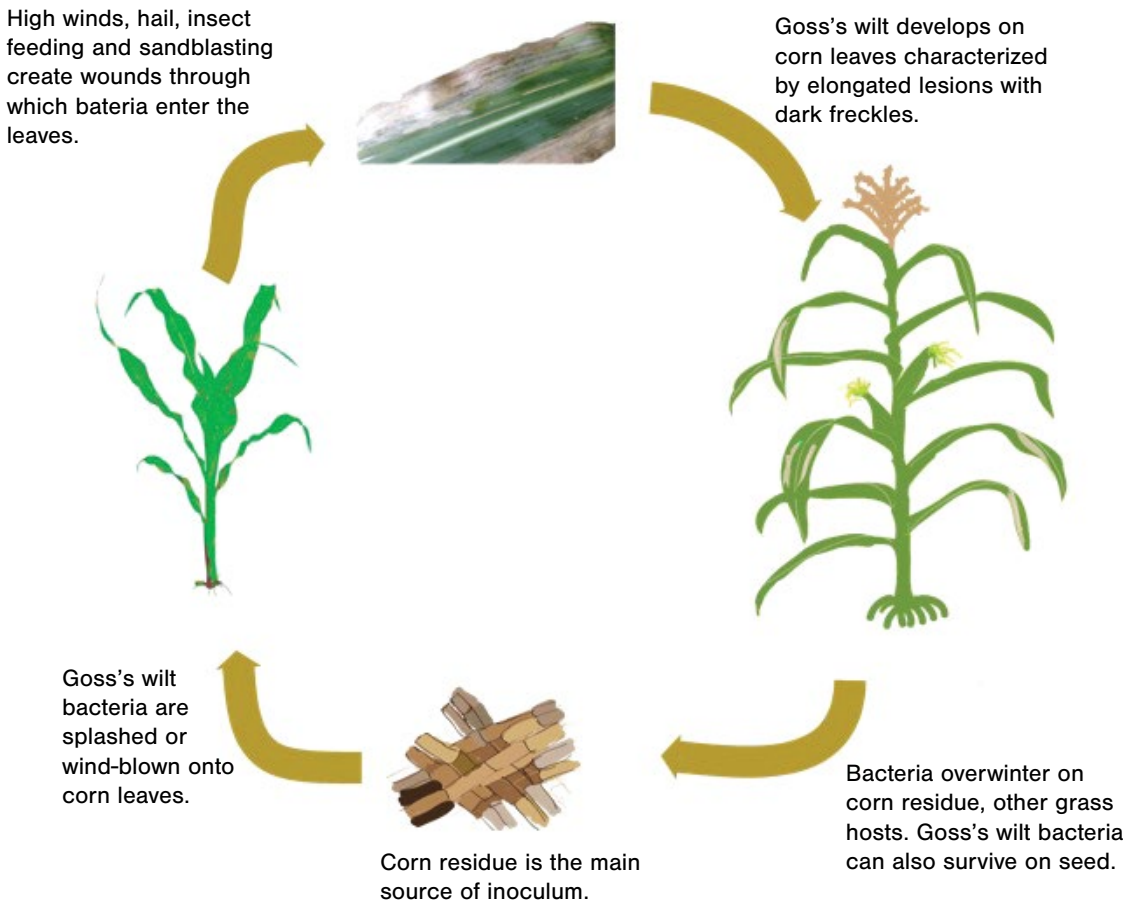

Fig. 5. Goss's wilt disease cycle.

Risk factors for Goss's wilt development

Because infested corn residues are the main source of inoculum, continuous corn and minimum/no-till practices favor Goss's wilt development. Planting infected seed can also be a risk factor, if seed comes from fields that had high Goss's wilt severity. Weather plays a big role in Goss's wilt development. Wind and heavy rains accompanied by hail increase the risk of Goss's wilt. Susceptibility of the hybrid planted also increases the risk for Goss's wilt development.

Management of Goss's wilt

The most effective tool available for Goss's wilt management is planting corn hybrids with resistance to Goss's wilt. When deciding on which hybrids to plant, producers should consider the Goss's wilt ratings of the hybrids. Seed companies do provide the ratings but care should be taken to understand the scale used for rating. One company may rate their hybrids from 1-9, where 9 is the best, while another company may use the same scale but where 1 is considered the best.

For fields with a history of Goss's wilt, tillage practices that bury the corn residues are preferred. This speeds up decomposition therefore reducing inoculum level. Rotation can also help in breaking the disease cycle and reducing inoculum level. Rotation should be between broadleaf crops and small grains other than sorghum since sorghum is a host for Goss's wilt. Good weed management is important as some grass weeds are hosts of the Goss's wilt bacteria. Cover crops containing ryegrass should not follow corn if the field has a history of Goss's wilt.

Other useful references

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