AGRONOMIC Spotlight

Technology Development & Agronomy by MONSANTO

Identify and Manage Goss's Wilt of Corn

- Over the last few years, Goss's wilt has increased in incidence and severity in some areas of the Corn Belt.
- Growers should scout for Goss's wilt symptoms between VE and R6.
- Injury from hail or high winds frequently plays a direct role in initial infection; therefore, scouting a week or more after such events may be most productive.
- Monsanto is conducting breeding and screening trials to develop new products with improvements in Goss's wilt tolerance.

Life cycle

Goss's wilt is caused by the bacterium *Clavibacter michiganensis* subsp. *nebraskensis*, which overwinters in infected crop residue. Bacteria can enter plants through leaf injury wounds created by strong wind, blowing sand, or hail. Inoculum can spread from field to field by wind-blown crop residue. Infection can also occur when rain or irrigation water splashes bacteria from infected crop residue onto corn plants. Alternate hosts for this pathogen include green foxtail and shattercane.

Symptomology

Goss's wilt appears as either a vascular wilt or leaf blight. Systemic infection that occurs early in the season result in vascular wilt. Symptoms of systemic infections include discolored vascular tissues containing orange bacterial exudates that may evolve into a brown rot of the lower stalk and roots. Wilt and death similar to what occurs under severe drought stress will likely take place.

Leaf blight symptoms that usually appear mid-season are long, gray-green to black water-soaked spots with wavy margins. Smaller, darker water-soaked lesions, often referred to as freckles, are apparent inside the larger lesions (Figure 1). Freckels are illuminated when leaves are held up to the sun. The lesions may ooze bacteria laden droplets in the morning. As the droplets dry, a crystalline sheen develops on the leaves (Figure 2). Eventually, the lesions will fade to a tan color and may blight large areas of leaves.

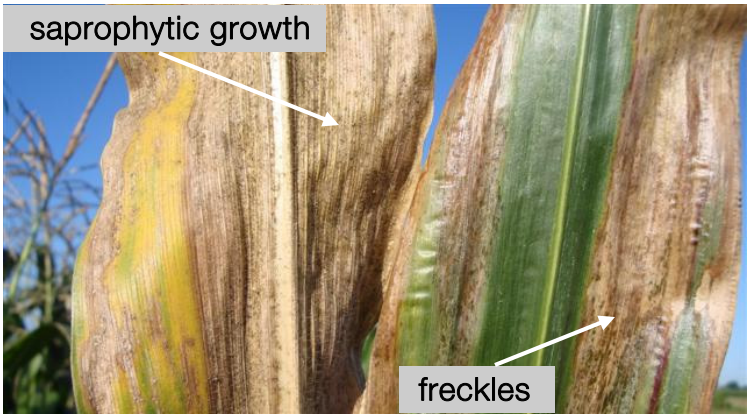

Figure 1. Saprophytic growth (left) and freckles (right) are two identifying characteristics of Goss's wilt.

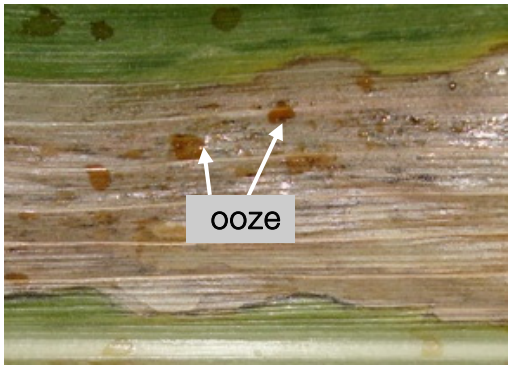

Figure 2. Bacterial cells may ooze from infected Goss's wilt infected leaves and dry on leaf surfaces, forming a shellac-like sheen.

Seed Infection and Transmission

Goss's wilt can move from infected plants to seeds when seed-parent plants are infected systemically. A few studies have examined whether these infected seeds could give rise to infected seedlings. Transmission of the bacteria causing Goss's wilt from seed to seedlings occurred at a rate of less than 2% when naturally infected seed were planted into sterilized soil in an initial study at the University of Nebraska[1]. In a more thorough study done subsequently at Iowa State University, the pathogen was transmitted from inoculated seed to seedlings at rates of 0.1-0.4%[2], but transmission did not occur from naturally infected seed to seedlings. Each of these studies indicate that Goss's wilt can be transmitted from seeds to seedlings, but at rates of little consequence in areas where the bacterium already occurs naturally.

Although the incidence of Goss's wilt has increased over the past several years, the Iowa State University Seed Testing Laboratory has not seen an increase in seed samples testing positive for the bacteria causing the disease. Positive seed samples continue to be very rare.

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Naturally occurring, heavily infected seeds are eliminated from commercial seed lots during the seed conditioning process. Thus, introduction of Goss's wilt by infected seeds should be of minor concern. In addition, corn brand production seed fields are inspected by Monsanto and State regulatory officials for the presence of various diseases. These inspections further help to eliminate Goss's wilt transmission via seed.

Monsanto Efforts

Since 2003, Monsanto has been continuously increasing it's Goss's wilt evaluations. Improvements in disease tolerance are made by evaluating experimental products during early stages of product development. This is accomplished by testing both artificially inoculated nurseries and by evaluating tolerance under natural high pressure disease environments. Monsanto has committed additional testing resources to allow for screening at all stages of product development, including screening of breeding populations during line development, pre-commercial products, and inbred lines. Special efforts are made to evaluate pre-commercial products in the Western Corn Belt where the disease has historically been a problem. Data collected at multiple sites allows Monsanto researchers to characterize and select new products with higher yield potential and improved Goss's wilt tolerance. In the field, Monsanto has developed mechanized inoculators to increase the consistency of trials. In the lab, molecular breeding tools are used to enhance resistance breeding efforts.

Monsanto Technology Development is also actively working to better understand Goss's wilt. Technology Development is partnering with both the University of Nebraska—Lincoln and Iowa State University to conduct a grower survey on Goss's wilt. The intent of the survey is to look at various cultural, tillage, and management practices that affect the development of Goss's wilt in corn.

Management Options

The primary tools to manage Goss's wilt include product selection, crop rotation, tillage, and weed management. The most important management option is product selection. Growers should evaluate product selection and placement on a field by field basis by matching yield potential, agronomic traits, and disease tolerance to their unique farming operation. Scout fields this year and note the location and severity of Goss's wilt to prepare for the next season. The best time for scouting fields is between VE and R6. Because injury from hail or high winds usually plays a direct role in initial infection of Goss's wilt, scouting after strong wind or hail may be particularly helpful.

Rotations for two or more years out of corn can provide good control of Goss's wilt by allowing infected residue to degrade and bacterial populations to decrease before corn is planted again. Non-host crops include alfalfa, oats, wheat, soybeans, and sugar beets.

Any tillage operation which buries infected crop residue, which encourages decomposition, can be effective in reducing bacterial populations and the rate of new infection. However, this is not a practical option where conservation tillage is used.

Weeds such as green foxtail, barnyardgrass, and shattercane act as alternative hosts for this disease. Controlling weeds can help limit sources of inoculum.

Summary

Goss's wilt may continue to be a difficult disease to manage in areas where management options are limited. In years when favorable environmental conditions prevail, Goss's wilt has the potential to cause significant yield loss. Monsanto research scientists continue to use new breeding methods to evaluate a broad range of germplasm from around the world to select products with higher yield potential, improved geographical adaptation, improved agronomic traits, and enhanced tolerance to diseases such as Goss's wilt.

Sources:
[1]Schuster, M.L. 1972. Leaf freckles and wilt, a new corn disease. 27th Annual Corn and Sorghum Research Conference Proceedings.
[2]Biddle, J.A. et al. 1990. Seed transmission of *Clavibacter michiganense* subsp. *nebraskense* in corn. Plant Disease 74:908-911.
Additional resources used to create this publication:
Munkvold, G. Professor and Seed Science Endowed Chair, Iowa State University. Personal communication.
Jackson, T.A. et al. 2007. Goss's bacterial wilt and leaf blight of corn. University of Nebraska-Lincoln. G1675.
Goss's bacterial wilt and leaf blight. 2010. University of Minnesota Extension. http://www.extension.umn.edu.
Compendium of corn diseases. APS Press.
Corn disease management. 2002. Illinois Agronomy Handbook. University of Illinois Extension.

For additional agronomic information, please contact your local representative