Bacterial Diseases of Corn

- Goss’s wilt, bacterial stalk rot, and Stewart’s wilt are bacterial diseases that can reduce corn population, standability, and yield potential.
- Although there are no in-season practices to effectively manage these diseases, understanding the distinctions between them can aid in future management.
- These decisions can help suppress each disease and help maintain highly productive corn systems.

Goss’s Wilt

Goss’s wilt is caused by the bacterium Clavibacter michiganensis subsp. Nebraskensis which was first identified in western Nebraska in 1969. Goss’s wilt infects all corn, but is particularly severe in susceptible field corn, sweet corn, and popcorn products.

Symptoms of Goss’s Wilt

Goss’s wilt has two phases: a seedling wilt that can result in a systemic infection, and an adult-plant wilt which is typically associated with leaf blight. Although the seedling systemic wilt is observed less frequently than the leaf blight, early infection of seedlings can have devastating effects on plant survival. The adult wilt phase is characterized by infection of the vascular tissue with movement of the bacterium within the plant. Symptoms can progress from a discoloration of xylem to a water-soaked, general wilt of plants potentially causing death.1 Susceptible corn products can suffer severe losses during epidemics of systemic Goss’s wilt.

The leaf blight phase causes gray to light yellow lesions with wavy margins that roughly follow leaf veins (Figure 1). Two characteristic symptoms Goss’s wilt are the presence of dark green to black water-soaked spots near the edges of expanding lesions or the appearance of “freckles” within infected areas of leaves. Goss’s wilt “freckles” are luminous when leaves are held to block the sun (Figure 2). Bacterial exudates (ooze) on leaf surfaces can also be used to differentiate Goss’s wilt. Exudates have a shiny, shellac-like appearance when dried. Goss’s wilt can be mistaken with symptoms of northern leaf blight (NLB), Stewart’s wilt (SW), or necrotic areas of leaves resulting from drought or nutrient deficiencies.

Environmental Effects on Goss’s Wilt

Goss’s wilt follows weather events in which rain and wind disseminate overwintered bacteria from plant residues. Wind or hail damage to plants creates wounds for bacteria to enter the plant. Hot, dry weather may help inhibit disease development, except in fields with overhead irrigation.

Management of Goss’s Wilt

Goss’s wilt overwinters in infested corn residue on the soil surface. This infested corn residue is the primary source of inoculum for the following corn crops. Continuous corn rotations can increase the amount of overwintering Goss’s wilt inoculum. Additional hosts for this pathogen include green foxtail, shattercane, and barnyardgrass. Infection requires leaf injury (hail, sand-blasting, wind, equipment). Insects are not known to spread the bacterium. Seed transmission of this disease occurs at an extremely low rate and has no epidemiological impact in areas where the pathogen is present.

Planting corn products with genetic resistance to Goss’s wilt is the best method to manage this disease. Tillage that buries corn residue can reduce levels of overwintering inoculum. Rotating away from corn for two or more years to soybeans, dry beans, small grains, or alfalfa can help reduce inoculum in fields. Control of foxtail, barnyardgrass, and shattercane is also important for management of Goss’s wilt.
Bacterial Stalk Rot
The pathogen that causes bacterial stalk rot is the bacterium, *Erwinia chrysanthemi* pv. *Zeae*, also known as *Dickeya dadantii*. Nearly all other stalk rots of corn are caused by fungi. Bacterial stalk rot is caused by a soft-rot bacterium that produces enzymes to degrade host tissues, resulting in slimy, smelly masses of rotted host tissue. The bacterium is most frequently found early in the season rotting leaves within the whorl prior to tasseling. Additionally, the bacterium may infect stalks.

Symptoms of Bacterial Stalk Rot
The most distinct symptoms of stalk rot or whorl stage infections are the slimy masses of degraded corn tissue accompanied by a foul odor. Discoloration of leaf sheaths and stalk nodes are initial symptoms (Figure 3). As the disease progresses, a soft rot occurs. Once this decay sets in, a foul odor can be detected and the top of the plant can be easily removed. Split stalks reveal a soft, slimy rot with discoloration at the nodes. The bacterium can infect the plant at any node from the soil surface up to the ear leaves or tassel. At the whorl stage, upper leaves die and are easily pulled from the whorl. Tasseling and pollination may be disrupted when infections occur high in the plant.

Environmental Effects on Bacterial Stalk Rot
High humidity and warm temperatures during mid-season favors the development of this disease. Bacterial stalk rot can be especially problematic in areas with heavy rainfall, overhead irrigation, or where water is pumped from a lake, pond or slow-moving stream. Infection at the soil line occurs if plants have been standing in water for a few days following heavy rain and warm temperatures. Infection also is associated with water remaining in the whorl for extended periods.

Management of Bacterial Stalk Rot
Bacterial stalk rot can survive in corn or sorghum stalks and residue. It is a sporadic disease that often affects individual plants. There is very limited host resistance to soft rot bacteria. Therefore, fall cultivation is recommended to help decompose residue and reduce disease inoculums. Farmers should also avoid excessive irrigation.

Stewart’s Wilt
Stewart’s wilt is caused by *Pantoea stewartii* Mergaert et al. (*Erwinia stewartii*). Stewart’s wilt occurs from the mid-Atlantic states westward throughout the Corn Belt. The vector of Stewart’s wilt is the overwintering corn flea beetle. This disease will not occur in the absence of flea beetles. Stewart’s wilt can reduce yield potential. Field corn, sweet corn, and popcorn are hosts for the bacterium. Sorghum, millet, sudan grass and yellow foxtail may also serve as reservoirs for the bacterium and/or corn flea beetles.

Symptoms of Stewart’s Wilt
Similar to Goss’s wilt, Stewart’s wilt has two phases. The seedling wilt phase occurs when the overwintering generation of flea beetles infect plants with the bacterium soon after corn emerges. During this phase, long, chlorotic lesions with wavy margins follow leaf veins as a result of bacteria in the xylem. Vascular tissues can be discolored and decay or death occurs at the base of the stalk on susceptible products. The leaf blight phase occurs near or after tasseling. Water-soaked lesions extend the length of the leaf and become necrotic. Stewart’s wilt lesions are similar to Goss’s wilt lesions late in the leaf blight phase (Figure 1). The two bacteria can be differentiated in a lab.

Environmental Effects on Stewart’s Wilt
Stewart’s wilt is solely dependent on the survival of corn flea beetles. If the sum of the average monthly winter temperature for each month (December through February) is greater than 90°F, corn flea beetle survival and disease risk is high, but if the sum of the average temperature for each month is less than 80°F, corn flea beetle survival and disease risk is low.2

Management of Stewart’s Wilt
Many corn products are available with Stewart’s wilt resistance. Neonicotinoid, seed-applied insecticides can help manage corn flea beetles and have been associated with lower than expected levels of Stewart’s wilt in recent years.

Sources:
2 Jackson, T., and Wright, B. 2012. Nebraska corn at elevated risk of Stewart’s wilt and flea beetle damage. University of Nebraska Extension. UNL–Crop Watch.
Web source verified 3/17/15.