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.

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. Stewart’s wilt can reduce yield potential. The corn flea beetle is the overwintering host and vector of the bacterium. Stewart’s wilt does not occur in the absence of flea beetles. Field corn, sweet corn, and popcorn are hosts for the bacterium. Sorghum, millet, sudan grass, and yellow foxtail may serve as reservoirs for the bacterium and/or corn flea beetles.

Symptoms. Stewart’s wilt occurs at one of two phases within the corn plant: a seedling wilt phase occurs when the overwintering generation of flea beetles infect plants with the bacterium soon after early-planted corn emerges. 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 second phase, or leaf blight phase, occurs near or after tasseling. Water-soaked lesions extend the length of the leaf and become necrotic. Lesions are similar to Goss’s wilt lesions late in the leaf blight phase (Figure 1 and 2). The two bacteria can be differentiated in a lab.

Environmental Effects. Stewart’s wilt is solely dependant 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.¹

Management. 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.

Goss’s Wilt

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

Symptoms. Similar to Stewart’s wilt, Goss’s wilt has two phases. The seedling wilt phase 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, wilt of plants potentially causing death.\textsuperscript{2} 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 2). Two characteristic symptoms of 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 (Figure 3). Goss’s wilt “freckles” are luminescent when leaves are held to block the sun. 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 corn leaf blight, Stewart’s wilt or necrotic areas of leaves resulting from drought or nutrient deficiencies.

**Environmental Effects.** Goss’s wilt follows weather events in which rain and wind disseminate overwintering bacteria from infested plant residues. Wind or hail damage to leaves and other plant parts create wounds for bacteria to enter the plant. Hot, dry weather can inhibit disease development, except in fields with overhead irrigation.

**Management.** Goss’s wilt overwinters in infested corn residue on the soil surface. This infected debris is the primary source of inoculum for the following corn crops. Continuous corn rotations enhance damage from Goss’s wilt due to an abundance of overwintering inocula. 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 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 reduces levels of overwintering inocula. Rotating away from corn for two or more years with soybean, dry bean, small grains, or alfalfa allows time for infected residue to degrade, reducing inoculum levels. Controlling foxtail, barnyardgrass, and shattercane is also important for managing Goss’s wilt.

**Bacterial Stalk Rot**

The pathogen that causes bacterial stalk rot is a bacterium, Erwinia chrysanthemi pv. Zeae, which also has been named Dickeya dadantii. Nearly all other stalk rots of corn are caused by fungi. The bacterial stalk rot pathogen is a soft-rot bacterium that produces enzymes to degrade host tissues, resulting in slimy, smelly, mushy masses of rotted host tissues (Figure 4). The bacterium can infect stalks, but is more frequent early in the season when it rots corn leaves in the whorl prior to tassel emergence.

**Symptoms.** The most distinct symptoms of stalk rot or whorl stage infections are the slimy masses of degraded corn tissue and the foul odor. Discoloration of leaf sheaths and stalk nodes are initial symptoms (Figure 2). 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 and 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 from infections high in the plant.

**Environmental Effects.** High humidity and warm temperatures during mid-season favor the development of this disease. It can be a problem 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 in standing water for a few days following heavy rain and warm temperatures. Infection is also associated with water remaining in the whorl for extended periods.

**Management.** The bacterium can survive in corn or sorghum stalks and residue and is a sporadic disease, often affecting individual plants. There is very limited host resistance to soft rot bacteria. Therefore, the best management practices are fall cultivation to incorporate residue and reduce disease inocula plus avoidance of excessive irrigation.

**Sources**

\textsuperscript{1} 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. http://cropwatch.unl.edu/.


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