agKnowledge Spotlight
Shedding light on the concerns of your fields.

Past, Present, and Future of Goss's Wilt

- Goss's wilt has been gradually spreading to new areas in North America over the past five decades.
- Whether or not the disease becomes established in an area is greatly dependent on the predominant tillage practices of that region; further spread of the disease is likely when conservation tillage and continuous corn production is practiced.
- Monsanto is focused on developing new corn products with improved resistance to Goss's wilt for all areas where the disease is a concern.

Disease Distribution

Goss's wilt was first observed in Dawson County, Nebraska in 1969. By the end of the 1970s, the disease had spread to most of Nebraska and to a few areas in Colorado, Kansas, Iowa, and South Dakota. Throughout the decades, the bacterial pathogen Clavibacter michiganensis ssp. nebraskensis (Cmn) continued to spread throughout corn-growing regions of North America. To date, Goss's wilt has been found in 18 states and in Alberta, Manitoba, and Ontario, Canada (Figure 1).[1,2]

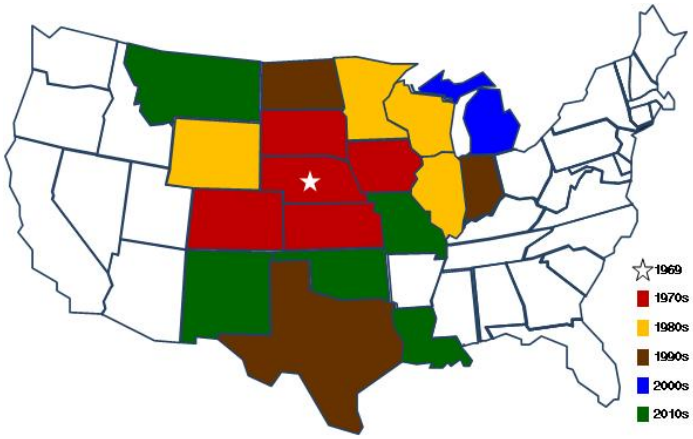

Figure 1. States and timeline of reported incidences of Goss's wilt since first identification in 1969 (white star).

Changing Production Practices

In the early 1980s, Goss's wilt was thought to have the potential to become a significant problem both in terms of prevalence of occurrence and impact on yield. By the end of the decade, it was fairly evident that Goss's wilt did not become a serious problem in corn outside of the western portion of the Corn Belt. The recent increase in the prevalence of Goss's wilt raises the questions: why didn't Goss's wilt become a widespread disease of corn in the 1980s and why does the disease appear to be making a comeback in recent years?

The answer seems to be associated largely with the widespread adoption of conservation tillage. In certain areas of the Corn Belt where the Cmn bacterium had been found in the 1980s, such as Minnesota, Iowa, and Illinois, the bacterium failed to become established and only sporadic occurrences of the disease were noted. The failure of Cmn to become established can be attributed to the region's predominant cultural practices of that period, which included clean fall plowing, usually with a mold-board plow. In the western Corn Belt where the disease was already a significant problem, conservation tillage had been practiced for decades.

Corn stubble is a source of primary inoculum for Cmn under naturally-occurring field conditions. University of Nebraska plant pathologists demonstrated that Cmn could be recovered eight months after harvest from 80% of infected leaf tissue left on the soil surface; however, the bacterium could not be recovered from infected leaf debris that was buried four or eight inches in the soil.[3] Thus, as the bacterium was spread to new areas (via movement with weather fronts, on infected corn debris, and/or infected seed) it failed to become established because infected debris was buried with adequate fall tillage. The increase in the practices of conservation tillage and continuous corn production throughout the Corn Belt are a contributing factor to the resurgence of Goss's wilt. Because corn residue at the soil surface has the potential to harbor a substantial amount of Cmn inoculum, once introduced into a field, the bacteria can survive on surface debris and gradually increase to levels that are likely to cause a significant problem when favorable conditions occur.

Figure 2. Early symptoms of Goss's wilt with leaf freckles present.

Product Selection

Product selection is the best approach to managing Goss's wilt. Corn products have a range of reactions to Goss's wilt from relatively resistant to very susceptible. This range of reactions occurs among commercial

Past, Present, and Future of Goss's Wilt

products from all seed companies. No corn plant is completely immune to infection. Corn products targeted for the western Corn Belt tend to have better resistance to Goss's wilt than those grown in the central and eastern Corn Belt because the frequency of the disease in the west has eliminated the practical use of the most susceptible products. The group of corn products available in the central, eastern, and southern areas of the United States have a wider range of reactions to Goss's wilt because the disease has not been a major issue in those regions until recently. Nevertheless, individual products grown anywhere throughout North America may have Goss's wilt resistance equivalent to products grown in the west.

The Future of Goss's Wilt

Severe occurrences of Goss's wilt are now seen over a wider geographic area than in previous decades. This is likely due to pockets of the pathogen becoming established in individual fields (although often initially undetected) where conservation tillage and continuous corn production are practiced. The probability of Goss's wilt increases when severe weather conditions conducive to infection occur and a susceptible corn product is grown in that particular field. Severe occurrences of Goss's wilt will likely continue until commercial products with increased resistance become available in these regions, or agricultural practices, such as crop rotation, that reduce the source of inoculum are practiced.

Monsanto's Breeding Efforts

In response to the increased prevalence of Goss's wilt, Monsanto has committed special efforts to develop new corn products with increased tolerance to the disease in all geographies. Large screening nurseries have been established in many areas that provide corn breeders an opportunity to assess the response of an individual corn product to Goss's wilt under different environments and differing levels of disease severity. Monsanto corn products are assigned a tolerance rating based upon their response to the disease across all geographies. Disease tolerance ratings range from 1 to 9, with 1 being excellent resistance and 9 being poor resistance.

Monsanto breeders are using genetic markers to enhance traditional phenotypic selection for increased resistance to Goss's wilt. Marker-assisted breeding is an important tool in the development of corn products and has helped speed up the development process for new products. The result has been an increased number of new corn products with improved resistance to Goss's wilt (Figure 3).

For additional information on symptoms and management of Goss's wilt, visit www.aganytime.com.

Figure 3. Differences in the severity of Goss's wilt infection on leaves of a susceptible and a resistant corn product from Monsanto. Resistance restricts the area of leaf tissue colonized by Cmn.

Sources

[1] Jackson, T.A., Harveson, R.M., and Vidaver, A.K. 2007. Goss's bacterial wilt and leaf blight of corn. NebGuide G1675. University of Nebraska-Lincoln Extension.

[2] Distribution map of Clavibacter michiganensis subsp. nebraskensis. April 2000. Map No. 549. CAB International.

[3] Schuster, M.L. 1975. Leaf freckles and wilt of corn incited by Corynebacterium nebraskense. Schuster, Hoff, Mandel, Lazar, 1972. Research Bulletin 270. University of Nebraska-Lincoln.

131209080240