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## Corn Disease Update

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# Corn Disease Update

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## Introduction

Several diseases were important in the 2016 Nebraska corn crop and impacted yield in some areas. Many of these diseases developed as a result of extreme weather events that were favorable for disease development. Most of those diseases are caused by pathogens that are capable of survival in the crop debris or residue and so they are more likely to develop again in future years if environmental conditions are favorable again. This article will summarize some of Nebraska's most important corn disease problems in 2016, tips for diagnosis and management strategies.

## Bacterial Leaf Streak

Bacterial leaf streak of corn, caused by *Xanthomonas vasicola*, was confirmed in 50 counties in Nebraska in 2016. A survey funded by the Nebraska Corn Board was conducted to investigate the distribution of the disease and to gather information about agricultural practices that may contribute to disease development. Results of the survey showed that this disease was prevalent across much of Nebraska with the exception of the Panhandle and the extreme eastern parts of the state. It was also confirmed in Colorado, Kansas, Iowa, Illinois, and Texas in 2016. Bacterial leaf streak was confirmed in dent (field) corn, popcorn, seed corn, and sweet corn. The pathogen was previously reported on corn in South Africa, but has never been reported in the United States until now.

Symptoms of bacterial leaf streak appeared on the leaves, and included yellow, orange or dark to light brown stripes with wavy margins. Lesions may be concentrated around the midrib or across the leaf blade, and often appeared yellow when backlit. Symptoms were observed on the lower leaves as early as the beginning of June in Nebraska on V7 corn and moved up the plant as the infection progressed; however, there have been cases where symptoms first appeared in the mid-canopy or upper leaves in July reportedly after severe storms. Because of this behavior, and the similarity of the lesions to the fungal disease gray leaf spot, the two diseases are often mistaken for each other. There are a few differences to look for when attempting to distinguish between these two diseases: first, consider the time of year that the symptoms began to develop. If the symptoms first developed in June, it is likely bacterial leaf streak, since gray leaf spot usually doesn't develop until later. Also, lesions caused by bacterial leaf streak will typically have a wavy margin, whereas gray leaf

spot lesions will typically be a perfect rectangular shape with smooth, linear margins. While these considerations can be useful, neither will provide a correct diagnosis every time, and it can be especially confusing when both diseases are present on the same leaf. When making management decisions it is important to make a correct diagnosis, as fungicides used to treat gray leaf spot are not expected to be effective against bacterial leaf streak.

*Xanthomonas vasicola* is thought to overwinter in infested crop residue from the previous year, where it can survive until the next growing season. It can then infect the next year's crop when environmental conditions become favorable for its growth. This bacterium does not appear to require wounds to establish an infection, as it is believed to infect the plant through natural openings, such as the stomata. Center pivot irrigation and wind driven rain may increase the severity of infection.

Crop rotation may help to reduce disease the following years, however disease development has been observed in corn after one-year rotations to soybeans, wheat, and after fallow. Tillage may also reduce infection by burying the infested residue and promoting degradation, but it will not completely eliminate disease and is not practical in all areas or production systems. Using good sanitation practices, such as cleaning equipment when moving from infested fields to non-infested fields, may help slow the spread of the disease.

## Gray Leaf Spot

Gray leaf spot development was somewhat delayed in 2016 compared to other years. This delay in disease development may have contributed to misdiagnoses of bacterial leaf streak (which often developed early) as gray leaf spot. However, the disease quickly became very important late season across in corn across much of the state as it increased rapidly during favorable weather conditions. Gray leaf spot is caused by a fungus (*Cercospora zeae-maydis*) that survives in infested plant debris from the previous seasons. It consistently develops on the lower leaves and continues to move higher on the plant as long as weather conditions remain favorable. This disease is favored especially by temperatures of 70-90°F and periods of 12 or more hours of very high relative humidity in the canopy (>90%). Gray leaf spot lesions begin as yellow flecks that expand to form rectangular gray to tan lesions between leaf veins. Severity of symptoms is evaluated by

the amount of leaf area covered by lesions and how high on the plant they have reached. Lesions may take as little as 14 days to develop in susceptible hybrids and up to 28 days to develop in more tolerant hybrids. Keep in mind that conditions are often more favorable later in the season for gray leaf spot, after tasseling when the disease tends to increase in severity more quickly. Late season in 2016, gray leaf spot became very severe in some areas.

Some high risk factors include:

- History of severe gray leaf spot
- Sensitive hybrid with poor ratings for gray leaf spot
- Continuous corn
- Minimum tillage that maintains more corn residue on the soil surface
- Warm conditions with high relative humidity

Gray leaf spot has also been the predominant disease in fungicide trials conducted at the UNL South Central Agricultural Laboratory during recent years. When they were needed, applications made at tasseling and soon thereafter have most consistently provided yield returns under significant disease pressure. In addition, fungicide applications made at tasseling or soon thereafter also often provided improvements in standability (as measured in push tests) compared to the non-treated control treatments during several trial years. Results from these trials can be viewed on the Crop Watch website under Plant Disease Management Trials for Corn.

For more information on GLS and fungicide application timing, see the article, “Fungicide Application Timing and Disease Control” in the 2016 Crop Production Clinics Proceedings.

### **Southern Rust**

Southern rust was quite widespread and severe in the southern United States in 2016 and confirmed as early as July in Nebraska. Eventually, southern rust was confirmed in many counties across the state. In some areas, it became very severe, especially in southern counties in Nebraska. Some of the worst affected fields were those that were delayed in planting due to heavy rains during the spring and delayed corn maturity.

Warm temperatures and high humidity are enough to promote development and spread of the disease. Rust diseases produce large amounts of spores quickly that can be easily moved by wind for long distances. The fungus can quickly cause disease during favorable conditions and because many commercial dent corn hybrids have little to no resistance to the disease. Having a history of southern rust in corn does not have any impact on disease development now, because this pathogen does NOT overwinter in infected residue. The spores must be carried into the area from other locations by winds from diseased areas. It is important to remember that it can take anywhere

from a few days to several weeks for widespread and severe southern rust to develop if it is going to do so. For that reason, we recommend scouting fields frequently especially those at higher risk, such as later planted fields and after alerts have been issued for southern rust development in nearby fields and counties.

### **Stalk Rot Diseases**

Much of the 2016 Nebraska corn crop experienced repeated and prolonged stress (and sometimes wounding) during the growing season. Stress during any part of the season can promote stalk rot and lodging at the end of the season as harvest approaches. Some fields experienced marked lodging, crown rot, top dieback, and stalk rot during the 2016 season due to numerous crop stress events.

Some high risk factors for stalk rot diseases and lodging are:

- Higher yielding hybrids
- Thin stalks
- Lost leaf area (due to leaf diseases, hail, etc.)
- Excessive rainfall/ponding
- Drought conditions
- Stalk wounding, usually by hail
- High planting populations

### *Scouting for Stalk Rot Diseases*

The first indication of a problem is often the early, and sometimes rapid, discoloration of the corn plant turning from green to brown or gray. Individual plants may be affected or patches of several plants. Affected plants often have stalks that are hollow and easily crushed by hand or bent using the “push or pinch” test. Stalk rots can occur at any place in the stalk from the crown at/below the soil line to the tassel. Rotting that occurs at an upper node and kills only the upper plant parts is referred to as “top rot” or top dieback and does not necessarily cause lodging of the whole plant. However, top dieback predisposes plants to lower stalk rot and loss of the upper leaves can lead to yield loss if it develops early enough. Degradation of the stalk below the ear can lead to plant lodging and losses during harvest.

### *Assessing stalk rot diseases and standability*

Walking through a field, randomly select a minimum of 100 plants representing a large portion of the field. To test for stalk rot you may choose to PUSH the plant tops away from you approximately 30° from vertical. If plants don’t snap back to vertical, then the stalk integrity may have been compromised by stalk rot. An alternative method is to use the PINCH test to evaluate plants for stalk rots. Pinch or squeeze the plants at one of the lowest internodes above the brace roots. If the stalks crush easily by hand, then their integrity is reduced by stalk rot and they are prone to lodging. If more than 10% of plants exhibit stalk rot symptoms, then harvesting that field should be a priority over others at less risk in order to reduce the chance of plant lodging and the potential for yield loss.

There are several fungi that are common in our production fields and can opportunistically cause stalk rot diseases in stressed plants. Some of the most common stalk rot diseases in 2016 were Fusarium stalk rot, Anthracnose stalk rot, and sometimes charcoal rot.

### *Management*

There is nothing that can be done late in the season to stop stalk rots as affected stalks will continue to degrade over time further weakening them. But, you can work to minimize your losses by identifying which fields have the worst stalk rot diseases and adjust the harvest order of those fields. Consider harvesting or chopping those fields that are heavily impacted by stalk rots first or earlier to minimize losses that can occur after lodging. Any stresses that can be avoided during the growing season may help reduce the incidence of stalk rot diseases.

### **Ear Rot Diseases**

Several ear rot diseases were confirmed in corn late in 2016, as well. Many of those diseases developed in corn that was injured by insect feeding, such as by western bean cutworm. Unfortunately, these fungi can continue to grow in bins during storage. Cold temperatures and low moisture can slow growth of grain mold fungi. Grain affected by ear rot fungi may need to be handled differently if it to be stored, especially for an extended time period. Maintaining moisture <15% and running bin fans to maintain uniform temperature and moisture conditions will slow fungal growth.

Ear rot diseases may cause both yield loss and reduction in grain quality. Ear rot diseases are caused by several species of fungi that can also continue to grow in grain after harvest during storage causing further quality loss. In addition, some fungi may produce secondary mycotoxins that can be harmful at higher concentrations to livestock and other consumers. Ear rot diseases and mycotoxins occur to some extent every year, usually at safe levels. Knowing which ear rot pathogens are present can help to predict which, if any, mycotoxins may be present and can be measured in grain samples by certified labs.

### *Fusarium Ear Rot*

Fusarium ear rot is a common disease in corn. Fusarium may infect any part of the ear and take advantage of wounds created by insects or hail. The species that cause this disease can also produce mycotoxins in the grain called fumonisins. Fusarium ear rot is favored by a wide range of environmental conditions and can be recognized by its scattered tufts of mold on the ears that may be white to pink in color and may be accompanied by starburst patterns on the kernels.

### *Diplodia Ear Rot*

Diplodia (also called Stenocarpella) ear rot is a common disease in the Corn Belt. The fungus that causes this disease

does not usually produce a mycotoxin in the United States, but can significantly reduce grain quality. Extensive fungal growth usually begins at the base of the ear and can overtake the entire ear creating a lightweight mummified ear. In addition to these symptoms, this disease can be recognized by the production of small raised, black fungal reproductive structures on infected kernels and stalks giving it a rough feeling when touched, similar to sandpaper.

### *Penicillium Ear Rot*

The fungus causing Penicillium ear rot can produce green to blue-green spores where it infects, especially on wounded kernels, such as on ear tips. This disease is particularly a storage problem and is favored by high moisture levels in grain bins. Management of the disease is by reducing wounding of ears in the field by insects and maintaining low moisture while the grain is in storage. Because of their similarities in appearance, it may be misdiagnosed as Aspergillus ear rot.

### *Aspergillus Ear Rot*

Aflatoxin is the best-known mycotoxin and is produced by the fungus that causes Aspergillus ear rot. There were no reports of aflatoxin in corn in Nebraska this year nor the Aspergillus ear rot disease. Hot, dry weather during the latter half of the growing season after pollination especially favors aflatoxin production. Drought-stressed corn, such as that in non-irrigated fields and the corners of irrigated pivots that are out of range of water from center pivots are especially vulnerable to the accumulation of aflatoxin. Aspergillus ear rot is caused by a fungus that may infect wounded kernels and produces green-yellow spores. Aflatoxin is toxic and carcinogenic to humans and livestock. The FDA has suggested action levels for aflatoxin concentrations, ranging from 0.5 – 300 parts per billion (ppb) depending upon its intended use, such as the species and age of the animal.

### **Literature Cited**

Coutinho, T. A., and Wallis, F. M. 1991. Bacterial streak disease of maize (*Zea mays* L.) in South Africa. *J. Phytopathol.* 133:112-120.