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Corn Disease Update

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The growing conditions during 2013 contributed to several disease problems in corn. Cold and wet conditions early led to development of seedling diseases. The hail damaged corn in many areas of the state during the season led to ear rot diseases that were exacerbated by cooler conditions and increased grain moisture. Diseases have been a problem throughout the season and could extend beyond harvest into storage of some corn.

Seedling Diseases Appearing in Corn

Cool soil temperatures and episodes of rainfall contributed to the development of seedling diseases in corn in 2013. The most common seedling diseases that were identified in samples submitted to the UNL Plant and Pest Diagnostic Clinic were those caused by *Pythium* and less frequently, *Fusarium* species.

Seedling diseases can be caused by any of several common soilborne organisms, such as *Pythium*, *Fusarium*, *Rhizoctonia* or plant parasitic nematodes. Seedling diseases are often difficult to diagnose because their symptoms are very similar and may be easily confused with those caused by other problems. Sometimes, diagnosis may be of limited value because management is often the same for several seedling diseases. Microscopic examination and other laboratory analyses of the diseased seedlings can often identify the cause(s) of the problems. Seedling diseases can be confused with insect injury, herbicide damage, planting problems, or environmental stresses that often have similar symptoms. For more information on differentiating early season chemical damage and seedling diseases, see the article, "Differentiating Chemical and Disease Symptoms in the Field" in the 2014 Crop Production Clinic proceedings. Some of the possible symptoms of seedling diseases are:

- Rotted seed prior to germination
- Rotted or discolored seedlings after germination prior to emergence
- Post-emergence seedling damping off
- Root decay

At least 14 species of *Pythium* have been previously identified that can cause seedling blight and root rot. These pathogens require excessive moisture because they produce motile swimming zoospores that infect plant roots. The pathogen overwinters in soil and infected plant debris by producing thick-walled oospores that can survive for several years in the absence of a suitable host or favorable weather conditions.

Although uncommon, *Pythium* may also cause stalk rot disease in corn during extended periods of wetness during the middle and later portions of the growing season. Symptoms of Pythium stalk rot can cause collapse of the lower stalks at or near the soil surface. Stalks may appear collapsed, twisted, and water-soaked and could be confused with bacterial stalk rot, but lack the characteristic foul odor.

There are more than six *Fusarium* species that can cause seedling diseases and root rots, as well and several are common in Nebraska fields. Stressed plants due to weather extremes (temperature and moisture), herbicide damage, and physical injury are more prone to infection and disease caused by *Fusarium* species.

Management

Unfortunately, resistance is not available for diseases caused by *Pythium* and *Fusarium*. Although improved field drainage can help reduce seedling disease severity, the most common method for disease management is with the use of seed treatment fungicides. Crop rotation can provide some reduction in disease.

Most seed corn is already treated with more than one seed treatment fungicide, often an insecticide, and, sometimes with a nematicide option. These products can provide protection against some of the pathogens that cause seedling diseases. But, in spite of their activity, diseases may still develop, such as during extended periods of inclement weather or under severe pathogen pressure. However, seed treatments will only provide protection during the first few weeks immediately after planting. You can minimize the likelihood of developing

seedling diseases by planting high quality seed at appropriate planting depths and soil conditions to support rapid plant growth and emergence.

Stalk Rot Diseases

The crop stress created by the growing conditions in 2013 led to the development of stalk rot diseases and lodging that slowed harvest progress in some areas.

Weakened stalks became evident in some of the corn still waiting to be harvested across the state late this past fall. High winds in October 2013 led to lodging in corn where some stalks were weakened by stalk rot diseases and other problems.

Scouting for Stalk Rot Diseases

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 fail to snap back to vertical, then the stalk has 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 other fields that are 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 that can cause stalk rot diseases. Some of the most common stalk rot diseases this year are listed below:

- **Charcoal rot** is one of the few diseases that are more common during drought conditions, and so, is more likely to affect non-irrigated crops. The disease is characterized by the presence of many minute black round structures inside the stalk that can give it a gray to black appearance (hence the name). In addition, the fungus that causes charcoal rot, *Macrophomina phaseolina,* has a wide host range and can cause the same disease in several crops, including soybean, sorghum, and alfalfa.

- **Fusarium stalk rot** is especially common during damp conditions, but may occur anywhere, including in irrigated fields this year. The pathogen, *Fusarium verticillioides*, can sometimes be visible as white fungal growth on the outside of stalks at the nodes. Eventually, the disease may cause discoloration of the inside of stalks to pink or salmon.

- **Anthracnose stalk rot** can also cause a leaf disease and is a common cause of top rots in corn. In more advanced stages the disease can cause the development of black lesions visible on the outside of the stalk and is caused by the fungus *Colletotrichum graminicola.*

Management

There is nothing that can be done to stop stalk rot development once it is identified in the field. In most cases, 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 those fields that are heavily impacted by stalk rots prior to fields with lower incidence of stalk rot diseases to minimize losses after lodging.

More Resources

For more information on stalk rot diseases of corn, see the UNL Extension publications:

Corn Disease Profiles II: Stalk Rot Diseases
http://www.ianrpubs.unl.edu/sendIt/ec1868.pdf

Common Stalk Rot Diseases of Corn
http://www.ianrpubs.unl.edu/sendIt/ec1898.pdf

If you are in doubt about the identity of a disease or cause of another plant problem, you may submit a sample to the UNL Plant and Pest Diagnostic Clinic (P&PDC) for diagnosis.

Grain Storage Management to Minimize Mold and Mycotoxins

High grain moisture at the end of the 2013 season delayed harvest for many farmers, but some chose to continue harvest in spite of high moisture. In addition, the corn in many parts of Nebraska experienced damage caused by hail that predisposed it to infection to ear rotting fungi. Some of the high moisture and/or damaged corn was placed in bins for storage and is at increased risk for grain mold development in the bin and reduced quality. Many species of fungi can cause ear rot diseases and molding of grain. Most of these fungi become associated with the grain in the field, but may continue to grow and reproduce if grain is stored under favorable conditions of moisture and temperature in the bin.

Harvested corn is NOT necessarily safer in the bin than in the field with regard to maintaining grain quality. If there was a problem with ear rot diseases in the corn in the field, there will likely be grain mold problems in the bin. Even under the best storage conditions, grain mold fungi are likely to continue to grow in the bin, where some can also produce mycotoxins. Under these conditions, it is important to cool and dry harvested corn as quickly as possible – preferably within 48 hours of harvest. It is NOT recommended to store infected grain, particularly for extended periods of time. In addition, grain that is damaged during or after harvest, such as during handling or storage by insects or other mechanical means, is much more prone to fungal infection by grain molds.

Ear rot diseases and grain molds can lead to substantial reductions in grain quality that can ultimately cost producers who may be penalized at elevators or by loss of feed quality.

Grain Moisture

Wet grain (greater than 16 percent moisture) loses quality grade three times faster when it is not being aerated to reduce the heat created by microbial respiration. Grain should be dried as quickly as possible by running the fan(s) continuously (rain or shine) until grain is below 17% moisture to slow mold growth in the grain. When grain is below 17% moisture, run fans even if foggy or raining to carry away heat buildup in the bin at least every 3 days until the moisture content throughout the entire bin is below 15% moisture. When grain is below 15% moisture, you may begin to run aeration fans intermittently when the equilibrium moisture content table indicates additional drying is possible.

If it is likely that fungi that produce mycotoxins are present in the corn, dry the grain to 14% moisture if it will be held for one month and if grain will be stored for over a month, dry the grain down to <13% moisture. If the corn is found to have any level of mycotoxin contamination it is recommended to partially fill the bin(s) initially, such as1/4 of the capacity of the bin, so the fan(s) will produce higher airflow rates (cfm/bu) and therefore dry the grain quicker and reduce mold growth and mycotoxin production and contamination of the grain.

If the bin was equipped with a stirring system, run a couple of rounds each time four or more feet of corn is added to the bin. Stirring will help to equalize the moisture content in the grain and to prevent over-drying the bottom of the bin. However, be careful to not over stir, as the down augers can damage the kernels and small cracks in the seedcoat allow fungal infection of the kernels.

Grain Temperature

In addition to getting the corn dry, you need to cool the grain whenever ambient air temperature allows. This will slow the growth rate of the fungal organisms and will prolong the shelf life of the grain. Run the fans whenever the air temperature is 10 degrees below the grain temperature in the bin to cool the grain. This advice holds even in years when we are not expecting mycotoxin contamination. Continue running fans until the grain is 30 degrees F. Reducing the grain temperature down to near freezing will stop mold growth. Nevertheless, check bins at least once a month for any signs of heating.

If your bin is not equipped with a grain temperature monitoring system, you should consider purchasing a grain thermometer that can be pushed into the grain. I recommend you buy a grain thermometer that can be pushed at least four feet into the grain. Some suppliers sell the thermometer head without an extension rod, but they have a threaded female socket that accepts a 3/8 inch threaded rod (ready-rod).

When measuring grain temperature, always allow at least five minutes for the thermometer to equalize with the grain before taking each

reading. Take readings about every 20 feet around the perimeter of the bin, but maintaining a distance of at least two feet from the bin wall. Then check several places in the center of the bin. If you find a difference of eight degrees or more between the warmest and coldest spot in the bin, run the aeration fan(s) to equalize the grain temperature in the bin. If you detect a musty smell when you turn on the fan or if you see condensation on the inside of the bin roof on a cold day, you might have a hot spot developing in the grain in the bin. Most often, these hot spots develop in the center of the bin directly under the loading auger where the majority of the fines collect. If you detect any of these warning signs you should consider unloading some grain and observe the grain coming out of the auger for signs of heating or spoilage.

If there are confirmed mycotoxins in the grain at harvest, it is safer to avoid storage of the affected grain. It is not recommended to hold the grain in the bin after temperatures begin to warm again in the early spring, Mold spores in the bin will survive harsh winter conditions and continue to grow again once temperatures exceed 40 degrees F. In addition, mycotoxins are temperature stable and their concentrations will not decline in storage, but likely only increase.

For More Information

Additional information on these and other diseases can also be found at the website Crop Watch at http://cropwatch.unl.edu/ under "Corn – Disease Management" or in the following UNL Extension publications:

Sampling and Analyzing Feed for Fungal (Mold) Toxins (Mycotoxins)
http://www.ianrpubs.unl.edu/epublic/live/g1515/build/g1515.pdf

Understanding Fungal (Mold) Toxins (Mycotoxins)
http://www.ianrpubs.unl.edu/epublic/live/g1513/build/g1513.pdf

Use of Feed Contaminated with Fungal (Mold) Toxins (Mycotoxins)
http://www.ianrpubs.unl.edu/epublic/live/g1514/build/g1514.pdf

Corn Disease Profile III: Ear Rot Diseases and Grain Molds
http://www.ianrpubs.unl.edu/epublic/live/ec1901/build/ec1901.pdf