Check General Root and Mesocotyl Health when Assessing Corn Stands

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Abstract
This growing season has started out cool with slow heat unit accumulation with frequent precipitation events across the state keeping soils wet. Although some are still out planting corn, there are some fields where corn is at growth stage V2. Reports of seedling blights are beginning to filter in.

Keywords
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Check General Root and Mesocotyl Health when Assessing Corn Stands

By Alison Robertson and Gary Munkvold, Department of Plant Pathology

This growing season has started out cool with slow heat unit accumulation with frequent precipitation events across the state keeping soils wet. Although some are still out planting corn, there are some fields where corn is at growth stage V2. Reports of seedling blights are beginning to filter in.

As you start to assess plant stands, remember also to check below ground growth, specifically general root and mesocotyl health. Wet and cool soil conditions (less than 50-55 F) predispose seedlings to infection by a number of fungi which cause disease that may result in seedling death. Remember too, that while uneven emergence and stunted seedlings may indicate seedling disease, insect feeding and herbicide damage may be factors.

Survival of young corn seedlings depends on a healthy kernel and mesocotyl which should remain firm and white through at least growth stage V6. Damage to the kernel or mesocotyl prior to establishment of the nodal root system can result in stunted, weak or dead seedlings. A developing corn seedling relies on the kernel endosperm for nourishment until the nodal root system has fully developed, usually around the 6-leaf stage. Thus the mesocotyl acts as the "pipeline" for translocation of nutrients from the kernel and seminal roots to the seedling stalk and leaf tissues.

Seedling diseases of corn (seed rots, seedling blights and/or root rots) are caused by numerous fungi including Pythium, Fusarium, Rhizoctonia, Aspergillus, Penicillium, and Trichoderma, all of which are common inhabitants of soils. In addition, these fungi also can be seed-borne in corn, except Pythium. Seedling susceptibility to infection increases the longer the seed sits in the ground, and the more stress germinating corn undergoes. Corn germinates well at soil temperatures above 88 F. When soil temperatures are below 55 F, germination is greatly retarded. Thus seedling disease often is more severe in early planted or no-till/reduced tillage fields because of cool soil temperatures.

Typical below ground symptoms associated with seedling disease include rotting seed and brown discoloration (rotting) of the mesocotyl and seminal roots (Figure 1). It is sometimes possible to determine in the lab which fungus is the culprit, however this information is not crucial since management options are the same for all seedling disease: plant high quality fungicide-treated seed, plant when soil temperatures are above 50 F, and ensure planting depth is not too deep.

Although crop rotation can be helpful in reducing inoculum levels, some fungi are pathogenic on both corn and soybean. Thus good records of seedling disease problems can be a helpful management tool. For example, fields with a history of seedling blight can be planted later in a planting schedule when soil temperatures are warmer.
Figure 1. Brown, discolored (rotten) mesocoty/ls are a symptom of seedling blight.

Seed treatment fungicides have been standard practice in corn production since the 1930s, but many changes have occurred recently and other changes are on the way. The fungicide combination on most commercial corn seed now includes Maxim XL® /Apron XL® (fludioxonil and mefen oxam) and Dynasty® (azoxystrobin) from Syngenta Crop Protection. Some seed also may be treated with Trilex® (trifloxystrobin, Bayer CropScience) instead of Dynasty, or with Allegiance (Metalaxyl) instead of Apron XL, Stamina® (pyraclostrobin) seed treatment fungicide (BASF Corp.) was approved for use in 2009, and is available on a limited scale this year.

In 2010, we will see the launch of Monsanto’s Acceleron® seed treatment brand on corn, which will include the fungicide ipconazole, in combination with other active ingredients. Many seed companies are routinely applying insecticides such as Cruiser® (thiamethoxam, from Syngenta) and Poncho® (clothianidin, Bayer CropScience)) in combination with the fungicide seed treatments.

Earlier this year, the nematicide Avicta® (abamectin) was registered for use on corn. The product will be launched commercially in 2010 in combination with Cruiser® seed treatment insecticide and the seed treatment fungicide Apron XL®, Maxim® XL and Dynasty®. Many other fungicides and insecticides are registered for use on corn, some for on-farm use (see 2009 Missouri Pest Management Guide).

The rapid developments in commercial seed treatment use are strengthening the spectrum and duration of protection, but no amount of seed treatment will eliminate seed and seedling disease under all conditions. It continues to be important to be aware of what’s on your seed and the performance that you experience with the products.

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