BETWEEN THE ROWS

May 3, 2013 | EARLY SEASON COLD STRESS | wyffels.com

Introduction

Recent precipitation and cold temperatures across much of the upper Midwest raise concern about the health of some recently planted, and in some cases recently emerged, corn. Timing and field conditions will have the greatest impact on any damage that may occur. Understanding the symptoms to look for and their effect on crop health will help you make management decisions to secure the greatest yield potential for your corn crop.

Cold Stress during Germination

One risk that newly planted corn faces is imbibitional chilling injury. This occurs when soil temperatures cool after planting and the kernels imbibe water and begin the germination process. The greatest risk of this occurs within the first 36 hours after planting, but there is risk of injury up until the seedling is emerged.

A seed will imbibe around 30% of its weight in water before germination. When a kernel imbibes water it naturally expands. If cell tissue of the kernel is too cold it will be less elastic and more prone to rupturing. There is no concrete knowledge of what soil temperatures need to be for chilling injury to occur. It is believed risk of injury starts at temperatures below 50°F and become more severe as soil temperatures drop.

Deformed Mesocoyl Elongation. Photo courtesy of RL Nielsen, Purdue University.

Symptoms of injury include swollen kernels that fail to germinate, which will appear mushy and discolored. Chilling injury can also occur after germination. Symptoms that may appear after germination are stalled growth of the radicle root and the coleoptile following germination. Stunting or death of the seminal root system. Deformed elongation of the mesocotyl, also known as corkscrew symptom. And delayed or complete failure of emergence, which would include leafing out underground.

Seedling Disease

Early season stress will promote seedling disease in certain conditions. Cool temperatures and cold imbibition of water will greatly slow seed metabolism. During a slow and challenging germination period, seed and seedlings are much more vulnerable to seedling blight pathogens. Soil temperatures below 55° F will delay germination and possibly weaken corn seedlings. Some seedling blight pathogens require water to inoculate seedlings, so the combination of moisture and cool temperatures would be a favorable environment for seedling diseases to develop.

Left: Shriveled mesocotyl from Seedling Blight. Right: Healthy mesocotyl

Seedling blight can be identified by digging up stunted plants or plants that have not emerged and examining the seed and the mesocotyl. If the seed is soft and rotten, or the mesocotyl appears brown and shriveled up, it's likely the result of seedling blight. Damage to the mesocotyl or kernel before the establishment of the nodal roots can often result in unproductive or dead plants.

– more –

Cold Stress of Emerged Corn

Damage can also occur to freshly emerged corn. Damage can range from minor leaf damage to complete death of exposed tissue. The growing point of a corn plant remains about 1/2 inch below ground until about the 5-collar stage (V5), which keeps the plant reasonably protected from the effects of above ground frost. Frost damage to corn is usually minor and limited to above ground plant tissue. Corn can easily recover from this type of injury early in its development and suffer no yield loss.

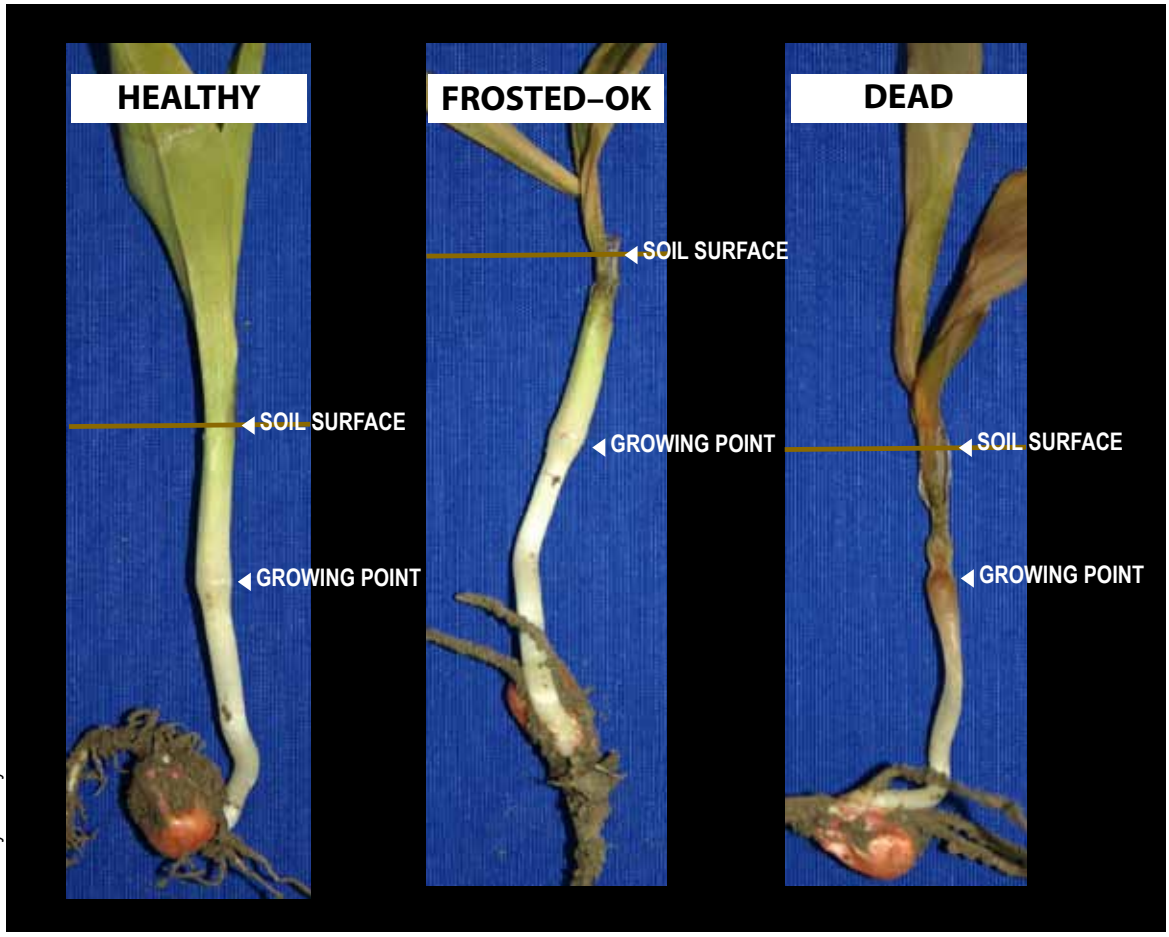
When air temperatures actually drop to lethal levels (28° F or less) for more than a few hours, the growing point of a young corn plant can be injured or killed even if it is still below the soil surface. The degree of lethal damage that occurs (even at 28° F or less) depends on your soil type and the amount of moisture in your soil. Corn plants in sandy soil or in very dry soil are more prone to freeze damage. Corn planted in low-lying muck areas may actually drop below the freezing mark quicker than other spots in the field.

Evaluating injury

The most important thing when evaluating injury due to cold stress is to be patient. The extent of the injury will not be fully realized until conditions improve to promote growth so that you can better assess the number of affected seedlings or plants. When you are evaluating stands and crop condition it is best to have a plan before you enter the field. Use a replant worksheet to help make the decision as objective as possible. You can find very good tools to help you make replant decisions from university extension resources, or in the Agronomic Tools section of the Wyffels website.

Summary

Many factors, both environmental and field specific, will influence the extent of damage that will occur from cold stress early in the season. Knowing what symptoms to look for and having patience when evaluating damage will allow you to make the best decision for your corn crop.



Go to our website for tips on taking population counts.

www.wyffels.com/Agronomy/Agronomic Tools/Taking Plant Population Counts