

2011 Corn Root Lodging

Corn root lodging is a significant problem in 2011. There are numerous concerns regarding the impact of root lodging on yield and harvest efficiency. This fact sheet helps explain the causes of root lodging and provides some management suggestions for dealing with the root lodging issue.

Causes of Root Lodging in Corn

- Restricted root development as a result of several environmental factors:
 1. Wet conditions at planting resulted in some fields with compacted soils below and around the root zone as a result of spring field work.
 2. Wet soils early in the growing season reducing the plant's need to expand the root mass.
 3. Drier than normal soil conditions immediately prior to the storms that may have slowed brace root development.
- Severe corn rootworm pressure.
- Wind and heavy rain at a critical time during corn root development and prior to brace root formation.
- Hybrid differences in root formation which can be impacted by: planting date, planting depth, hybrid maturity, insecticide use or efficacy and the hybrid's genetic tendency for root lodging resistance.

Root Development

The corn plant has three different stages of root development during its lifecycle: seminal root formation at germination and emergence, nodal root development during vegetative growth and brace root development immediately prior to and during flowering. Environmental stresses impacted root development throughout all three stages and must be considered when assessing the causes of this year's problems.

Many fields were wet several inches below the surface at the level spring tillage equipment would have run this spring. Even though topsoils were in good condition at planting, these conditions resulted in a compacted layer which restricted nodal root development in June and early July. Early season moisture availability was plentiful so shallow-rooted plants grew normally up to V8 to V12. Abnormally hotter and drier conditions dominated our weather patterns in July, with some fields beginning to show significant drought stress prior to brace root formation. The dry conditions resulted in decreased overall size of root masses prior to the storms.

Brace roots, those roots emerging from plant nodes above the soil surface, lacked adequate development until well after the mid to late July storms. Brace roots may not develop in the absence of soil moisture or extreme temperatures. Brace roots are responsible for aiding in the overall standability of the plant. Without these, and with much of the rest of the root mass absent, the plants were unable to stand during the storms.

This phenomenon has been observed throughout the Corn Belt and documented by university researchers. In previous seasons, Peter Thomison, an Ohio State Extension Agronomist noted:

"Many investigators have attributed rootless corn problems to weather related conditions.... These include hot, dry surface soils, shallow plantings, compact soils, loose or cloddy soil conditions."

".....Before the problem is evident, corn plants may appear vigorous and healthy, but after a sudden storm with strong winds, plants will be scattered or fall over because there is limited support."¹



Figure 1. Poorly developed root system (left); normal root (right).

Hybrid differences in root lodging can be attributed to several factors. The first obvious difference may merely be a difference in overall ability to regenerate roots following damage. Another difference may be attributed to timing of brace root development. Brace root development in corn typically does not begin until the V18 stage of development or immediately prior to tasseling.

¹ Thomison, Peter. "Trouble-Shooting "Rootless Corn" Problems," The Ohio State University Extension Agronomy Facts. AGF-117-95 (1995).

Flooding – Lodging may be evident immediately when flood waters recede, or later as weakened roots or stalks eventually succumb to fall wind and weather events. Diseases may be transmitted to roots and stalks during even moderate flooding. Additionally, lodging puts the ear near ground level where it may be submerged and subject to deterioration of grain quality. Where flooding results in lodging, fields should be monitored closely and harvested as soon as practical.

Western Corn Root Worm (WCRW)

WCRW has been implicated in recent years as playing a significant role in damaging nodal roots of corn and predisposing corn to root lodging. In many areas WCRW is a significant factor in the root lodging that is being observed.

High adult rootworm infestation levels are evident in many fields with root lodging damage. This is a likely indication that WCRW may be an increasing problem. Additionally, the variant WCRW is in selected areas throughout Michigan and Ohio. The variant WCRW is known to establish in a non-host crop such as soybeans.

Controlling WCRW – Use of a Bt-protected hybrid containing Herculex® XTRA *Insect Protection* will greatly reduce the effects of rootworm feeding. Insecticides can also provide some protection from rootworm feeding.

Knowledge of the variant WCRW lifecycle and control options for the future is important in confronting the root lodging concerns in our area. Scout corn fields or soybean fields, going to corn the following season, during and shortly after pollination.

For more information on this important topic for next year's growing season consult these sources of information:

Web Resources for Western Corn Rootworm Management Information:

1. Integrated Pest Management Newsletter-Iowa State University. <http://www.ipm.iastate.edu/ipm/icm/1999/9-13-1999/crwlodgedcorn.html>
2. Corn Rootworm Homepage-Iowa State University <http://www.ent.iastate.edu/pest/rootworm/>

Harvest and Yield Issues

Many of the worst root-lodged fields will be very difficult to harvest. Slower combine speeds as well as combining in one direction may need to be considered.



Combine attachments, such as corn reels, may aid in harvesting downed corn. Corn reels can help feed the stalks into the combine head and reduce the possibility of the stalks “bunching” on the corn head. There are several manufacturers of corn reels.

Contact your Pioneer sales rep for more information or contact Kelderman at their website:

<http://www.keldermanairride.com/category.php?id=2>

Plastic corn head snouts may also offer some assistance in harvesting by allowing stalks to more easily slide over the head and into the gathering chains.

Many fields are exhibiting severely damaged roots, which may make them more predisposed to stalk rots, including anthracnose. The first signs of stalk rot invasion will be in the lower portion of the stalks, which will begin to feel soft. They can be easily crushed between the thumb and forefinger. Black lesions may also develop on the outside epidermis of the stalk near the base. The usual causes are *anthracnose*, *fusarium* and *gibberella*.

Monitor root-lodged fields closely and consider timely harvesting at higher moistures if stalk rot development is an issue.

Assessing Yield Impacts – The impact of root lodging on yield can vary widely, depending on timing, moisture availability and root regeneration after lodging. In the most severely lodged fields ear size has been reduced. Some fields have barren or “scatter-grained” ears. Pollination appears to have been affected or delayed in many fields, which may impact yield. The timing of a killing frost this fall will be important in determining the impact of root lodging on yield.

Additional Information

Pioneer Crop Insights vol. 17, #10. Wind Lodging Effects on Corn Growth and Grain Yield:

<https://www.pioneer.com/home/site/us/agronomy/library/template.CONTENT/guid.07ED66A7-A900-46C4-8B82-D3726E1687CC>

Pioneer Field Facts. Fall Flooding to Corn:

<https://www.pioneer.com/home/site/us/agronomy/library/template.CONTENT/guid.EBE86708-39C0-BE3B-940A-2CA2E4E4F2A5>

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