Corn Stalk Rots and Managing Lodging Issues

Physiological Stalk Lodging

Physiological stalk lodging is usually the result of an interaction between weather, fertility, compaction, leaf disease, plant population, planting date, and kernel fill.

Ultimately, anything that reduces photosynthesis and the production of carbohydrates (sugars) may negatively impact stalk integrity. The result can be stalk cannibalization as grain fill takes priority over other plant functions. Physiological lodging can be just as severe as pathological stalk lodging; however, since pathogens may not be the cause, the interior plant pith may appear white in color (Figure 1). Alternatively, fungi may colonize these predisposed tissues giving the appearance of stalk rot even though the primary cause is physiological.

Root system growth can be limited by wet and cool weather at planting, compaction, insect feeding, or injury from fertilizers or herbicides. Without a viable root system, a dry environment during grain fill can cause the plant to cannibalize nutrients and water from the stalk to nourish developing kernels.

Any factor, such as a nutrient deficiency or a leaf disease, that restricts or destroys the green leaf tissue required for photosynthesis, can lead to lodging issues. Photosynthesis is required for the production of carbohydrates and sugars which, in turn, produce proteins and other substances to support plant growth. Nitrogen deficiencies begin appearing as inverted “V”-shaped discolored areas on lower leaves. Potassium is a key nutrient for stalk health; deficiency initially appears as a “V”-shaped discolored area on outer leaf margins. When deficiencies are severe, the necrosis can reduce photosynthesis and result in stalk cannibalization.

Leaf diseases, such as gray leaf spot and northern corn leaf blight, can destroy green leaf tissue. When stalks deteriorate due to either cannibalization or stalk rots, they become increasingly subject to lodging. Corn product resistance to individual diseases and inherent stalk strength varies. Lignin, a compound that acts as a cement to bind cellulose fibers and cells together can vary among products, and plants with more lignin can have greater stalk strength and standability ratings.

High plant populations can affect standability if the growing season and other interactions are not supportive of the population.

Figure 1. Characteristic symptomology for physiological stalk lodging, including pinched stalk and white pith.

Planting date can also be a factor. Kernel row number is determined early in a corn plant’s life. Favorable weather during that time can increase the number of potential kernels while poor weather can decrease kernel number. Drought conditions or prolonged periods of cloudy weather during grain fill can force the plant into stalk cannibalization to support grain fill.

Plants suffering from physiological stalk weakness become increasingly susceptible to secondary problems, such as stalk rots. Rain and wind can cause the plants to lodge prematurely, possibly before black layer formation.

Pathological Stalk Lodging

Pathological stalk lodging can be caused by the presence of one or more stalk rot diseases. Stalk rots are favored by good early-season growing conditions followed by stress after pollination. Stresses can include drought, nutrient deficiencies, foliar diseases, hail damage, high heat, and prolonged cool, cloudy weather. Common stalk rot diseases associated with lodging include; anthracnose, diplodia, fusarium, gibberella, and charcoal stalk rots.

Anthracnose stalk rot symptoms are usually most apparent just prior to plant maturity. The disease is identifiable by the shiny black discoloration of the outer stalk rind that develops in blotches or streaks, especially lower internodes (Figure 2). Internal pith may become black and soft and extend to several internodes. Conditions favoring anthracnose stalk rot include infected surface residue, insect injury, and environmental stress. Excellent resistance to anthracnose stalk rot is available in specific corn products.

Diplodia stalk rot symptoms are generally not noticed until several weeks after silking. Plants may begin to

die prematurely when they take on a grayish green cast similar to frost injury.

Lower stalk internodes become brown to straw colored, spongy, dry, and easily crushable (Figure 2). Pith tissues disintegrate, leaving vascular strands intact. Tiny, dark fungal structures (pycnidia) form just under the stalk surface and cannot be scraped off the rind surface. White fungal mycelium may appear on the stalk surface. Diplodia is favored by dry conditions early in the season followed by conditions that are warm (80 to 87°F) and wet after silking. Plants can be predisposed to the disease by leaf diseases, hail damage, insect feeding, high nitrogen use, low potassium, and high populations.

The causal fungus overwinters on plant residue; therefore, reduced tillage and continuous corn fields can have an increase in inoculum levels available to cause infection. Infection can occur through seedling root, mesocotyl, or crown tissues.

Fusarium stalk rot is difficult to diagnose, but usually is identifiable by a whitish-pink to salmon discoloration in the stalk pith (Figure 2). The pith disintegrates much like other stalk rots; however, it may be more notable at the nodes. Symptoms are usually more severe when stress occurs during the growing season. Entrance usually is through the roots, mesocotyl, or crown tissues although hail or insect damage also are avenues of infection. Fusarium usually begins as a crown rot that progresses into the stalks.

Gibberella stalk rot is distinguished by the pink to reddish coloration of disintegrated pith tissue and root crowns that are often discolored and severely rotted (Figure 2). In contrast to fusarium stalk rot, gibberella stalk rot has small, round, black specks called perithecia near the nodes that can be easily scraped off. The fungus survives on infected plant residue and is the same fungus that is responsible for head scab of wheat and barley. It is considered a debris-borne disease that can occur in most fields if conditions are favorable. Infection generally occurs through the roots, mesocotyl, and crown tissues. The disease appears to be more severe when crop stress occurs after tasseling.

Charcoal stalk rot can appear when drought and high soil temperatures occur. The interior stalk pith becomes discolored with black micro-sclerotia, which have the appearance of charcoal being rubbed on the pith. The pith disintegrates leaving behind the vascular bundles. The fungus infects through the roots, mesocotyl, and crown early in the season; however, symptoms usually do not appear until near maturity.

Figure 2. (left to right) Anthracnose stalk rot, diplodia stalk rot, fusarium stalk rot, and gibberella stalk rot.

Scouting for Lodging Potential

Scouting fields for potential lodging should begin in late summer. Each corn product within a field and fields with different management practices should be scouted separately. To determine stalk strength, a zigzag pattern should be taken through products or fields to evaluate 100 plants by pinching lower nodes or pushing stalks to a 45° angle. If more than 10 to 15% of the stalks can be crushed or broken, substantial lodging is possible.[1] An early harvest should be considered after black layer formation, regardless of kernel moisture content, if there is a potential for significant lodging.

Harvesting

Drying cost is a concern when harvesting wet grain, but the expense could result in an increase in harvested bushels and dollars.

Tips to help maintain yield potential in a lodged crop include: referring to the combine manufacturer's manual for harvesting guidelines, use of header reels, harvesting against the lodged corn angle to help maximize lift into the header, and harvesting when dew is present to help minimize fluff. Always refer to the manufacturer's manual before performing any maintenance.

Sources (verified 8/28/20)

[1] Munkvold, G. 2002. Time to start scouting for corn stalk rot. Integrated Crop Management. IC-488(20). Iowa State University Extension. https://lib.dr.iastate.edu/.

[2] Corn stalk rots. 1995. University of Illinois Extension. RPD No. 200. http://ipm.illinois.edu/.

[3] Vincelli, P. and Hershman, D.E. 1985. Corn stalk rots. PPA-26. University of Kentucky. http://uknowledge.uky.edu/.

[4] McNeill S. and Montross, M. Corn harvesting, handling, drying, and storage. http://www2.ca.uky.edu/.

[5] Munkvold, G.P. and White, D.G. 2015. Compendium of corn diseases, Fourth edition. APS Press.

Legal Statements