Stress During Grain Fill: A Harbinger of Stalk Health Problems

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Harbinger. [hahr-bin-jer]
Anything that foreshadows a future event; omen; sign: Frost is a harbinger of winter.

During the grain filling period of corn, developing kernels become a significant photosynthetic “sink” for the products of photosynthesis and respiration. Corn plants prioritize the movement of these photosynthates to the kernels, even at the expense of not maintaining the cellular health of the stalk, leaves, and roots.

The primary effect of severe stress on a corn plant is a reduction in photosynthetic rates. When photosynthetic capacity decreases significantly during grain fill, plants often respond by remobilizing stored carbohydrates from stalk and leaf tissues to supply the intense physiological demand by the developing grain on the ears. In addition to physically weakening the stalk of plants, remobilization of stored carbohydrates and/or the consequent lower cellular maintenance of root and stalk tissues increases the susceptibility of the plant to root and stalk rots.

NOTE: Even if significant stalk rot does not develop in such stressed plants, loss of structural stalk integrity itself greatly increases the risk of stalk breakage.

Fields at higher risk for weakened stalks and stalk rot development will be those where plants have managed to set fairly decent ears, but have experienced severe stress during grain fill. Common photosynthetic stresses that occur during grain filling in Indiana include drought stress, nitrogen deficiency, defoliation by hail, and foliar leaf diseases. The effects of dry weather during August on corn stalk health are accentuated where compacted soils restricted root growth earlier in the season or on sandy soils with minimal water-holding capacity.

Growers should monitor stressed fields in late August and early September for compromised stalk strength or the development of severe stalk rots and adjust their harvest schedules accordingly to harvest these fields early in the season to avoid the consequences of severe stalk lodging. In years where crop development is delayed, like in 2009, stalk quality problems often are not apparent until mid- to late September.

Stalk breakage itself is obviously easy to spot when scouting a field. However, compromised stalks may stand unnoticed until that October storm front passes through and brings them to their proverbial knees. The simplest techniques for identifying suspect stalk quality involve either pushing on stalks to see whether they will collapse or bending down and pinching the lower stalk internodes to see whether they collapse easily between your fingers. Sometimes the mere act of pushing stalks out of your way as you walk from one row of corn to another is enough force to collapse weakened stalks.

TIP: Bending down repeatedly to pinch lower stalk internodes qualifies as an aerobic exercise.

Fields and/or hybrids at high risk of stalk breakage should be harvested as early as possible to minimize the risk of significant mechanical harvest losses. Recognize that hybrids can vary greatly for late-season stalk quality even if grown in the same field due to inherent differences for late-season plant health or resistance against carbohydrate remobilization when stressed during grain fill.

Another side-effect of late-season stress during grain fill is the greater risk of premature kernel black layer formation. In 2009, foliar diseases like gray leaf spot (Cercospora zeae-maydis) and northern corn leaf blight (Exserohilum turcicum) developed late in the season (some say, exploded) and destroyed much if not all of the green leaf tissue before the grain had matured. Such destruction of green leaf tissue, in addition to encouraging the remobilization of stored carbohydrates from the lower stalks, also predisposes the grain to premature kernel black layer formation. The consequences of premature kernel black layer include not only lower grain yield, but also the likelihood of lower test weight grain.
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