

Stalk Lodging in Corn – Causes and Management

Stalk Lodging in Corn

- Stalk lodging is generally defined as breakage of the corn stalk below the ear following physiological maturity, which makes harvest more difficult and can reduce harvestable yield.
- There are a number of factors that can contribute to stalk lodging in corn, but it is most commonly associated with a combination of weakened stalks due to some sort of stress during grain fill and stalk rot pathogens that subsequently invade the weakened stalks.
- Severe weather during drydown can be a primary or contributing cause of stalk lodging. In many cases, stalks that are already weak will break under high winds and rain.
- Insect feeding, particularly that of second-generation European corn borer, can be a cause of stalk lodging but is far less common now due to the wide adoption of Bt corn.



Carbohydrate Demand During Grainfill

- Stalk lodging problems often originate from stress during grain fill that increases the amount of carbohydrates remobilized from the stalks and roots.
- Upon successful pollination, ear development places a great demand on the plant for carbohydrates. When the demands of the developing kernels exceed the supply produced by the leaves, stalk and root storage reserves are utilized.
- Environmental stresses which decrease the amount of photosynthate or energy produced by the plant can force plants to extract even greater percentages of stalk carbohydrates, which preserves grain fill rates at the expense of stalk quality.
- High temperatures accelerate plant development, shortening the time to maturity and reducing the total amount of photosynthate production.
- Factors which reduce functional leaf area, such as disease lesions, insect feeding, or hail damage also reduce photosynthate production.
- As carbohydrates stored in the roots and stalk are mobilized to the ear, these structures begin to decline and soon lose their resistance to soil-borne pathogens.

- High temperatures during grain fill increase the rate at which fungi invade and colonize the plant.
- Though pathogens play a key role in stalk rot development, it is primarily the inability of the plant to provide sufficient photosynthate to the developing ear that initiates the process.



Stress Factors That Can Lead to Weak Stalks

Drought Stress

- Decrease in photosynthetic rates due to drought stress has been well documented. Water relations within the plant and CO₂ and oxygen exchange are directly affected.
- In addition, if leaf rolling occurs during drought, the effective leaf surface for collection of sunlight is reduced.

Low Solar Radiation

- Photosynthesis is most efficient in full sunlight. The rate of photosynthesis increases directly with intensity of sunlight.
- Photosynthesis can be reduced more than 50% on an overcast day compared to a day with bright sunshine.
- Prolonged cloudy conditions during ear fill often result in severely depleted stalk reserves.

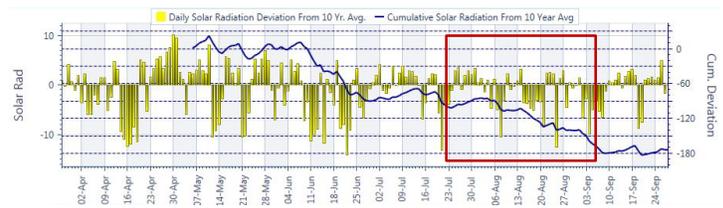


Figure 1. A Pioneer hybrid plot in 2018 in which poor stalk quality was associated with below average solar radiation throughout the grain fill period. (September 28, 2018; Stephenson County, IL)

Reduction in Leaf Area

- Any reduction in leaf area will limit total photosynthesis.
- Leaf area may be reduced due to hail, frost, disease lesions, insect feeding or mechanical injury.
- Whenever functional leaf area is reduced prior to completion of ear fill, stalks will be weakened.

Nutrient Deficiency

- Research studies have documented that soil fertility has a profound effect on stalk quality.
- Studies show that a combination of high nitrogen and low potassium can severely reduce stalk quality.
 - High nitrogen is associated with greater kernel number, which increases the demand for carbohydrates to supply the developing ear.
 - Potassium functions in the building of leaf and stalk tissue. Sufficient plant-available potassium is important in preventing premature plant death.

Favorable Conditions Followed by Stress

- Depletion of stalk tissue can be most severe when favorable growing conditions precede stress during grain fill.
- If favorable growing conditions exist when the number of kernels per ear is being established (V10-V17), the eventual demand for photosynthate will be large.
- Each potential kernel represents an additional requirement for translocatable sugars from the plant. If stress conditions develop during ear fill which render the plant unable to produce enough sugars, stalks will suffer.



Figure 2. Pioneer hybrid advancement trial showing differences in stalk lodging among hybrids. Photo: Bob Liska, Pioneer Product Agronomist.

Genetic Differences

- Hybrid genetics are an important influence on stalk lodging potential. Some hybrids naturally partition more carbohydrates to the stalk.
- In the hybrid advancement process, researchers are careful to select hybrids with the highest harvestable yield potential across many years and environments.
- Hybrids also differ in their level of genetic resistance to stalk rot pathogens. Pioneer brand corn products are rated for their resistance to the most common stalk rot pathogen, anthracnose.

Pre-Harvest Scouting

- Weak stalks can be detected by pinching the stalk at the first or second elongated internode above the ground. If the stalk collapses, advanced stages of stalk rot are indicated.
- Another technique is to push the plant sideways about 8 to 12 inches at ear level. If the stalk crimps near the base or fails to return to the vertical position, stalk rot is indicated.



Figure 3. Combine with aftermarket header reel for harvesting lodged corn. Photo: Brewer Blessitt, Pioneer Technical Service Manager.

Harvesting Lodged Corn

Lodged or Standing Fields First?

- In most situations, it is better to harvest lodged fields or field areas before the well-standing fields. This strategy must be evaluated on a case-by case-basis, however.
- If better-standing corn is ready for harvest, it may be more efficient and cost effective in some cases to harvest it first, before lodging increases there.
- In some cases, lodged corn may have a more limited window of time during the day when it can be harvested effectively, when stalks and leaves are dry enough to feed through the head but not so dry that they shatter and pile up on the head. In these cases, alternating between harvesting lodged corn and standing corn nearby may be favorable.

Speed and Direction

- In order to pick up and save more ears from lodged plants, slower than normal ground speeds are required.
- Under severe stalk lodging conditions, harvesting against the direction of the lodging is usually an advantage.

Strategies for Flat Fields

- If the crop or ears are 8 to 10 inches or more above ground level, then it will likely dry to some extent and the corn can be harvested with a low-profile corn head.
- If the crop or ears are 6 inches or less above ground level, then the corn will not likely dry and a reel mounted on a corn head or a soybean platform may be needed to harvest the crop.
- Some fields may lodge worse as time progresses, especially if a stalk rotting disease such as anthracnose is present. Watch these fields closely.

Add-On Snouts and Reels

- Various aftermarket header attachments are available that can help with harvest of severely lodged corn.
- Plastic snouts and reels to help pick up lodged corn and move it off the corn head and into the combine.