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Corn Root Lodging

CROP BULLETIN

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KEY POINTS

- Root lodging often occurs in late June and early July when severe thunderstorms are common, and brace roots on corn plants are not yet fully developed.
- Wind-induced root lodging is not always related to root injury but is more likely to occur when root systems are damaged or restricted.
- Corn plants have more ability to recover from lodging when it occurs during vegetative growth stages.
- Yield impact is greatest when lodging occurs during pollination.

SUMMER STORMS CAN CAUSE ROOT LODGING

- Root lodging in corn can occur when soils are saturated by heavy rain and the rain is accompanied by high winds.
- Root lodging risk in the Corn Belt is typically greatest in late June and early July when severe thunderstorms are common, and corn is most vulnerable.
- Corn in the mid-vegetative stages of development has sufficient top growth to be impacted by severe winds but brace roots are not yet fully developed.
- Injury to the root system caused by corn rootworm feeding can increase susceptibility to lodging.

Figure 1. A combination of wet soils and strong winds can lead to lodging even if roots systems are healthy; however, plants with damaged or restricted roots are more susceptible to lodging.

FACTORS THAT CAN INCREASE ROOT LODGING RISK

- Compacted soil around the root zone due to wet conditions at planting, resulting in restricted root development.
- Wet soil early in the season, which reduces the need for root expansion.
- Dry soils later in the season that slow down brace root development.
- Water-saturated soils at the time of a wind event.
- Corn rootworm damage.

IMPACT ON GROWTH AND DEVELOPMENT

- The impacts of root lodging depend on timing, moisture availability, and root regeneration after lodging.
- The earlier that root lodging occurs, the less of an impact it is likely to have on yield.
- Yield loss will likely be greater if root systems have been damaged by rootworm feeding.
- Lodging in mid-to-late vegetative stages can delay silk emergence by 1-2 days.
- Root lodging during pollen shed can cause silks to be covered by the leaves of lodged plants, reducing pollination success.
- The later that root lodging occurs in the growing season, the less able corn is to straighten back up afterward without pronounced goose-necking.
- As corn nears its full height, stalk elongation is nearly complete, making recovery after lodging unlikely.

Figure 2. Heavy corn rootworm feeding on unprotected root. Corn rootworm damage reduces a plant's structural support and makes it more susceptible to lodging.

EFFECT OF ROOT LODGING ON CORN YIELD

- A 3-yr field study by Ohio State University researchers evaluated effects of root lodging on corn development and grain yield (Lindsey et al., 2021).
- Simulated wind lodging treatments were applied by pushing plants over by hand immediately after irrigation or heavy precipitation events.
- Recovery from lodging was highly dependent on crop growth stage, with plants that lodged during vegetative growth (V10 and V13) able to recover much more than plants that lodged after tasseling (VT-R1 and R3).
- Yield loss resulting from lodging was greatest at VT-R1, stemming from reduced kernel number, poor pollination, and increased barren plants (Figure 1).
- Yield loss from lodging at R3 was mostly attributable to reduced kernel weight, and partially to reduced kernel number.
- Ears close to the ground at VT-R1 and R3 increased incidence of vivipary which could also impact grain marketability.

Figure 3. Yield loss associated with root lodging at different corn devel-opment stages in a 3-yr Ohio State University study (Lindsey et al., 2021).

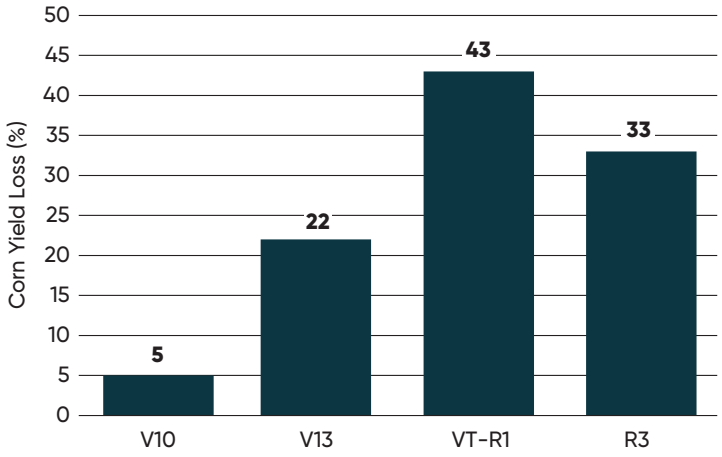

Figure 4. Brace roots are important for stabilizing the plant under high winds and recovery after lodging has occurred. Lodging risk is increased when high winds occur before brace roots have fully developed or brace root development has been inhibited by dry soil conditions.

MANAGING LODGED CORN

- Although yield loss due to lodging cannot be recovered, management practices can be used to mitigate additional threats to remaining yield and reduce the risk of lodging in future crops.
- Extension pathologists do not generally recommend rescue applications of fungicide on root lodged corn beyond what a grower would normally do.
  - » Effectiveness of a fungicide application decreases with the severity of lodging because of reduced spray coverage, and the likelihood of an economic return may be lower for corn that already has reduced yield potential.
  - » Diseases favored by injury to plants form wind or hail are primarily bacterial and not controlled by fungicides.
- Goose-necked corn can be challenging to harvest. The use of after-market corn head reels can help guide stalks through the header and minimize harvest loss.
- If lodging was due to rootworm feeding, practices to reduce rootworm population levels should be implemented.

REFERENCES

Lindsey, A.J., P.R. Thomison, and P.R. Carter. 2021. Has Corn Response to Root Lodging Changed Over Time? Pioneer Agronomy Research Update. Vol. 11. No. 7. Pioneer. Johnston, IA.