

Ear Declination Prior to Corn Maturity

Key Points:

- Ear declination in corn prior to maturity is most commonly associated with late-season drought stress, which causes a loss of cell turgidity and collapse of the ear shank.
- The point of failure in the shank is often severely pinched, which can restrict the flow of sugars into the ear necessary to complete kernel fill.
- If the flow of sugars into the ear drops low enough, it can trigger premature black layer formation and an early end to grain fill.

Drooping Ears Prior to Corn Maturity

- It is common for ears on corn plants to droop downward after physiological maturity and prior to harvest (Figure 1).
- As long as the ear does not drop off the plant, this is not a problem – a downward tilted ear is better able to shed water, which can reduce the risk of ear rots and vivipary (kernels sprouting on the ear) if conditions turn warm and wet prior to harvest.
- However, ear declination prior to black layer is not a good sign. It likely means that the plant has experienced severe late-season stress and grain fill is shutting down.
- The earlier that this occurs in the kernel-filling process, the greater the yield impact is likely to be.



Figure 1. It is common for mature ears to tip downward prior to harvest.



Figure 2. Drooping ears on plants that experienced severe late-season heat and drought stress. Ears on these plants were at around 50% milk line, meaning that around 12-15% of yield would be lost if grain fill ended at this point. Corteva Agriscience Johnston Field Research Center, Johnston, IA. August 30, 2023.

What Causes Premature Ear Declination?

- Ear declination prior to maturity is most commonly associated with late-season drought stress (Figure 2).
- The loss of cell turgidity due to water deficiency in the plant can lead to structural failure in the ear shank.
- Cannibalization of carbohydrates from vegetative tissues can also play a role, as the plant reallocates resources from the stalk and ear shank as it struggles to fill the ear.
- As the shank weakens, it eventually collapses under the force of gravity on the ear.
- The point of failure in the shank is often severely pinched, restricting the flow of carbohydrates into the developing ear (Figure 3).
- Plants with heavier ears are at greater risk of premature ear declination. This can result from favorable conditions during early grain fill – causing the plant to set a large ear – followed by severe late-season stress.

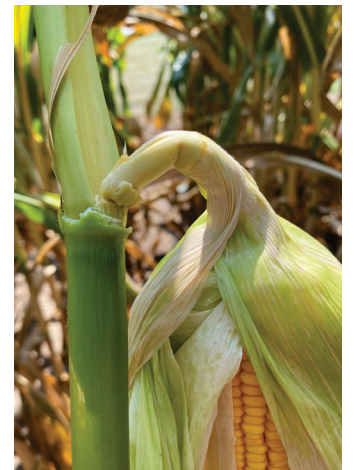


Figure 3. Pinched ear shank



Figure 4. Close-up of a pinched ear shank on a plant that experienced severe late-season drought resulting in ear declination prior to physiological maturity. The pinched shank restricts the flow of sugars into the developing ear. Johnston, IA. August 30, 2023.

Restricted Flow of Sugars to the Ear

- Once the ear droops, the pinched ear shank can restrict the flow of sugars into the ear. If the flow drops low enough, it triggers premature black layer formation and an early end to grain fill (Figure 4).
- Black layer formation is related to the ability of plants to maintain a continuous sucrose supply to developing kernels. Any disruption of this supply that causes the flow of sucrose to drop below a minimum threshold can trigger early black layer formation.
- The yield impact of early grain fill termination depends on the kernel fill stage when it occurs (Figure 5).

Stage R5 Beginning Dent

Grain Moisture: **50-55%**
400 GDUs remaining to maturity
 Yield loss at this stage: **35-40%**

Stage R5.25 ¼ milk line

Grain Moisture: **45-50%**
300 GDUs remaining to maturity
 Yield loss at this stage: **25-30%**

Stage R5.5 ½ milk line

Grain Moisture: **40-45%**
200 GDUs remaining to maturity
 Yield loss at this stage: **12-15%**

Stage R5.75 ¾ milk line

Grain Moisture: **35-40%**
100 GDUs remaining to maturity
 Yield loss at this stage: **5-6%**

Stage R6 Physiological maturity

Grain Moisture: **30-35%**
0 GDUs remaining to maturity
 Yield loss at this stage: **0%**



Figure 5. Estimated yield loss associated with termination of grain fill prior to physiological maturity.

Nielsen, R. 2020. Do Your Ears Hang Low? (Premature Ear Declination in Corn) Corny News Network. Purdue Univ. Extension. <http://www.kingcorn.org/news/timeless/Droopy.html>.
 Taylor, M., A Nygren, and J. Rees. 2023. Drooping Corn Ears Across Nebraska. CropWatch. Univ. of Nebraska-Lincoln. <https://cropwatch.unl.edu/2020/drooping-corn-ears-across-nebraska>

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Risk of Ear Drop

- A weakened ear shank can increase the risk of ear drop prior to harvest.
- Fields with ear declination prior to maturity should be monitored ahead of harvest so they can be prioritized if ear drop starts to occur.



Figure 6. Severe late-season stress can weaken stalks and ear shanks as the plants remobilize carbohydrates to fill the ear.