The first step in initiating seed germination is imbibition of water. As the seed takes on water (up to 30 percent of its own weight for corn and 50 percent for soybeans!), enzymes within the seed start converting starch from storage forms into forms that will help feed the newly awakened embryo. Cell membranes in the seed have to rehydrate to re-initiate growth; that process can go awry in cold temperatures.

**Post-Planting Plant Processes:**

1. **Imbibition: Seed takes up water over a 48 hour period**  
   - Taking in cold water (<50°F) damages cell membranes and deforms seedlings.

2. **Elongation: The hypocotyl and radicle emerge and elongate**  
   - Cold temperatures slow this process, leaving seedlings vulnerable to abiotic stress and seedling diseases.

3. **Germination**  
   - Corn: The coleoptile emerges from the soil surface. Cold temperatures slow the plant down, but the growing point is protected below ground until the V5 to V6 growth stage.
   - Soybeans: The hypocotyl arch pushes up through the soil, taking the growing point with it. The growing point is exposed to frost after emergence (VE).

**Monitor Soil Temperatures: Use a Meat Thermometer**

1. Check soil temperature at planting depth (typically 1.5 to 2 inches).
2. Check the temperature early in the morning before the soil warms up. Soil temperatures regularly swing 10 to 20 degrees throughout the day.

Many state extension services or weather services offer soil temperature monitors that are accessible online.

Cool temperatures after the initial imbibition period may slow the plant down and delay emergence, but won’t be as dangerous as chilling in the first 48 hours. The emerging plant is vulnerable to fungi and disease, so using a comprehensive seed treatment like Escalate® powered by Nemasect™ can help to protect seedlings.
PLANTING INTO COLD SOILS

Decision Making:
In a wet spring, you may be tempted to plant sandier soils first because they are the first to dry out. This can be problematic if there is a cold snap after planting, because the sandy soil has less ‘insulating’ effect and the seeds will be exposed to colder temperatures than those planted in heavier soils at the same time.

As you look at the forecast, think about it this way: will the plant have a “cold drink” or a “warm drink” immediately after planting? If it is a “cold drink,” consider delaying planting.

Soil variability affects soil temperature — be confident about the soil temperature of the coldest part of the farm before planting.

Beck’s Practical Farm Research (PFR)® has shown that early planting pays over time, but in specific years there can be a risk to being too aggressive getting into the fields. If soil temperature conditions are borderline and the forecast calls for a cool spell, you’re better off waiting to plant. If the forecasts show that the weather will be warmer, you may see a benefit from early planting. Typically, there is more to lose with late planting than early planting.

Pictured:
A healthy plant and adjacent seed damaged by imbibitional chilling. The plant to the left likely germinated under slightly warmer conditions.

Photo credit: Denny Cobb