



Cold Temperatures and Corn Emergence

Corn is a warm-season crop, and likes temperatures in the range of 85-90°F for optimal germination and emergence. Planting corn in Iowa during April when soils are cool and frequently wet means that corn is almost always under some degree of cold stress during the germination and emergence process. The first 24 to 48 hours after planting is a critical time for the corn plant, as it takes in 30 to 40% of its weight in water through imbibition. Prolonged exposure to soil temperatures below 50°F after planting affects the germination process, and promotes seed deterioration and seedling disease. Cold stress affects germinating corn in two major ways:

Imbibitional Chilling Injury

This occurs when the first water taken in by the germinating seeds is cold. Cell membranes in the germinating seeds can be brittle during cold temperatures, and the cool water can cause these to rupture as the water is taken into the seed. Ruptured membranes cause the cell contents to leak out, and leaves the seed susceptible to early-season pathogens. These can be identified in the field as swollen seeds with radicles and coleoptiles that have not emerged from the seed and have been aborted.



Imbibitional chilling may also be identified as deformed mesocotyls, leafing out of the corn plant underground, or corkscrewing mesocotyls. A few examples are shown from Dr. Nielsen (Purdue University). Imbibitional chilling can occur any time the soil temps are falling below 50 degrees within the first 48 hours of planting, and the risk is very high when the soil temps fall below 40 degrees within the first 48 hours of planting.

Delayed and Uneven Emergence

Extended cold periods after planting further delays emergence, and leaves the seeds susceptible to attack by insects and disease. Surviving seedlings are also more likely to produce runts. At an average soil temperature of 50°F it takes corn plants around 20 days to reach 50% emergence. That's a long time for seeds to survive prior to emergence! The figure to the right shows that delaying corn emergence by 1 ½ weeks (M) reduces yield by 5%. Delaying emergence by 3 weeks (L) reduces yield by 12%! (NC Regional Extension Pub 344).

Emergence pattern, % of maximum yield		P
Even emergence		
EEEE		100
MMMM		95
LLLL		88

Key Takeaways

- The most critical time period for imbibitional chilling to negatively impact a corn seedling is within the first 24 to 48 hours after planting.
- Soil temps dropping below 50 degrees within 48 hours of planting increases risk of Imbibitional I chilling, and soil temps below 40 degrees dramatically increases the risks of Imbibitional chilling.



- Early planted corn that experiences delayed germination and slow growth rates may be more subject to damage from below-ground feeders like wireworms and white grubs.
- Use emergence and vigor scores to help decide which hybrids to plant first.
- Waiting until average soil temperatures in the seed zone are above 50°F and having a favorable two-day forecast helps alleviate potential risk of germination issues.

Tyler Steinkamp

Crop Protection Agronomist

(712) 363-2131

tmsteinkamp@landolakes.com