



KEEPING INFORMED

PRIDE SEEDS APRIL 2021



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IMBIBITIONAL CHILLING

SPRING has sprung and the Calendar has hit April. Although, most producers across the prairies have started seeding some cereals and other crops it is important we keep our corn in the bag! We can not let the calendar, or the neighbour, dictate when we should hit the field. Our best indicator to start planting corn in soil temperature and soil conditions. If we start planting into fields early when soils are cool and wet, we can expose that corn crop to stress. The single most important thing we can do right now is keep the seed in the bag and wait for warm soils.

‘Cold Stress’ - What is Imbibitional Chilling

“Imbibition” refers to the initial uptake of water by seed during the first 24 to 48 hours after being planted into moist soil. The resulting rehydration causes the seed to swell and the germination process to begin. Imbibition occurs naturally, with no physiological processes involved (e.g., dry wood will imbibe water). This process occurs whether soils are cold or warm and for this reason there is the potential for “imbibitional chilling” injury on early planted corn.

The seed swells as it rehydrates, and this process damages the internal cell membrane structure. When seeds (and soil) are warm, the membrane damage is quickly repaired by the physiological activity associated with germination and “life goes on” normally. When seeds (and soil) are cold, their cell membranes are less elastic, resulting in the cell membrane damage due to swelling, this is more severe, and the physiological repair of the damage is slowed or stopped. Left unrepaired, this damage to cell membranes and the subsequent leakage of cell contents can result in death of the seed. By understanding this process, we need to be certain that the seedlings first exposure to the soil and moisture needs to be warm (approx. 10°C). We know that the first 24-48hrs are crucial for germination and emergence.

Factors influencing the Risk of Imbibitional Chilling Injury

- **Intensity and Duration of Cold Soils.** Obviously, 5°C soil temperatures represent a higher risk than 10°C temperatures. A single day of cold soils is likely less risky than multiple, consecutive, days of cold soils.
- **Soil Moisture.** Daily soil temperature fluctuation is more dramatic in dry soils than in moist soils. That means higher daily maximums and lower daily minimums.
- **Plant Residue Cover.** Daily soil temperatures fluctuate less in no-till fields that have a lot of surface residue from previous crops or current cover crops. In particular, soil temperatures in such fields will not drop as rapidly or dramatically in response to a cold snap as will bare fields. That’s the good news. The bad news is that soil temperatures in fields with heavy surface residues are generally lower to begin with than bare soils early in the season and so early planting of corn in no-till fields is somewhat riskier in general.

The Impact it Has on a Corn Crop



What happens: Corkscrewed mesocotyl/coleoptile development can occur when the coleoptile encounters resistance/cool temperatures as the mesocotyl elongates.

Its impact: Delays uniform emergence. Plants that are not uniform or are delayed can act as weeds to the surrounding plants. This ultimately takes away nutrients and water from the healthy emerged plants and gives it to the struggling seedling as a way to compensate.



What happens: Poor root system development as a result of an unhealthy mesocotyl. The corn seedling germinates, and root development is not 'normal'.

Its impact: Poor root development can lead to root lodging and standability issues throughout the season.



What happens: Internal cell wall become damaged as a result of taking in cool water or being placed in cool soils.

Its impact: The cell wall leaks cells contents into the soil and the seedling subsequently dies before it even has the chance to emerge.

Key Takeaway: You may not think having corn seed planted in cold soils will impact its growth until it rains, this is false. If there is any moisture present in the soil that the seedling can imbibe then it is at risk. If soil temps are below 8°C then corn should be left in the bag.

Further Reading



<https://www.agry.purdue.edu/ext/corn/news/timeless/ImbibitionalChilling.html>

<https://www.agry.purdue.edu/ext/corn/news/timeless/GermEmergReq.html>



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