MINN-DAK FARMERS COOPERATIVE

BEET TOPics

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Frost On Sugarbeet Seedlings...

As we turn our focus to this coming weekend, the Ag Staff has been getting a lot of questions regarding the forecasted cold temperatures and potential frost specific to its impact on the newly emerged sugarbeets. The intent of this short bulletin is to give you some tips and tricks for evaluating frost damage in your field (should the need arise) throughout the course of the next few days...

So What Temperature Will Actually Kill A Sugarbeet Seedling?

Unfortunately, there really is no specific temperature that can be used as an exact threshold. It really becomes dependent upon several important factors including soil moisture, duration of the low temperature, wind speed, trash/cover crop, and sugarbeet stage. Generally speaking, temps dipping down into the upper 20s for a short duration do not worry me too much. Keep in mind that cloud cover and light winds really help keep the cold air mass from lingering over/on the seedlings, reducing the potential for frost damage. Both are currently in this weekend's forecast.

Are Cotyledon Sugarbeets More 'Frost-Tolerant' Than Older Plants?

As a matter of fact, yes they are! The physiological make up of cotyledon beets is designed to handle modest freezing conditions. Besides having thick, waxy cuticles, cotyledon sugarbeets contain high solute concentrations of minerals, sugars, and other compounds that act like a 'natural antifreeze' reducing the freezing point of the tissue. Older plants (2-4-lf beets) do not have this elevated solute concentration, making them more susceptible to colder temps.

Can Frost Damage Be Confused With Anything Else?

It sometimes can. Frost damage, being dry and necrotic, can be confused with early-season damping off caused by a root disease. The difference is that frost damage stops on the seedling at the soil line, whereas damping-off continues below the soil line (see pic below).

You Mentioned That Soil Moisture And Trash/Cover Crop Could Be A Factor - Why?

It all comes down to heat storage. Drier soils won't have as much latent heat storage in the soil to create that microclimate (heat or water vapor moving upward out of soil) to protect the young seedlings. It is also of note that drier soils follow air temperature closer (we see the exact same situation at harvest).

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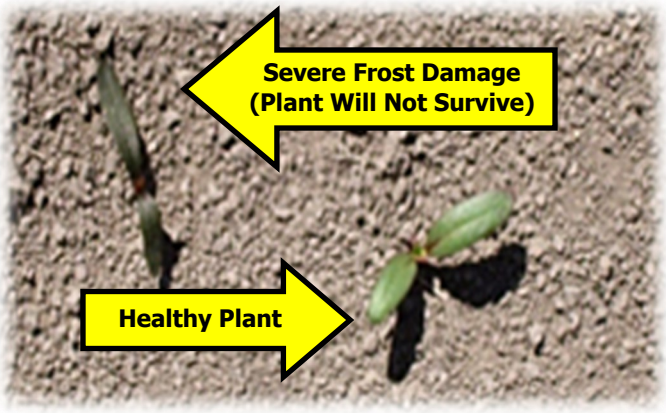
Fields that have high trash/residue or have an established spring cover crop are a double-edged sword. The residue will reflect solar radiation and therefore absorb less heat into the soil, causing the sugarbeet seedlings to freeze at a more rapid rate (especially during a hard frost) than that of black soils with low residue/trash and no cover crop. However, fields that have high trash/residue and/or an established spring cover crop have the advantage going into forecasts that predict multiple and consecutive mornings of frost events (similar to that of this weekend). The second or consecutive day of a frost event is usually more damaging to the crop as the soil's heat reserve is gone. The trash/cover crop can often act as a 'soil insulator' to help mitigate this soil heat loss, thereby lessening the severity of frost-damage to the beets.

Where And When Do I Begin Looking For Frost Damage?

Trying to scout for and assess the severity of sugarbeet damage after a frost event is absolutely maddening….it will drive you nuts! The very first thing to remember is that frost is VERY inconsistent and is usually quite patchy throughout the field. If a forecast calls for frost during the night, do not head out to the field for an assessment until after lunch. This will give the sun a chance to warm up the tissue of the potentially damaged seedlings, making the damage (if any) much more pronounced. Low-lying areas such as ditches and field depressions are good places to start looking for damage. Make sure to stay away from tree lines and grass edges when scouting as they can protect the seedlings from the cold temps. Keep in mind that if the seedlings are questionable, come back a little later and take another look. A few hours can make a huge difference in sugarbeet appearance.

What Type Of Symptoms Should I Be Looking For When Scouting For Frost Damage?

If the frost damage on a sugarbeet seedling is severe, the plant (or portions of it) will turn from John Deere Green, to dark NDSU green, and then eventually to black. In fact, the young plant can turn so dark and thread-like that it is difficult to identify in fields. The growing point of the plant is vital to its chance of survival. If you cannot see green tissue between the leaves, peel the cotyledons apart like a banana to determine just how deep the frost-damage occurred.



Cotyledons froze off, but note how the growing point is still viable. This plant will survive.

Note how the cotyledons folded over growing point during the frost event. This was just enough to protect growing point, and these were healthy plants after the frost.

Is There Anything I Can Do To Be Proactive Going Into This Weekend?

Absolutely! In order to have an effective post-frost evaluation, you'll need to establish some sort of baseline count ahead of time. This way, you'll know how many young sugarbeets you had in a specified area before the frost event occurred. One of the most common practices is to flag out an area six rows wide by ten feet long (110 sq ft) and take a stand count of all beets inside of this area on an individual row basis (pic to the right). Average the count per row for the 'pre-frost' established baseline and write it down on one of the flags for reference. If you consider your flagged area to be one large field, you'll have an approximate idea of the extent of damage (alive vs. dead seedlings) that you can extrapolate to the remainder of the field.

Another effective method of a baseline assessment is the 'toothpick' or 'straw' count. Take a box of toothpicks (or straws) with you when evaluating the pre-frost stands. Mark off ten-foot of row and place tooth picks or straws next to each emerged seedling within the designated area. Note that this can also be completed immediately after a frost event as well. Again, write down the stand count on a flag (with date) at the end of the row in question. This method is a little more time consuming, but enables you to determine if there have been any new beets emerging since you took the initial baseline counts. If you consider this method, I would suggest that you set up this scenario in 3-4 locations throughout the field.

How Do I Know How Bad The Damage Is Or If I Should Consider Replanting?

Call your Agriculturist - Plain and Simple. Your Agriculturist is the absolute best resource you have for the determination of whether or not a sugarbeet field should be replanted. Replanting is one of the hardest decisions for any grower, please reach out to the experts to help guide you through the process…

Be prepared to discuss the following:

- Potential loss of yield vs. Possible replanting advantage
- The date replanting can be completed
- Seed to germinate and grow or seed that has germinated and still should emerge
- Any disease and insect pressure that may have caused stand loss
- Anticipated weed pressure in field
- Uniformity of remaining stand across the field (skips, gaps, doubles, etc.)
- Cost and availability of desired variety
- Will costly soil-applied herbicide effectiveness be lost
- Availability of soil moisture to establish replanted field in a timely manner