Frost Tolerance of Corn and Soybeans

Over the weekend, temperatures dropped into the low 30s and upper 20s (F) across much of Wisconsin. With planting progress across most of the state ahead of the long term average, it’s likely that some of the emerged crop has suffered frost damage in select areas.

This is what you need to know when contemplating and evaluating the effects of frost injury to corn and soybeans. Temperatures at or below 28-30°F for several hours are usually needed to kill plant tissue. However, an air temperature of 28°F does not guarantee that the crop will freeze. Cold air settles into low-lying areas, heavy residue tends to keep rising soil heat at or below the soil surface, and dry soils tend to lose heat more quickly than moist soils; these environments are more likely to produce freeze injured crops. Many other factors like cloud cover, wind, soil temperature, soybean stage, previous weather and genetics influence injury from frost. This often leads to very spotty injury across the landscape.

Corn is more frost tolerant than soybeans. Corn seedlings are at a lower risk of death from freezing temperatures because the growing point of corn remains below ground until the V5-6 stage. When air temperatures drop below 28°F for more than a few hours, the growing point can be injured or even killed while below the soil surface.

For soybeans, the growing points are above ground and are exposed after the cotyledons open. Freezing of all growing points is fatal. However, soybeans are better able to compensate for partial stand losses than is corn. Newly emerged soybeans are protected by the nearby warm soil, and small, emerging and cotyledon stage soybeans can be a bit more tolerant to freezing temperatures than older soybean or corn leaves. For example, in a 2001 study at NDSU, the temperature required to kill 1/2 of the seedlings was as low as 24°F. Older soybeans are less freeze tolerant.

Crook stage soybeans will be killed if the crook tissue below the cotyledons is killed. Likewise, frozen tissue below the cotyledons of any older soybean will result in death. However, if the frost only affects the tops of the young soybean, those with one or more intact cotyledons might recover from surviving axillary buds. In more advanced early season soybeans, regrowth may occur from one of the vegetative buds in the leaf axils. If leaf axils haven't been frozen, the frosted soybean should regrow from one of these growing points.

Corn and soybean frost injury appears as water-soaked lesions on the corn leaf tissue and soybean cotyledons, leaves, or hypocotyl that dry and turn brown after several days. Examples of injury can be seen below, or in the Purdue photo gallery, Symptoms of low temperature injury to corn and soybean.
Patients is a virtue when waiting for the crops to indicate their recovery. Allow at a minimum three to five days (or longer if temperatures remain cooler) after the frost event to evaluate crop damage. Surviving corn plants should be showing new leaf tissue expanding from the whorls, while dead plants will still look dead. Surviving soybean plants will have firm, healthy stems and growing point, and show new leaves emerging from one or more of the uppermost undamaged nodes. As with corn, dead plants will remain dead.

For more information on evaluating your stand in the event of frost damage and replanting decisions, talk with your local Syngenta representative, reseller or agronomist.


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