



Mirror, Mirror on the Wall, Will My Wheat and Soybean Crop Freeze and Fall?

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Weather forecasts have farmers “sweating” the upcoming cold weather. Here are a few thoughts and resources based on the forecast temperatures my weather app is suggesting for WI farmers as of Tuesday May 5th at 5 am.

First let’s start with the wheat crop which in WI ranges from the **tillering (F4) to jointing (F6) growth stages**. Cold temperature would need to reach 24 degrees F or less for 2 plus hours before injury occurred. I just do not see that happening in any major wheat growing region in WI this week **so in short don’t fret the wheat crop**.

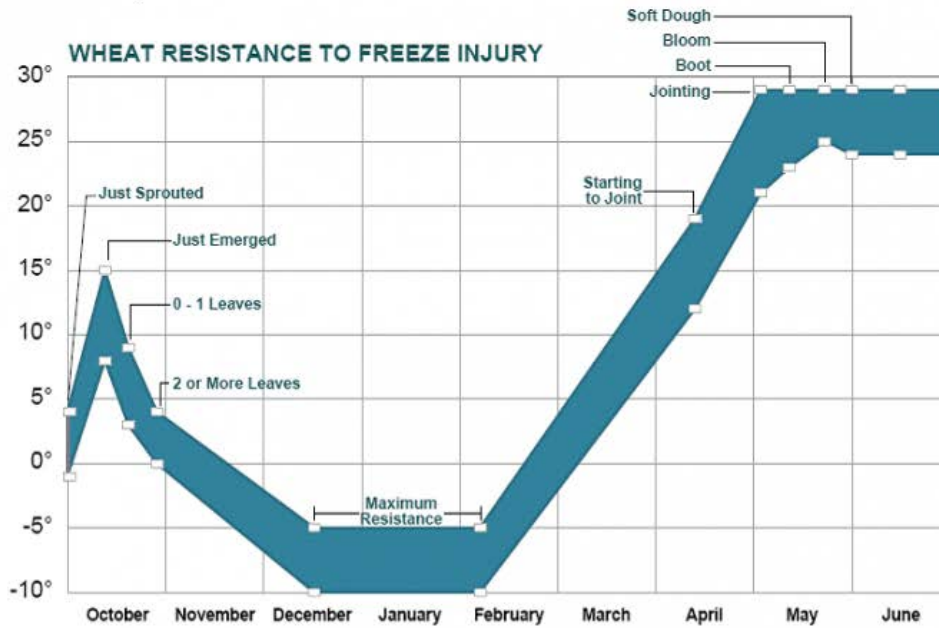


Figure 1. Temperatures that cause freeze injury to winter wheat at different growth stages. Winter wheat rapidly loses hardiness during spring growth and is easily injured by late freezes (graph adapted from A.W. Pauli).

Table 1. Temperatures that cause freeze injury to wheat at spring growth stages and symptoms and yield effect of spring freeze injury.

Growth stage	Approximate injurious temperature (two hours)	Primary symptoms	Yield effect
Tillering	12 F (-11 C)	Leaf chlorosis; burning of leaf tips; silage odor; blue cast to fields	Slight to moderate
Jointing	24 F (-4 C)	Death of growing point; leaf yellowing or burning; lesions, splitting, or bending of lower stem; odor	Moderate to severe
Boot	28 F (-2 C)	Floret sterility; spike trapped in boot; damage to lower stem; leaf discoloration; odor	Moderate to severe
Heading	30 F (-1 C)	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Flowering	30 F (-1 C)	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Milk	28 F (-2 C)	White awns or white spikes; damage to lower stems; leaf discoloration; shrunken, roughened, or discolored kernels	Moderate to severe
Dough	28 F (-2 C)	Shriveled, discolored kernels; poor germination	Slight to moderate

Table 1. Wheat Resistance to Freeze Injury (From: [Spring Freeze Injury to Kansas Wheat](#))

Now let's talk about soybean. I am cautiously optimistic that if the forecast temperatures hold, most of the soybean crop will in fact be **#COOLBEANS** but will survive. My optimism lies in the **Knowledge** I received in an email from Dr. Jim Specht from UNL a few years ago (modified slightly by me for context). For the most-part, farmers in WI fall within the context of this email.

First of all 34F will not impact above-ground tissue. Second, tissue freezing does not even take place at 32F because cell cytoplasm has solutes in it – like a modest anti-freeze, which depresses freezing point of the tissue a degree or two less than 32F – thus air temps surrounding the tissue have to get to below 31 or 30F before tissue freezing can occur. Third, the soil surface is typically warmer than the air temperature (particularly when the soil is wet) and does not give up heat acquired during a sunny day as fast as the air does after sunset. In actuality, the interface between soil surface temp and the air temp near that soil surface will be closer to the soil temp than to the air temp which most people measure on thermometers viewable at their height (not at ground level). Biophysically, control of the soil temp over the air temp this is called the “boundary layer effect”). So don’t trust air temperatures read on thermometers unless you know what the air temperature near the soil surface was (put a thermometer on the soil surface where the cotyledons are and check it just before dawn (when the soil surface temp reaches its nadir for a 24-hour temperature cycle). Fourth, the cotyledons are a huge mass of tissue that are about 95% water. That big amount of water-filled tissue is hard to freeze unless the exposure to temps of 30F at the soil-air interface is many, many hours. Cotyledons will freeze faster (in fewer hours) but only if the soil surface temps get well below 30F (say 25F). The only concern I would have is when cotyledons are no longer closed and protecting the young stem tip. However, if that is in fact frozen off, the nodes to which the cotyledons are attached will regenerate TWO main stem tips. Not an ideal way to start the growing season, but better than having to replant (0.5 bu/ac loss **per each day** that soybeans are NOT in the ground on May 1).

Text courtesy of Dr. Jim Specht (UNL)!