

Pointers for Assessing Freeze Damage in Wheat—Texas High & Rolling Plains

April 15, 2013

Calvin Trostle, Ph.D.

Texas A&M AgriLife Extension Service--
Lubbock

ctrostle@ag.tamu.edu, 806-746-6101



TEXAS A&M
AGRILIFE
EXTENSION

Wheat & Freezing Temperatures

- Wheat is a cool-season grass, but once it begins spring growth, it is much more susceptible to cold temperatures
- Absolute temperature {Air temperature vs. down in the canopy}, for younger wheat, especially before early boot stage
 - If only light winds only, lower areas of field (playa basin, a draw) tend to have more injury; but winds (April 10 circulate the cold more--more potential damage in the canopy, less relative damage in low areas)
- Duration of cold—a standard is typically injury at a certain temperature at 2 hours of exposure
- Growth Stage
- Variety of Wheat?—Probably not (I do notice that triticale seems to lay down more readily)

Not Meant to Be “Waffle Words”

- ⦿ 2 hours at (XYZ) temperature is the point at which “we anticipate significant freeze injury potential on wheat” (especially for grain)
- ⦿ That is how I state it. We just don’t know for about a week, sometimes more, what kind of damage might have been incurred
- ⦿ May 25 freeze in Texas High Plains didn’t cause that much problem
- ⦿ There is a lot of uncertainty, and I don’t often state the wheat freeze injury in blunt words, unless it is pretty obvious

Growth Stages

- ⦿ Early maturing wheat more likely to be injured than late maturing wheat
 - ⦿ Late 1999-2004: when freeze injury occurred 90% of the time it involved early maturing, greenbug-resistant TAM 110; or Jagger, which tended to break dormancy early
 - ⦿ Lush, high moisture, high nitrogen wheat: more sensitive
- ⦿ Grazed wheat is delayed sometimes by 2 weeks or so (and this can be used to hold back wheat that was planted early or is early maturity)
- ⦿ In 2013 it appears in the Texas High Plains that wheat jointing was up to 2 weeks later than what I normally expect thus reducing freeze injury potential









Developing 1st hollow stem



Growing point



Growing point differentiation in wheat: a small head down in stem. Spikelet number & seeds per spikelet mostly already determined. If grazing and then going to grain cattle should have been off about 7-10 days ago.

Key Temperatures (~2 hours)

- ⦿ Tillering, time duration can be quite wide, as low as 12° F
- ⦿ Jointing, 22-24° F
- ⦿ Boot 28° F; this can vary (possibly lower) as early boot might still have some canopy protection, but later boot begins to emerge above the canopy
- ⦿ **Heading, 30° F**
- ⦿ **Flowering, 32° F**
 - ⦿ **These are potentially the worst...**
- ⦿ Milk & dough, 28° F

- ⦿ For foliage, top damage can look bad from the road—lots of damaged tips (March 25 freeze was a good example), but in reality only 1-2% of the total foliage
- ⦿ Other needed information about the status of a wheat crop, unfortunately, requires some effort—cutting plants, parting the foliage to look for split stems, or examining the anthers with a hand lens
- ⦿ We can't wait for damage to become obvious in case the producer needs to change course (graze or hay)

Tillering Stage

- ⦿ Burned foliage and leaf tips
- ⦿ Injury slows growth and may damage some young existing tillers, but as conditions warm, growth of new leaves and tillers resumes
- ⦿ We are usually not too worried about this stage of growth as jointing has not yet occurred

Jointing Stage

- ⦿ Our literature in “Freeze Injury on Wheat” says this occurs in Texas late March through April
- ⦿ I think it comes before that. I have often regarded jointing around Lamesa (60 miles south of Lubbock) around March 1-7 for typical to early jointing
 - ⦿ Earlier in much of Rolling Plains
 - ⦿ And of course 2 weeks later in the Panhandle
- ⦿ Jointing can vary \pm 2 weeks
- ⦿ **Wheat Management Reminder:** all topdress N should be applied by the time the field is jointing









More about Jointing

- ⦿ Growing point has become much more sensitive to injury.
- ⦿ Dead leaf might appear in the “whorl”
 - ⦿ This means that particular stem (not the whole plant) will add no more forage (thought compensation from other tillers can be high) and will not produce any grain
- ⦿ Stems can collapse (they feel rubbery, “flat” with your fingers) and lodging is an issue. I see a fair amount of triticale go down with good freeze. Young tillers under the forage can be trapped and die (if early joint, flash graze?)
- ⦿ Discoloration or splitting of lower stems or brown in the lower nodes may not interfere seriously with water, nutrient uptake





























Triticale
Tallman
Resource Seeds
Entry 13

Boot Stage

- ⦿ This common in Rolling Plains and some south of Lubbock
- ⦿ Early boot may be still on the edge of the canopy vs. fat boot just prior to head emergence
- ⦿ Anthers (male, later produce and eject pollen) may show damage later after heading—shriveled, don't become **yellow**, turn tan or **brown**
- ⦿ Heads may emerge from the side of the boot, and if the heads in the boot or at emergence are yellow or white or just look limp, they are damaged. Little grain.
- ⦿ This might be only on main stems, if secondary and tertiary tillers trail the main stem by a few days—they can escape injury







Conflicting Symptoms, Jointing & Later

- ⊙ Russian Wheat Aphid is very injurious, at much lower numbers than greenbugs, due to the toxicity of the injected toxin
- ⊙ White striping on leaves, sometimes white and purplish leaf sheaths
- ⊙ Not related to freeze (Calvin, Lynn Co., ~2002)
- ⊙ If you look at fields, note aphid presence. Have they sprayed?
- ⊙ RWA tend to feed, often above the collar on the leaf blade, and the leaf blade curls or rolls up around them for protection



Heading Stage

- ⦿ Sterility the main concern
- ⦿ Bleached awns (beards)—white in appearance. If they are white all the way down to the floret (where the seed will develop from the ovary, if fertilized), the individual floret will likely not produce a seed
- ⦿ “Frost Ring” from the stem/collar intersection at the time of freeze moves further up as the stem elongates





Flowering Stage

- ⦿ Usually flowering about 1 week after heads emerge
 - ⦿ **Most sensitive stage (32° F)**
- ⦿ Rolling Plains concerns, just barely on a few fields south of Lubbock (though rye has been headed out for up to two weeks)
- ⦿ Anthers (male, pollen source) are normally yellow. Pollination actually occurs in wheat largely before the anther is extruded.
- ⦿ Damage to anthers could have occurred earlier (boot) and may not emerge at all.

Flowering Stage 2

- ⦿ Wheat heads flower in the middle of the head first (then up & down, 2-4 days)
- ⦿ Anthers a few days before emergence are **light green**, become **yellow** (sometimes with an orangish tint) by the time they are extruded. If killed earlier, the anthers may be white. Emerging anthers usually turn tan or brown after emerging

Milk & Dough Stages

- ⦿ Not relevant at this time

Possible Changes in Outcome

- ⦿ Converting grain fields to forage?
- ⦿ Not until we have handle on the grain yield
- ⦿ The earlier stage of growth a freeze occurs the less potential reduction in grain yield.
- ⦿ And plants do compensate. Example: field that is found to have 20% damaged grain heads (dead) does not experience a 20% decline in yield, maybe 10%. Compensation from tillers—a tiller that may have been unproductive now produces 8, 10, 12 harvestable grains
- May be of lower quality, lower test weight

Possible Changes in Outcome 2

- ⦿ Grain may still be the best option for rotation, etc.
- ⦿ What role does crop insurance have?
- ⦿ Many dryland fields are already stressed and without rain have little potential
 - ⦿ They should be grazed if animals are available (unless they don't want hood compaction)
 - ⦿ They aren't tall enough to justify swathing
- ⦿ Feed quality is still good for freeze-damaged wheat, just like we have always known for forage taken at earlier stages of growth

Possible Changes in Outcome 3

- ⦿ If a crop is held for forage now, but is bearded wheat, then the forage crop can not readily be taken past late boot stage waiting for additional forage compensation
- ⦿ The emerged of bearded heads necessitates forage harvest
- ⦿ What about **nitrate accumulation**? I have not heard this being an issue in the Texas High Plains in the past (maybe we weren't paying attention), but in theory if a wheat crop can't make grain but nitrate-N accumulation continues and has no place to go (no developing grain) then nitrate concentrations could increase
- ⦿ But there is usually additional tiller growth now



LONGHORN

Modern Beardless Wheat
AgriPro
120 lbs./A

WHEAT IN
TUBES
120 lbs./A

WHEAT IN
TUBES
120 lbs./A

WHEAT IN
TUBES
120 lbs./A

Since We are Talking Wheat...

- ⦿ 1) Ask producers if they are aware of or have access to our Texas High Plains (multi-site, multi-year regional averages reported) and Rolling Plains variety trial results
- ⦿ 2) Timing of topdress N on wheat by the jointing stage
 - ⦿ Not “Spring” topdressing, but think “**Later Winter**” topdressing
 - ⦿ If you see a little wheat **starting to joint**, then the growing point on the rest of the field’s mainstem is starting to differentiate (key component for yield, e.g. spikelet number and seeds per spikelet): “**If you haven’t already topdressed your wheat, do it now.**” (vs. ‘once you see jointing then topdress your wheat’)
 - ⦿ **Observation**: the further south in the TX High Plains the more likely producers are late with topdress N

Since We are Talking Wheat...

- ⦿ 3) Examine their planting dates to suggest against too early/too late grain planting dates:
 - ⦿ Northern & Southwest Texas Panhandle, ~Oct. 1-7 optimum
 - ⦿ Northern South Plains, Southeast Panhandle, ~Oct. 10-15
 - ⦿ Central South Plains, Oct. 20
 - ⦿ Lower South Plains, Oct. 25 (at least single digits of November)

If dryland, then moisture affects planting date

- ⦿ Some producers this year in the lower South Plains planted wheat for grain (no grazing) in September: Not Needed!
- ⦿ But on the other hand, wheat can't often make up grain potential with tillering & high seeding rate if planted late