

Wheat Science News

Research & Education Center, Princeton, KY 42445

April 10, 2012

Volume 16, Issue 2

Potential Wheat Freeze Damage

Jim Herbek — Extension Grain Crops Specialist

Recent and upcoming weather forecasts (April 7 to April 12, 2012) have/are indicating temperatures to drop into the upper 20's or low-mid 30's (fahrenheit) in Kentucky which has the potential to cause damage to the wheat crop. The warm Winter and Spring we have experienced has accelerated wheat growth and advanced the growth stages so that the wheat crop is at least two to three weeks ahead of normal. This has caused the wheat crop to be vulnerable to potential freeze damage if the forecasted low temperatures do happen. Wheat damage from cold temperatures depends on the wheat growth stage, the critical temperature needed for damage at each growth stage, and duration of the critical temperature (at least two hours are needed). See Table 1 for freeze injury guidelines at various growth stages.

The majority of the wheat in Kentucky has headed, particularly in West Kentucky. Growth stages range from the boot stage, to heading, to flowering and possibly early kernel development (in the southern and southwest portions of Kentucky). These stages are very vulnerable to freeze damage if the expected low temperatures occur (See Table 1). Injury can occur across large areas of the field, but usually is most severe in low areas where cold air settles. Thus, even if temperatures only drop to the mid-30's, temperatures at or below freezing can occur in portions of the field. Freeze damage symptoms include leaf discoloration, head damage (white or bleached), stem damage (discolored) and even sterility (no kernel development). See Table 1 for a description of freeze damage symptoms at various growth stages and also freeze damage pictures on page 2.

If a freeze event occurs, the wheat will need about a week to ten days of good growing conditions before we can accurately assess the extent of the damage. The flowering (pollination) stage is a very freeze-sensitive stage. Exposure to temperatures of about 30°F at pollination can kill the anthers (produces the pollen) of the flower and cause sterility, even without any damage symptoms appearing on plant vegetative parts including the head. The head (including the florets) may remain green, but if the anthers and pollen were killed, no kernels will develop.

If the critical low temperature for damage was reached at the growth stage of the wheat crop when the freeze event occurred, then the crop will need to be monitored to determine the extent of the damage. The temperatures and growth stages listed in Table 1 work well in most situations as a general guideline to assess damage.

See ID-125 "A Comprehensive Guide to Wheat Management in Kentucky" for more information on wheat freeze damage and also more information on wheat growth stages.

<http://www.ca.uky.edu/agc/pubs/id/id125/id125.pdf>

Freeze Damage



Plate A-1. Varietal differences in spring freeze injury have been observed, but differences are mostly caused by variations in plant growth stages when freezes occur. The variety on the left has more leaf burn than the variety on the right.



Plate A-2. Leaf burn is a symptom of freeze damage to wheat that has broken dormancy and has had prolonged exposure to low temperatures (24°F or lower) during lush, rapid growth.

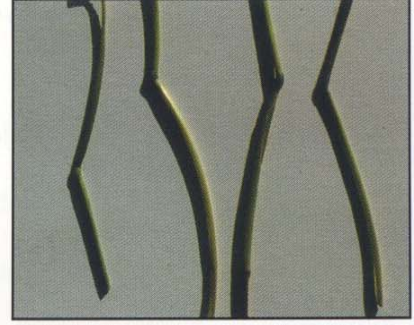


Plate A-3. Bent elbow (bending of the stem at the lowest node forming an elbow) is another symptom of freeze damage to the stem. Bent stems usually resume an upright position but lodging can be a problem with the added weight of the grain as heads begin to fill.



Plate A-4. Stem freeze damage can occur after the jointing stage and usually occurs to the lower stem. Symptoms include discoloration, lesions, splitting, collapse of internodes, and enlargement of nodes. Damaged stems usually deteriorate further by breaking or rotting. The four stems on the left show freeze damage.



Plate A-5. Growing point damage. After the jointing stage, the growing point (developing wheat head) is susceptible to freeze damage. To check for damage, cut into the stem. A normal, uninjured head (two plants on the left) is glossy, turgid, and yellow-green. A freeze damaged (killed) head (three plants on the right) is pale white or tan, limp, shrunk, and not developed in size. Plants were collected 13 days after the freeze.



Plate A-6. Freeze injury to the head at the boot, heading, or flowering stage can result in death of the heads or floret sterility. The most obvious symptom is a white head color. Due to differences in maturity of the florets along the length of the head at the time the freeze occurred, there is a range in the location of the injury to the head. The center or one or both ends of the head may be sterile. In some cases, the whole head may be sterile.



Plate A-7. The pollination (flowering) stage is the most freeze-sensitive stage. Exposure to temperatures of 30°F at pollination can kill the male parts (anthers) of the flower and cause sterility without any symptoms appearing on plant vegetative parts. The head on the right is sterile due to freeze damage at pollination. No kernels developed in the florets because the anthers and pollen were killed. The undamaged head on the left has a developing kernel in each floret.

Table 1. Freeze injury in wheat.

Growth stage	Approximate injurious temp. (two hours)	Primary symptoms	Yield effect
Tillering (1-5) ^a	12°F	Leaf chlorosis; burning of leaf tips; silage odor; blue cast to fields	Slight to moderate
Jointing (6-7)	24°F	Death of growing point; leaf yellowing or burning; lesions, splitting, or bending of lower stem; odor	Moderate to severe
Boot (10)	28°F	Floret sterility; spike trapped in boot; damage to lower stem; leaf discoloration; odor	Moderate to severe
Heading (10.1-.5)	30°F	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Flowering (10.51-.54)	30°F	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Milk (11.1)	28°F	White awns or white spikes; damage to lower stems; leaf discoloration; shrunken, roughened, or discolored kernels	Moderate to severe
Dough (11.2)	28°F	Shriveled, discolored kernels; poor germination	Slight to moderate

^a Numbers in parentheses refer to the Feekes scale

2012 UNIVERSITY OF KENTUCKY WHEAT FIELD DAY

Mark Your Calendar



May 15 (Tuesday) 8:30 AM—12 Noon
Registration begins at 8:30 AM— Tours begin at 9:00 AM

**University of Kentucky Research Farm
1134 Hopkinsville St., Princeton KY 42445**

Pesticide and CCA Credits Applied For

**For More Information, Contact: Dottie Call, Wheat Group Coordinator
UK Research and Education Center, P.O. Box 469, Princeton, KY 42445**

Telephone: 270/365-7541 Ext. 234 E-mail: dcall@uky.edu

Visit our Website: <http://www2.ca.uky.edu/wheatscience/>

Lloyd W. Murdock, Extension Soils Specialist

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UNIVERSITY OF KENTUCKY
College of Agriculture

Research and Education Center
P.O. Box 469
Princeton, KY 42445-0469

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