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# Current Report

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## COLD INJURY TO WINTER WHEAT

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The cold temperature on the night of April 20 has caused considerable concern to most of the wheat producers in the northern half of Oklahoma. The big question is, "Has our wheat been damaged?"

Development of the wheat plant from the vegetative to the reproductive stage depends upon day length as well as temperature. Reproductive growth starts in the spring as the days get longer and the temperature reaches 40° F. The optimum temperature for growth of the wheat plant is 68 to 70° F.

When the wheat plant starts jointing in the spring, the head or spike is also beginning to form. The growing tips of winter wheat in Northern Oklahoma will enlarge and begin differentiation into spikes about March 1. The spikes that will exist at maturity in normal plants can easily be found around April 1, or approximately 30 days before the spikes appear. Spikelet differentiation begins in the middle of the spike and proceeds toward the tip and toward the base. The formation of the kernels occurs first in the middle of the spike and progressively later toward the base and the spike.

### SPIKE DAMAGE

Frost or freeze injury can occur to the wheat spike any time after jointing occurs, but the spike is more easily damaged at the time it emerges from the boot. The stage of development is apparently more important in determining the amount of injury than the variety of wheat. Several factors determine to what extent the wheat will be injured by cold. Some of these factors are: (1) temperature, (2) length of exposure,

(3) stage of maturity, (4) amount of moisture in and on the plant, (5) the amount of wind, (6) the fertility of the soil. There is a direct relationship between the amount of head injury, the temperature, and the length of exposure. Floral sterility in wheat may occur when it is exposed to a temperature of 28.4°F. for four hours. A progressive increase in damage will occur at lower temperatures and longer exposure. The percentage of floral sterility is increased if the spikes are wet at the time of freezing. High soil fertility also increases the susceptibility of the florals to low temperature.

Research results from the Nebraska Agricultural Experiment Station indicate that practically no injury occurred when wheat spikes were exposed for two hours at 28.4°F. At 24.8°F. the percentage of spikes showing sterility was much greater. The Nebraska data indicated that at temperatures below freezing, injury occurs rapidly, resulting in sterility of the florets. The length of exposure was also an important factor in the amount of injury produced.

The greatest amount of injury to the spike was observed when freezing occurred during pollination. Pollination usually occurs just about the time the spike is coming out of the boot. Spikes that were still in the boot showed less injury and the spikes in which the fertilized embryo had begun to develop appeared to withstand the freezing temperature better than spikes in the pollination stage.

Damage to the spike can usually be observed in five to seven days after injury. Due to the length of time required for the spike to clear the boot and the difference in maturity of the florets, there is usually a range in the location of the injury to the spike. Some spikes are sterile at the tip, some are sterile at the base, others are sterile in the center, while, in extreme cases, the entire head may be sterile.

#### STEM DAMAGE

Stem damage can also occur from late spring freezes. The most serious type of injury to the stem usually occurs at the base of the plant. Occasionally all degrees of stem injury can be observed, but usually the most serious are: bending of the stem at the lowest joint forming an elbow, twisting of the stem near the base followed by breaking and rotting and splitting of the stem near the base usually followed by rotting. Bent stems will usually resume an

upright position and produce grain; twisted and split stems will either rot or continue growth. If growth is continued, many of the split stems will lodge because of the added weight of the grain as the heads begin to fill.

#### QUALITY DAMAGE

Freezing temperature may also lower the quality of wheat. Occasionally the kernels from a frozen spike will have a dull greyish appearance and will be lighter in weight and of lower quality than normal wheat.

Research indicates there are differences in the susceptibility of varieties of winter wheat to head injury by freezing temperatures. However, floral sterility is influenced more by the stage of head development at the time of exposure than by varietal susceptibility.