



Seedling effects:

In general the colder our winters in South Carolina, the better our wheat crop. Unlike more northern areas, we have little risk of soil freezing and “heaving” to expose seedling roots to injury. Heaving has occasionally been reported on heavy soils, but it rarely gets cold enough in our state to injure wheat until jointing occurs. Prior to jointing, the growing point of small grains is below the soil line and insulated from cold. Wheat seedlings can have alternating bands of yellow and healthy green tissue after periods of cold nights and warm sunny days. This “coontail” appearance is not harmful and the wheat will rapidly outgrow it. Water droplets freezing on wheat, can also temporarily cause yellow or dead tissue spots that are confused with disease symptoms. This may trigger unnecessary early season fungicide application. Tillering wheat can also have temporary “tip burn” from cold temperatures.

Stem freeze damage in March:

Once small grains joint, we have two types of cold risk: stem freeze in March and head injury in April. After jointing, the growing point and embryonic head are above the soil line. Damage usually occurs when the watery stem freezes below the developing head. The formation of ice crystals in the stem damages conductive tissue and cuts off the flow of water and nutrients to the head. If damage is severe (several hours in the high teens or low twenties), the stem will be mushy and watery below the node within a day of stem freeze. Marginal injury on jointing wheat (mid to high twenties) may not show up right away, but can cause reduced head fill, particularly if the field is drought stressed later in the season. Old stem freeze injury can cause premature plant senescence and can be diagnosed at head fill by peeling leaf sheaths away from the stems and looking for a darkened or discolored area on the stem. The degree of stem freeze damage is determined by the maturity stage at the time of injury. If the main stem has a node barely above the soil line and temperatures just dip below freezing, there is little risk of injury. If only the main stem was jointed and frozen, the primary and secondary tillers can compensate and still produce a good crop. We have measured 65+ bu/ac wheat after freezing the main stem. If the primary tiller was also jointed, then yield loss will be much more severe. We have seen wheat yields decreased by 50% when the main stem and primary tiller both freeze.



Main stem killed by March freeze; other two tillers were not jointed and survived.

Head freeze damage in April:

After heading, wheat becomes much more sensitive to cold injury. Before the head fully emerges from the boot, we can tolerate temperatures of 28 - 30 degrees F for an hour or so. When the leaf sheath freezes, the head may have trouble emerging and be bent or “fiddle headed”. These heads can still have sound grain. This symptom is often confused with herbicide injury.



Heads killed by April freeze.

After full head emergence, wheat is very susceptible to 30 degree F. At this point a freeze can be disastrous. You can inspect for freeze injury to heads by looking at the anthers under a 10X hand lens two days after the cold event. Healthy, developing anthers are plump and green. If damaged by cold, they will be shriveled and discolored. Head freeze results in partial or total head blanching. Since not all the anthers develop at once, only a segment of the head may be sterile.

“Fiddlehead” caused by cold injury to leaf sheath during booting; head survived.

Reducing freeze risk:

Planting date and variety selection are the only ways to manage cold injury risk. Our game plan in South Carolina is to plant as early as we can to maximize yield potential, without taking on too much cold injury risk. This earliest planting date varies across our “wheatbelt”. Many years of experience here at Blackville have convinced us that planting medium maturity wheats before 15 November is too risky for cold damage. Our rule of thumb is that we don’t want wheat to begin jointing before the first week of March. As you move north in the state, you can plant earlier without unacceptable cold risk. In Dillon County for example, you can usually plant 1 November without excessive cold risk. Pay attention to varietal maturity ratings. Plant “early-maturing” varieties last and “late” varieties first. Planting large acreage often requires taking some cold risk on the earliest planted fields.

Nitrogen rates have less effect on cold injury than planting date and variety. Nitrogen deficient wheat often heads out the same day as adequately fertilized wheat, only the N deficient plants will be smaller and yield less. Vigorous growth after topdress N application can result in more water in the stem and potentially more freeze damage, but topdress N applications must be made prior to jointing in order to maximize yield potential.

Prepared by:

Jay W. Chapin, Extension Specialist and James S. Thomas, Ag. Science Assoc.
Edisto Research and Education Center, 64 Research Road, Blackville, SC 29817; 803-284-3343; jchapin@clermson.edu