Other Issues

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Waterlogging stress in wheat and oats

Field view of waterlogged wheat plants

Occurrence: Waterlogging stress occurs in wheat and oats when the soil remains saturated or flooded for more than a few days due to poor infiltration or inadequate surface drainage, typically on heavier soils. Waterlogging stress typically occurs during seedling and tillering stages during the winter and results in poor shoot and root growth and delayed plant development. Damage to the plant occurs due to lack of oxygen in the root zone that inhibits root respiration and metabolic function, coupled with toxic accumulation of trace elements under the resulting conditions. Root growth can be inhibited and result in inability to uptake applied fertilizers and tolerate drought stress later in the season.

Symptoms often are uneven across the field and include stunted, yellowed plants with delayed maturity in lower areas or heavier soil regions of the field. Symptoms can resemble those of soil compaction or nitrogen deficiency, but waterlogged plants may not respond to higher nitrogen due to stunted root growth. Flooding during reproductive growth can result in poor grain fill, early maturity in patterns across the field and low yields. Downy mildew, caused by a water-loving fungus, often occurs as a result of waterlogging stress as do root rots.

Management options: Good surface and internal drainage are the best options to prevent waterlogging in fields. Surface water drains should be put in place prior to or at planting. Higher top-dressing nitrogen rates may partially offset symptoms by stimulating vegetative growth if waterlogging is not severe and prolonged.

Freeze damage in wheat and oats

Occurrence and symptoms: Damage to wheat and oats from cold weather can occur in the winter during vegetative growth or in the spring after jointing and head initiation.

Wheat in Louisiana remains green and grows throughout the winter. The damage that occurs during winter months is normally loss of leaf tissue and has minimal effect on crop development and yield, usually just browning of leaf tips on younger leaves. Such damage occurs when warm weather that results in rapidly growing leaves and nonhardened tissue is followed by temperatures well below freezing. Wheat that is exposed to gradually colder temperatures undergoes physiological changes and "hardens off" so that temperatures in the teens cause minimal leaf tissue damage. Occasionally, however, very cold temperatures (single digits) completely kill above-ground tissue and can result in stand loss. But the below-ground growing point normally recovers, and the plant puts out new leaves when normal weather returns.

Frozen wheat heads

Frozen seedling leaf damage

The most severe damage to wheat from low temperatures occurs after jointing to rapidly expanding stems and developing

heads that have little protection against cold. This most commonly occurs when a warm midwinter is followed by a hard freeze in March. Temperatures just below freezing for a few hours can severely damage developing stems and heads and can sterilize pollen if heads are near emergence, resulting in apparently healthy heads at maturity that, when examined have very few seeds. Sometimes portions of the head are killed, leaving misshapen heads. The extent of yield loss depends on how late in the spring the cold damage occurs and how much time the plant has to develop new head-producing tillers.

Frozen young head extruded

Management options: Planting date and variety choice are really the only options to avoid cold damage. Earlier-heading varieties are more prone to spring freeze damage and should be planted later, after the midpoint of the recommended planting window. Planting later helps prevent early varieties from jointing and developing reproductively while there is still a high probability of damaging temperatures. Likewise, planting later slows crop development and helps guard against spring freeze damage. Varieties with later than average heading dates can be planted earlier since their natural growth pattern is to develop later in the spring.

Glyphosate drift on wheat

Glyphosate drift symptom on flag leaf

Glyphosate is the most widely used herbicide for preplant burndown prior to planting summer crops in Louisiana. Unfortunately, timing of preplant burndown applications occur during a time of peak growth in wheat (i.e., panicle initiation, heading, etc.).

Drift of glyphosate onto wheat can occur both from aerial and ground applications. Research has shown that glyphosate at 2 and 4 ounces per acre reduced wheat yield 57 percent and 62 percent, respectively, when the drift event occurred when wheat was at the first node growth stage. In addition, when wheat was heading, glyphosate drift at 2 and 4 ounces per acre reduced yield 26 percent and 45 percent, respectively. This data indicates wheat is very sensitive to glyphosate drift.

Field view of glyphosate drift

Phosphorus deficiency in wheat

Symptomology: During early season crop growth, initial phosphorus deficiency symptoms are reduced growth and vigor of seedlings. As the wheat plant progresses, phosphorus deficiency negatively affects tiller production. This will result in stands that appear thin. Additionally, phosphorus-deficient leaves have very dark green to reddish to purple appearance. These symptoms typically occur in the older leaves, while the younger and newly emerged leaves remain green.

Phosphorus deficiency during early season growth (Note the emergence of newer leaves that remain green, while older leaves are affected)

Prevalence in the field: Phosphorus deficiencies often occur in cold, wet soils. This can be a more significant problem for later planted wheat in Louisiana, which often is planted into these conditions. Phosphorus deficiencies typically are more widespread across the field than many other nutrient deficiencies.

Nutrient correction: Once phosphorus deficiency symptoms occur in field, it often is difficult to adequately correct for the current growing season due to the immobility of phosphorus in the soil system as well as yield damage that potentially has already occurred. Use the current growing season as a tool to correct for future growing seasons. To compound the difficultly of phosphorus deficiencies, phosphorus deficiencies often can be a secondary response to other stress symptoms, such as flooded conditions, frost stress or lowered pH, which must be corrected for deficiencies not to occur.

Potassium deficiency in wheat

Symptomology: Potassium deficiencies typically shows up as leaf chlorosis (yellowing) early in the deficiency or during mild cases. This yellowing will become necrotic (dead plant tissue) rapidly as the deficiency persists. This deficiency will initiate at the leaf tip and along the leaf margins, but as the deficiency progresses, the entire leaf will be affected.

Chlorosis of the leaf margin with necrotic leaf tips (Note the resemblance to drought stress)

Additionally, the deficiency will begin with the oldest leaves, while the youngest remain green. The symptoms will progress up the plant, however, as the deficiency persists. Long-term deficiency symptoms of the plant will resemble drought stress, which will result in lowered test weights.

Prevalence in field: Potassium deficiencies in the field can be very sporadic. They often are associated with sandier textured soil. Even in high clay content fields, however, sand veins often can show significant potassium deficiency.

Nutrient correction: With the immobility of potassium in soil systems, it often is difficult to correct for potassium deficiency in season. The use of foliar potassium has shown promise in other cropping systems, but very little still is understood. Therefore, these should be used cautiously, and consultation with a LSU AgCenter specialist or extension agent is recommended.

Sulfur deficiency in wheat

Symptomology: Sulfur deficiencies result in decreased plant growth, due to lack of protein formation. Deficient plants typically have general paleness of the entire plant with chlorosis of the newer leaves. Initial symptoms begin at the tip of the youngest leaves and progress to the base. The progression often is so rapid, however, differences are not evident. Sulfur deficiencies can be misidentified as nitrogen deficiencies, but the symptoms will not be alleviated by supplemental nitrogen applications.

Comparison between sulfur deficient wheat (right) and unaffected wheat (left)

Note the overall paleness of the plant, with significantly lighter leaves in the upper canopy

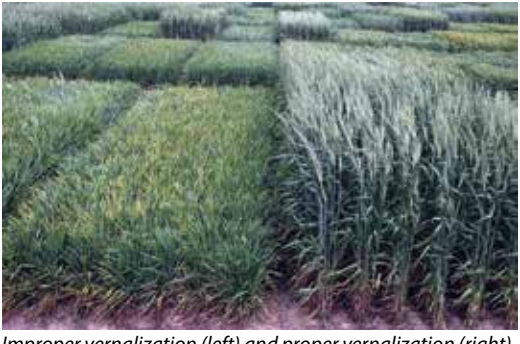
Prevalence in the field: While nitrogen and sulfur deficiencies do not necessarily occur together, since, similar to nitrogen, sulfur is mobile in soil systems, deficiency patterns resemble that of nitrogen, sulfur deficiencies, however, are more prone in sandier soils and soils with low organic matter content. Additionally, because sulfur is mobile, areas with high leaching potential also will be areas that show sulfur deficiencies.

Nutrient correction: Since sulfur is mobile in the soil, it is easier to correct for than immobile elements. But, since sulfur plays such a vital role in protein synthesis, plants often can exhibit what is called "hidden hunger." Significant yield can be lost prior to any visual symptom. Additionally, due to the difficulty distinguishing between nitrogen and sulfur deficiencies, tissue analysis often will need to be done. While the effectiveness is not well known in wheat, in-season adjustment can be carried out through the use of sulfate fertilizer sources.

Vernalization failure in wheat

Description: Winter wheat in Louisiana is planted in the fall and undergoes physiological changes during winter exposure to cold weather (32-50 F) that trigger initiation of reproductive growth (jointing) and heading. Most winter wheat varieties require from two to eight weeks of exposure to cool temperatures to induce heading. This process is called "vernalization." After vernalization requirements have been met, rate of development toward heading is influenced by temperature (heat units) and, to some extent, photoperiod. Varieties developed in the Midwest often require greater periods of vernalization, while spring wheat varieties have no cold requirement. Heading date is roughly correlated with the vernalization requirement in that early heading varieties generally require fewer days of vernalization than later-heading varieties.

Wheat varieties that do not properly vernalize will not head properly and will have reduced yield or no yield. In many cases, heat units and photoperiod eventually cause the variety to partially head out, but head density will be greatly



Improper vernalization (left) and proper vernalization (right)

reduced and maturity will be delayed and nonuniform. These fields have a very ragged appearance in late spring with "bolted" heads spread across the field. Some varieties segregate for vernalization requirement and will appear uniform in normal winters but have partial heading in warm winters. Nonvernalized plants may put out large numbers of leaves that become yellowed with age.

Management options: Growers should not plant a variety that has not been tested in Louisiana since there are many wheat varieties that are adapted to more northern states that will fail in Louisiana. Avoid planting varieties that have very late relative heading dates, and match planting date to variety. Varieties with moderately late heading dates should be planted on the early side in north Louisiana, and those with early heading dates should be planted late (to avoid spring freezes). Growers in central and south Louisiana should avoid late-heading varieties since these may fail to vernalize in some years.

Proper vernalization (left) and vernalization failure (right)