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Reduced Yields with Broadcast Seeding

This spring, Brad Brown, with University of Idaho, and I have been out to look at several fields that had trouble with emergence this year. Most of the problems this year were in fields that were broadcast seedings. The value of wheat has increased significantly this past year and this changes the economics when failures occur, especially since much of the wheat is forward contracted. The increased value of wheat makes decreasing the probability of stand failure and a few bushels per acre worth going after.

One of the factors you can control in stand establishment is seeding depth. A seeding depth of about an inch and no deeper than 1.5 inches is desirable. When broadcast seeding, you are spreading the seed on top and counting on covering the seed with soil by some other tillage tool. With drilling you should be able to control this better. The challenge in furrow irrigated fields is to get the field corrugated after seeding without burying the seed too deep. I have heard that a few farmers have a drill that will build corrugates ahead of the drill. This would allow you to see the final depth of seeding. The key is to place the seed in the soil at the desirable depth, accurately and consistently.

Brad Brown did a study on comparing broadcast vs. drill for three years (1995-1997) at the Parma experiment station and reported the results in Issue 14 of the "Cereal Sentinel". Below is a quick summary his experimental results and I have updated the economics. Broadcast seeding delayed or reduced emergence every year of the study. Drilled stands averaged over the three years yielded 7.3 bushels per acre more than broadcast seedings. Assuming a wheat price of \$8.00 per bushel, drilling would increase gross returns by \$58.40 per acre per year. Of course you will have to do the math and logistics to determine if it makes sense in your operation. Increasing wheat price changes the economics of growing wheat and it looks much different than it did just a few years ago.

Seeding rates are often increased when broadcast seeding. This experiment also looked at 60, 120, 180 lb/acre seeding rates. There was no advantage of increasing seeding rate above 120 pounds per acre when broadcast seeding or drilling. The response of increasing seeding rate was the same.

For More Information:

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Cereal Tolerance to Freezing Temperatures

At the Malheur Experiment Station the minimum temperature was 21 degrees the morning of April 21. So below is a summary of how wheat is affected by cold temperatures in the spring.

Wheat in Oregon is subjected to adverse weather conditions during some of its growth period. Low temperature injury during winter and spring can be particularly destructive. The winter hardiness of modern varieties and good management practices have reduced winterkilling of wheat, so injury during winter is less common than it was years ago.

Wheat has little resistance to low temperatures after it begins growing in the spring; therefore, injury from freezes at this time can occur. Temperature conditions that cause spring freeze injury, symptoms of injury at different spring growth stages and management practices to use when wheat is injured.

Spring freeze injury occurs when low temperatures coincide with sensitive plant growth stages. Injury can cover large areas of the state or only a few fields or parts of fields. It is most severe along rivers, valleys and depressions in fields where cold air settles.

The risk of spring freeze injury is greater when wheat initiates spring growth early due to higher than average temperatures and inadequate moisture and advances through its developmental stages quicker than normal. If a freeze occurs, wheat has a greater chance of being damaged because it is further advanced.

Table 1. Temperatures that cause freeze injury to wheat at spring growth stages and symptoms and yield effect of spring freeze injury.

Growth stage	Approximate Injurious temperature (two hours)	Primary symptoms	Yield effect
Tillering	12 F (-11 C)	Leaf chlorosis; burning of leaf tips; silage odor; blue cast to fields	Slight to moderate
Jointing	24 F (-4 C)	Death of growing point; leaf yellowing or burning; lesions, splitting or bending of lower stem; odor	Moderate to severe
Boot	28 F (-2 C)	Floret sterility; spike trapped in boot; damage to lower stem; leaf discoloration; odor	Moderate to severe
Heading	30 F (-1 C)	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Flowering	30 F (-1 C)	Floret sterility; white awns or white spikes; damage to lower stem; leaf discoloration	Severe
Milk	28 F (-2 C)	White awns or white spikes; damage to lower stems; leaf discoloration; shrunken, roughened, or discolored kernels	Moderate to severe
Dough	28 F (-2 C)	Shriveled, discolored kernels; poor germination	Slight to moderate

Effects of Freezing at Tillering and Jointing

Emergence to Tillering (Zadoks scale 1-25)

During the seedling and early tillering stages, the growing point is below the soil surface and protected from freeze injury. The growing points of wheat and barley are generally located deeper in the soil than the growing point of oats.

Most damage occurs to leaves, which may have distinct light-yellow bands and which become chlorotic or necrotic and usually twisted. Banding usually appears on smaller plants and reflects the pattern of daily growth and nighttime freezing. Leaf tips and occasionally whole leaves may die within 1 to 2 days after freezing. A strong odor of dehydrating vegetation may develop several days after severe freezes.

Jointing (Zadoks scale 31-39)

Leaves of freeze-injured plants develop damage symptoms similar to those of the tillering stage. The most serious injury can occur to the growing points, which are now 1 to several inches above the soil surface. The growing point in a stem is located just above the uppermost node you can feel when you run the stem between your thumb and forefinger. To observe the growing point, split the stem lengthwise with a sharp blade to expose the developing head.

A normal, uninjured growing point is bright pearl white to yellow green and turgid. Freeze injury causes the growing point to turn dull white or brownish and water soaked. Injury to the growing point can occur in plants that appear to be otherwise normal because the growing point is most sensitive to cold.

When a growing point has been injured, stem elongation stops, but later uninjured tillers continue to grow and may mask the damage. Injury at this stage usually results in a mixture of normal and late tillers, uneven maturity and a corresponding decrease in grain yield.

Lower-stem injury at this and later stages can result in stem discoloration, roughness, lesions, splitting, collapse of internodes or enlargement of nodes. Stem damage is often not visible until after the boot or later stages.

Stem discoloration is associated with reduced metabolite transport through the nodes. Metabolites collecting under the nodes cause the discoloration. Injured stems often break over at affected areas so that one or more internodes may be parallel to the soil surface. In stems with no discoloration, injury does not appear to interfere with the plant's ability to take up nutrients from the soil and translocate them to the developing grain. Injured areas are more likely than healthy tissue to become infected with microorganisms, which also may cause stem discoloration and deterioration. Wind or hard rain will easily lodge these plants, decreasing grain yields and slowing harvest.

Sources:

Spring Freeze Injury to Idaho Cereals, University of Idaho Extension Bulletin #724, Robertson, Larry D.

Spring Freeze Injury to Kansas Wheat, Kansas State University, March 1995. C-646 James P. Shroyer, Merrel E. Mikesell, and Gary M. Paulsen.

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Reducing Establishment Costs

Tillage and fertilizer costs have become more expensive. Many producers do not soil test before growing cereals. Soil testing and using university guide lines may save you considerable money. Another way to save money, is to cut back on the number of tillage operations prior to seeding depending on the crop rotation you are using. I would look forward to visiting with you on ways to decrease these costs on your farm. Please give me a call at 541-881-1417.

Sincerely,

A handwritten signature in cursive script that reads "Steve Norberg".

Steve Norberg

Field Crops and Watershed Mgt.

April 2008

We are on the Web:
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