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Feeding Scab-Infected Wheat to Livestock

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Fusarium head blight, also called scab, is a disease of many small grain crops including wheat, barley, and rye. Oats can also be affected but generally with less damage. Scab is caused by the fungus *Fusarium*. Several species of *Fusarium* can cause the disease, but far and away the most common in South Dakota is *Fusarium graminearum*. This is the same fungus that causes Gibberella stalk rot in corn. When *F. graminearum* infections occurs in corn ears, the disease is referred to as Gibberella ear rot; it does not arrest kernel development.

Generally, warm and wet conditions at wheat flowering favor scab. Disease incidence is favored by temperatures in the 80-95°F range during flowering and by substantial rainfall during the 7 days previous to flowering.

Crops planted in corn stalk residue are at greater risk than crops planted in soybean residue. Wheat planted in wheat residue is at intermediate risk to wheat planted in corn or soybean residue.

Most often in South Dakota, spring wheat and barley encounter these conditions. Rarely has winter wheat experienced the disease. This is not because the winter wheat varieties are resistant, but because the flowering time of winter wheat is generally during cooler weather, so winter wheat escapes the disease in most years.

As *Fusarium* grows into the developing grain, growth of the seed is arrested. Depending on when the infection

occurs, the seed may develop incompletely or not at all. Often the seed is shriveled and white to pink in color. These seeds are often called *Fusarium* damaged kernels (FDK), visually scabby kernels (VSK), or tombstones.

As the fungus grows, it produces mycotoxins (fungal produced toxins). Various environmental conditions can affect the amount of toxin produced, and in some conditions a great deal of toxin can accumulate despite a relatively low level of disease. *Fusarium graminearum* can produce several toxins, but in small grains, especially wheat and barley, a toxin called deoxynivalenol (DON) or vomitoxin is most frequently encountered. Occasionally, a second mycotoxin, zearalenone, may be produced; however, this is rare in wheat.

Levels of DON are highest in the vegetative parts of the head. Chaff associated with the grain often has a very high level of DON. Hence, uncleaned grain may have more DON than cleaned grain. Visually affected seed (FDK or VSK) can also indicate presence of the toxin. It should generally be expected that higher levels of DON occur in uncleaned or scabby grain. The toxin may also accumulate in straw from affected fields.

Levels of DON in grain and straw are not reliably predicted, so testing is always the best approach.

It is important to recognize that the molds themselves do not cause the livestock problems. The molds produce

the mycotoxins, and it is the mycotoxins that cause the problems. There are many different types of mycotoxins, and each affects livestock differently.

Beef Cattle

The nutritional value of scab-infected wheat is generally quite good. It is the mycotoxins DON and zearalenone that are the problems. Scab-infected grains should be tested for DON and zearalenone prior to feeding. Contact your county Extension office for addresses and assistance.

Beef cattle are generally less sensitive to DON and zearalenone than other species; however, at high concentrations these mycotoxins can reduce performance and (or) impact reproductive performance. Feeds with high concentrations of mycotoxins can be diluted out with other feeds or fed to less susceptible classes of cattle.

Maximum tolerable concentrations for beef cattle are listed in Table 1. These recommendations are for the total diet. You should also consider other sources of mycotoxins when evaluating feeding alternatives for scab-infected wheat. Exercise particular caution when feeding screenings. If the screenings are from scab-infected wheat, the mycotoxin concentrations in the screenings could be quite high. It is also quite possible that other moldy feeds (grains, hays, or silages) may contain substantial amounts of mycotoxins as well. Any light-test-weight grains and feeds with visible mold or musty odor should be sampled and tested for mycotoxins. When scab-infected wheat is blended with other moldy feeds, the effect of the mycotoxins will be additive.

Be careful when using straw from scab-infected wheat. Generally, wheat scab is localized in the heads; however, on occasion it can migrate down the plant and increase mycotoxin concentrations in the straw. If the straw is to be used for bedding, use it for mature cows or feedlot cattle. If the straw is to be fed, it should be tested

Table 1. **Beef cattle:** maximum concentrations of mycotoxins in the diets.

	Vomitoxin (DON) (ppm)	Zearalenone (ppm)
Feedlot cattle	10	20
Virgin heifers	10	10
Pregnant dry cows	10	20

for DON and zearalenone prior to feeding and diluted accordingly.

Dairy Cattle

Scab-infected wheat can be fed to dairy cows as long as the total diet concentrations of DON and zearalenone do not exceed the maximum tolerance levels (Table 2).

Wheat grain is usually used at low concentrations in the diet of dairy cattle because of its highly fermentable starch and propensity to cause sub-clinical and(or) clinical acidosis. This might be one reason why it is less likely that problems when feeding scabby wheat to dairy cattle will be severe.

As with beef cattle, if other feeds in the diet also contain mycotoxins, the effect will be additive. Toxin concentrations that would otherwise be borderline or harmless in scabby wheat can result in reduced performance and other symptoms when combined with toxins from other feeds.

Of particular interest in dairy diets are moldy hay or hay crop silages. As these forages are a large portion of the diet (50% and above), adding grains that also contain mycotoxin might result in decreased performance. Thus, it is critical to test all questionable feeds for their toxin content.

Samples should be sent for analyses particularly when they have low bushel weight, visible mold, or musty odor. They should also be analyzed whenever there is a reduction in feed intake, respiratory distress, diarrhea, or reduce production. One of the first things a dairy producer will notice will be decreased feed intake (more than 10%) and an accompanying drop in milk production.

It makes sense to feed non-lactating animals such as growing heifers or low-producing cows later in lactation, rather than feed to fresh cows. If a certain amount of

Table 2. **Dairy cattle:** maximum concentrations of mycotoxins in the diets.

	Vomitoxin (DON) (ppm)	Zearalenone (ppm)
Heifers	10	5
Lactating cows	5	2
Pregnant dry cows	5	5

moderate-toxin-concentration grain still needs to be fed, it is safer to dilute it with other grain that has tested negative for toxins at or close to feeding time.

Sheep

Lamb finishing studies have shown that scab-infected wheat with levels of DON less than 10 ppm can be successfully used in finishing diets.

Reduced feed intake is generally the first symptom when the threshold for dietary DON is exceeded. For feed products with tested levels of DON, gradually blend into the diet mixture in 5-10 % increments; yet do not exceed 10 ppm total diet DON concentration. Monitor intake closely. Depressed intake will negatively affect expected growth performance and feed efficiency.

Wheat screenings are particularly risky feed resources in crop years with high scab incidence since the DON level will likely be higher than in the whole grain kernel.

Avoid using scab-infected grain in diets for pregnant ewes. For pregnant ewes bedded with straw derived from scab-infected wheat, the risk for abortions is comparatively low since the hazardous compounds are generally associated with the grain kernel and screening.

Swine

Swine are very sensitive to scabby wheat mycotoxins. As little as 1 ppm of DON can significantly reduce weight gain in pigs. Higher concentrations result in feed refusals and vomiting, which is a classic symptom of vomitoxin. If zearalenone is present in scabby wheat, it can cause reproductive problems in the breeding herd. A classic sign of zearalenone toxicity is red and swollen vulvas of pre-pubertal gilts, just like they are in heat.

If the wheat is suspected to contain mycotoxins, it should be sent to a lab for analysis. A quick, on-farm test would be to isolate a pen of pre-pubertal gilts and feed the wheat to them. If they vomit or won't eat the feed, it

contains DON. If after 5 days their vulvas are red and swollen, the wheat probably contains zearalenone.

It is still best to send a sample of the wheat to a lab to find the exact amount of mycotoxins in the grain. That gives you the opportunity to properly incorporate it into the diet.

If you have to feed scabby wheat to pigs, feed it only to pigs heavier than 150 lb that are not going to be part of the breeding herd. Keep the wheat out of the nursery and sow diets. Blend the scabby wheat with clean grain so the total diet contains no more than 1 ppm of either zearalenone or DON.

Ensiling

Ensiling will help preserve scab-infected wheat forage but will not reduce mycotoxin concentrations. You should sample the silage at the time of feeding so you have the most accurate estimation of mycotoxin concentration. A sample at this time would include mycotoxins produced from the wheat scab as well as any that may be present as a result of mold development during the ensiling process.

Mold Inhibitors and Mycotoxin Binders

Mold inhibitors will stop more mycotoxins from being produced but they will not do anything to the mycotoxins already present.

There are commercial products available that are effective against the mycotoxin aflatoxin (clay products, pellet binders, bentonite, etc). They are **NOT** effective against DON and zearalenone, the two mycotoxins present in scabby wheat. Heat treatment or other processing methods will not inactivate mycotoxins.

The only thing you can do with DON and zearalenone contaminated grains is to blend them with clean grains to achieve acceptable toxin levels in the total diet.

South Dakota State University, North Dakota State, and several commercial laboratories will accept wheat feed samples for DON and zearalenone testing. Your county Extension office can give you more information.

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