

Mold Damaged Feed Grains - Can They be Fed to Pigs?

by: Gary L. Cromwell
Professor, Swine Nutrition

The high cost of corn (\$5.00 to \$5.50 per bushel) has prompted swine producers to look for other sources of energy feeds for their hogs. Unfortunately, alternative cereal grains and grain by-products are also relatively high in price because of the increased demand for them.

In evaluating an alternative energy or protein source, it is important to know the chemical composition of the ingredient in question. As a minimum, one should know the protein (better yet, the lysine), fat, and fiber content. Composition tables will often give further information on the energy content and other components of the feed product in question. Some of the grain by-products are higher in protein (and lysine) than corn, but many are higher in fiber and lower in energy than corn. Producers may need to call for help from a university or feed company nutritionist or extension specialist to obtain assistance in evaluating ingredients with which they may not be familiar.

Occasionally, producers are confronted with whether or not they should attempt to feed a low quality feed grain that is light in test weight or damaged by insects or mold. Grains that are damaged by lack of rainfall (certainly not a problem this year!!) are lighter than normal in test weight. However, most research has shown that the feeding value of light test weight grain generally is equal to normal grain, when compared on an equivalent weight basis.

Excess rainfall or damp conditions, particularly prior to harvest, can lead to mold problems in the field. Mold damage during storage also can occur if the grain is harvested under damp conditions or is not properly dried. Broken kernels or insect damage also makes grain more vulnerable to mold infestation. Molds produce toxins (mycotoxins) which can be harmful to pigs and other livestock.

One of the major mycotoxins is aflatoxin, produced by the mold, *Aspergillus flavus*. Corn may be infected with this fungus, yet not be visibly moldy. The presence of the fungus can be detected by placing corn under ultraviolet light (black light), in which case a bright, greenish-yellow fluorescence will occur if the mold is present. While this screening procedure can detect the presence of the fungus, it does not necessarily mean that the grain is contaminated with aflatoxin. A further chemical test must be conducted to determine whether or not aflatoxin is present and at what levels.

Low levels of aflatoxin (20-50 ppb) do not cause any problems in growing pigs, but high levels cause reduced gain, lower resistance to disease, prolonged blood clotting time, and liver damage. Grain with up to 200 ppb aflatoxin can be fed to finishing pigs, but it should not be fed to young pigs or breeding animals.

Certain zeolites or clays, such as hydrated sodium calcium aluminosilicate (trade name, NovaSil) and sodium bentonite, protect against aflatoxin toxicity when they are included in diets containing aflatoxin-contaminated grain. These compounds are generally added to feeds to improve flowability or as pelleting agents. Apparently the zeolites bind the aflatoxins and prevent their absorption. Dr. Merlin Lindemann in our swine nutrition group was one of the first to make this discovery when he was at Virginia Tech several years ago.

Another group of mycotoxins is the trichothecenes, which are produced by *Fusarium* fungi. Deoxynivalenol, commonly called vomitoxin, is the major one in this class. Vomitoxin is also called the feed refusal factor, because when it is present at high levels, it will cause total feed refusal by pigs.

Several years ago, we had a lot of vomitoxin-contaminated wheat in Kentucky. It looks like we could have a problem again this year. Some of the wheat fields in western Kentucky are reported to have as much as 30 to 40% scabby wheat. Weather conditions this spring have been similar to those several years ago when scab was common and much of the wheat was infected with vomitoxin. Whether this year's wheat will also be infected with vomitoxin is unknown at present.

In 1992, we conducted several experiments both at Princeton and at Lexington and found that pigs would tolerate vomitoxin, provided that it was diluted out with good quality wheat or corn. Probably the most important discovery was the relationship between vomitoxin concentration and feed intake, which is illustrated in Figure 1. We found that both feed intake and growth rate in pigs are reduced by approximately 10% for each 1 ppm of vomitoxin in the diet. Interestingly, we also found that the zeolites are not effective in alleviating vomitoxin toxicity like they are in preventing aflatoxin toxicity.

Zearalenone is another common mycotoxin, and it is produced by *Fusarium roseum* and *Gibberella zeae*. This compound produces estrogenic effects such as reddening and swelling of the vulva and nipples, irregular estrual cycles, and pseudopregnancy in sows and gilts. High levels also can cause vaginal and rectal prolapses. The tolerance is 20 ppm for growing swine. Zearalenone contaminated corn should never be fed to breeding animals. If pregnant sows consume zearalenone shortly after breeding, they likely will lose their litter and not recycle for a considerable length of time.

Ochratoxin and citrinin are less common mycotoxins that may be present in barley and other small grains. Ergot is an alkaloid-like mycotoxin produced by fungi that may affect rye or wheat. Ergot is very toxic and grain contaminated with this mycotoxin should not be fed to pigs.

If mycotoxins are suspected, the grain or feed should be tested to determine which ones are present and at what level. If the levels are within the tolerance range, the grains may be fed to finishing pigs. It is best not to feed mycotoxin-contaminated grain to young pigs. And they should never be fed to replacement gilts or to pregnant gilts or sows. Blending of contaminated grain with sound grain to bring the grain within the tolerance range is an option when the grain is fed on the farm.

