



Current Report

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Storage and Use of Low Test Weight and Sprouted Wheat

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An abundance of rainfall during the 2007 harvest season has left producers with questions of what to do with low test weight and sprout-damaged grain. Fortunately, there are answers for questions about feed quality, short-term storage, and germination of grain held over for 2008 seed.

Sprout-damaged Grain can be Used in Livestock Rations

Idaho researchers fed sprout-damaged wheat in feedlot diets to cattle. Sprout-damaged wheat (0, 10, and 25 percent sprouted) composed 35 percent and 65 percent of the concentrate in the rations. These different levels of sprouted wheat in the diet had no effect on animal performance and efficiency. Washington State University studies indicate that sprouted wheat compared favorably to a barley-based finishing ration. No differences in average daily gain, feed to gain ratios, or carcass characteristics were detected. Additional research also indicated that sheep ate more high-sprout wheat compared to sound wheat. Trials conducted with swine indicated a greater rate of gain by feeding sprouted wheat, but slightly poorer feed efficiency.

Table 1. Weight gain and efficiency of yearling steers fed normal or sprouted wheat.

Portion of "Sprouted" Wheat	Sprouted Wheat Kernels in Ration (lbs/day)	ADG Efficiency	Feed
0%	0%	2.28	8.94
20%	12%	2.30	8.56
40%	24%	2.41	8.46
60%	36%	2.34	8.89

Idaho data.

If mold is present, aflatoxin screening should be conducted on the grain. If aflatoxin is not present, sprouted wheat can be efficiently utilized in beef cattle rations.

General guidelines for feeding sprouted wheat to livestock:

Ruminants

- Limit wheat to 40 percent or less of the total ration.
- Bring cattle to full feed at a slower rate. Self-feeding wheat should be avoided.
- Coarsely processing wheat improves digestibility. Dry rolling is preferred, but cracking or coarse grinding will give similar results.
- For growing and finishing cattle, including an ionophore will help reduce consumption and acidosis. Adding buffers such as limestone can be beneficial as well.
- If there is any suspicion of molds and toxins, a sample should be taken and analyzed. Molds and toxins may reduce intake and performance and may increase digestive upset and abortion. Young calves, gestating cows, and lactating cows should not be fed wheat containing vomitoxin.
- Do not use wheat in creep rations.

Swine

- Balance diets containing wheat on a lysine basis.
- Process wheat-based diets coarsely to reduce dust and increase palatability.
- If vomitoxins are present, do not feed wheat to swine.

Low Test Weight Grain Usage

Adverse weather conditions such as freezing during the time when seed is developing can cause low test weight. Low test weight is not a direct indicator of feeding value in wheat, corn, or milo. Various research trials have indicated that low test weight grains produce similar animal performance results when compared to higher test weight grains. In the case of wheat, feeding grain with a test weight of more than 50 pounds per bushel results in very few differences in animal weight gain compared to feeding higher test weight wheat. Wheat with 45 to 50 pound test weight resulted in a feeding value of 95 percent of the feeding value of corn.

Nutritional Information

Energy content of cereal grain is a useful measure of the nutritional value of the grain. Research has found that severely frost-damaged or sprouted grain may have slightly lower energy and digestibility levels than undamaged crops. However the reduced levels are still within the acceptable range for livestock feed. Frost damaged grain may have a higher sugar and lower starch concentration. The fiber and ash content may also be lower. Crude protein content may be higher in frost damaged or sprouted grain while starch content may be lower.

Table 2. Effect of sprouting on nutrient characteristics of wheat.

	<i>Non-Sprouted</i>	<i>Sprouted</i>
Bushel weight, lb	60.4	55.96
CP, %	12.32	13.16
Fat, %	0.79	.88
Crude fiber, %	3.22	3.57

Idaho data

Storing Moist or Sprouted Grain

Grain with moisture content more than 12.5 percent will be at risk in storage regardless of test weight, sprouting, or quality. The higher the moisture content, the higher the risk. Moist grain increases the chance of mold, mustiness or odor, and insect damage. Excess moisture must be reduced as quickly as possible using aeration to ensure successful storage. During summer aeration, about ½ percent of moisture is removed from 12 percent grain during one cooling cycle. A “cooling cycle” is the amount of time required to cool the entire grain mass from one temperature to another. For bins with aeration systems producing 1/10 cfm/bu (typical aeration for steel bins) about 80 to 90 hours are required for one cooling cycle. If the bin is peaked, about 120 hours are required. If the aeration system produces 1/5 cfm/bu, the cooling cycle will move twice as fast or 40 to 45 hours for a level surface top and 60 hours for a peaked surface. (More information about grain aeration is available in Extension Fact Sheets BAE-1102 and BAE-1103.) The moisture content of sprouted grain is actually 1.0 to 1.5 percent higher than the grain moisture meter indicates. If the moisture meter reads 10.5 percent or less, the sprouted grain will have a moisture content of 12 percent or less and the risk during storage is low. For higher moisture content grain, monitor the grain every two days until the moisture content has reduced to safe storage levels. Seed that has sprouted to the point that it has visible plant parts is not a good candidate for storage.

If aeration is not available, it is advisable to turn the grain mass to mix layers of moist and drier grain. The bin may be “cored” by pulling the center core grain out of the bin using the unload spout or conveyor hopper.

Warning: Moist grain respire at a higher rate than dry grain. During respiration, oxygen is converted to carbon dioxide which can create a safety hazard for workers entering the storage unit. Extreme caution should be used when entering bins containing moist grain. Check for low oxygen or high carbon dioxide levels using a CO₂ detector. Operate

the aeration fans for 30 minutes to an hour to exchange air in the grain and headspace with fresh air.

Can Sprout Damaged Wheat be Saved for Seed?

The answer to this question depends on several variables, but the most important among these is the level of sprout damage that has occurred. Wheat that has roots or coleoptiles visibly protruding from the seed coat should not be saved for seed. It is likely that these important plant parts would be knocked off during seed handling and germination would be extremely low.

Grain that shows some signs of germination such as swelling or a split seed coat may still be viable for use as seed if some precautions are taken. As with any seed wheat, a germination test is essential. Germination ability decreases more rapidly in sprout-damaged seed than in non-sprout-damaged seed. It is worthwhile to perform one germination test just after harvest and one just before planting on wheat seed that is suspected of having sprout damage.

A method to determine germination can be conducted as follows:

- Wheat should be at a temperature around 70° F.
- Place 1.5 inches of sand in a box and place 50 wheat seeds in the sand.
- Cover the seeds with an additional 1 inch of sand.
- Wet the sand with water but there should not be standing water.
- Keep sand moist for seven days.
- At the end of seven days, count the emerged seedlings.
- The germination percentage is calculated by dividing the number of emerged seedlings by 50 and multiplying by 100.

The standard for certified seed is 85 percent. Producers can use wheat with a lower germination percentage as long as they increase the seeding rate to compensate.

Finally, it is important to remember that sprouting damage will likely reduce the vigor of seed wheat and shorten the coleoptile length. This affects the ability of the wheat seedling to break through the soil surface once germination has occurred. A good rule of thumb is to never plant sprout-damaged wheat deeper than 1 inch. Most wheat that has a good germination at sowing will be able to emerge from this depth if soil factors such as crusting do not prohibit emergence.

Insect Activity in Low Test Weight or Sprouted Grain

Insect management for short-term storage of low-test weight or sprouted grains should not pose any unique insect problems compared to storing high-quality grain as long as the grain is dry (12.5 percent or less moisture). Stored-grain insects are not brought in from the field, so the condition of the grain and bin before the grain is put into storage are important to keeping the grain from becoming infested. PREVENTION is the key.

Newly harvested grain can become contaminated with stored-grain insects by contact with grain that was previously infested. This can occur in combines, truck beds, wagons,

augers, bucket lifts, or other equipment that is used to move or handle grain. Therefore, the harvest, handling and storage equipment should be cleaned before any grain is harvested, hauled, moved, or stored.

Take the following measures to ensure that there is little chance of a previous infestation becoming a problem:

- Sweep out or vacuum all equipment and remove all old grain. After cleaning, you may want to apply a residual insecticide.
- Thoroughly sweep and clean all parts of the empty bin, including ledges, rafters, augers, etc.
- Remove all debris from fans, exhausts and aeration ducts—especially from beneath slotted floors.
- Seal all unnecessary openings in the grain bin.
- Remove all vegetation and debris within a 10 foot radius of the bin.
- Spray cleaned areas around the bin with a residual herbicide to keep weeds from growing and creating harborage for migrating insects.
- Use a residual empty-bin spray on all surfaces of the inside of the bin, until runoff.
- Empty bins, especially those with false floors, can be fumigated with a phosphine product. You must be certified in pesticide application category “7C Fumigation” to apply any fumigant.
- Aerate grain whenever the outside air temperature is at least five degrees cooler than the average grain temperature.

As long as the grain is dry (12.5 percent or less moisture) and is going to be used within a week to a month, no insecticide grain treatments should be needed. If the grain is going to be stored for a longer time, then consider using a grain protectant at harvest and manage it for long term storage.

Even though harvest is extremely challenging during unusually wet spring and summer periods, producers do have options for their crop. Think through the options listed above—using the grain as feed, storing it short term, and even saving some of it for next year’s seed—and make the best choice for your operation.

References

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- “Feeding Frost-Damaged and Sprouted Grain to Livestock”, Saskatchewan Agriculture and Food, <http://www.agr.gov.sk.ca/docs/production/feedingFrostDamagedGrain.asp>

The Oklahoma Cooperative Extension Service

Bringing the University to You!

The Cooperative Extension Service is the largest, most successful informal educational organization in the world. It is a nationwide system funded and guided by a partnership of federal, state, and local governments that delivers information to help people help themselves through the land-grant university system.

Extension carries out programs in the broad categories of agriculture, natural resources and environment; family and consumer sciences; 4-H and other youth; and community resource development. Extension staff members live and work among the people they serve to help stimulate and educate Americans to plan ahead and cope with their problems.

Some characteristics of the Cooperative Extension system are:

- The federal, state, and local governments cooperatively share in its financial support and program direction.
- It is administered by the land-grant university as designated by the state legislature through an Extension director.
- Extension programs are nonpolitical, objective, and research-based information.
- It provides practical, problem-oriented education for people of all ages. It is designated to take the knowledge of the university to those persons who do not or cannot participate in the formal classroom instruction of the university.
- It utilizes research from university, government, and other sources to help people make their own decisions.
- More than a million volunteers help multiply the impact of the Extension professional staff.
- It dispenses no funds to the public.
- It is not a regulatory agency, but it does inform people of regulations and of their options in meeting them.
- Local programs are developed and carried out in full recognition of national problems and goals.
- The Extension staff educates people through personal contacts, meetings, demonstrations, and the mass media.
- Extension has the built-in flexibility to adjust its programs and subject matter to meet new needs. Activities shift from year to year as citizen groups and Extension workers close to the problems advise changes.

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Issued in furtherance of Cooperative Extension work, acts of May 8 and June 30, 1914, in cooperation with the U.S. Department of Agriculture, Robert E. Whitson, Director of Cooperative Extension Service, Oklahoma State University, Stillwater, Oklahoma. This publication is printed and issued by Oklahoma State University as authorized by the Vice President, Dean, and Director of the Division of Agricultural Sciences and Natural Resources and has been prepared and distributed at a cost of 20 cents per copy. 0707 GH Revised.