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# Feeding Low-Test-Weight and Sprouted Wheat

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***Most wheat is grown for human consumption. Because of its high starch and protein content and excellent milling qualities, it is used as the foundation for numerous food products. Unfortunately, undesirable growing and harvest weather may compromise its suitability for milling. Many studies have been conducted on feeding wheat to livestock. Most report excellent animal performance when the wheat-containing diet is managed correctly.***

Wheat used for feeding cattle and swine is often priced at a disadvantage to other cereal grains, such as corn and grain sorghum. Wheat that has been downgraded because of low test weight and/or sprouting is generally priced for feeding rather than milling characteristics. Livestock feeders, particularly cattle feeders, should consider taking advantage of wheat that is unacceptable for milling.

A small amount of energy is lost during germination, which produces heat, carbon dioxide, and moisture. In most cases, germination does not appear to reduce the nutritive value of the grain. In some cases, sprouting may actually improve the feeding value. As sprouting increases to substantial levels, nutritive value of the grain diminishes, but moderate levels appear to have little effect (*Tables 1 and 2*).

Regardless of condition, wheat fed to livestock should be processed by grinding, dry rolling, or steam flaking to disturb its hard seed coat. According to Australian research, whole wheat has a digestibility of about 60 percent compared to 86 percent for dry-rolled wheat. Attention to processing is critical. Wheat fed to ruminants should be coarsely rolled (breaking the kernel into a few pieces), not finely ground. Excessive fines increase acid production in the rumen and cause digestive upsets. Digestive problems in ruminants might include bloat, founder, and acidosis. Excessive fines also can inhibit dietary intake and reduce animal performance. Regardless of quality, wheat fed to swine should be ground to a particle size of 700 microns for optimum utilization.

Wheat is low in fiber content. This, combined with its high starch content, makes wheat more difficult to feed than other grains in ruminant rations. Inexperienced feeders should consider mixing wheat with other grains, such as corn or grain sorghum, to stabilize the rumen fermentation of the diet. Generally, wheat should be restricted to 30 to 50 percent of the complete diet of beef cattle on finishing diets. This is to ease bunk management. Adapting fed cattle to diets with high wheat content may take 20 to 30 days.

Stocker cattle consuming silage or hay diets also can utilize damaged, low-test-weight wheat. Wheat should be limited to 1 percent or less of the animal's body weight with growing cattle. It is imperative that the protein content of the diet be formulated to meet the animal and rumen microbial requirements. Wheat usually contains less than 14 percent protein, which limits its use in cow diets that are based on moderate- or low-quality forages. Protein supplements used in these feeding situations usually contain 20 to 40 percent protein. When feeding swine, wheat may be used as the sole grain source because swine are not subject to the digestive disorders found with ruminants.

Pricing low-test-weight, sprouted wheat can be calculated from the current value of corn and soybean meal. One hundred pounds of wheat has about the same value (protein and energy) as 92 pounds of corn and 8 pounds of 48 percent soybean meal.

This relationship can be used to calculate a breakeven wheat price. For example, if corn is $3.00/bushel and soybean meal is $250/ton, the price of wheat should be about $3.56/bushel.

If starch content of wheat is reduced because of adverse weather, the protein concentration is usually elevated 1 to 3 percent. When the test weight is more than 50 pounds per bushel, few animal performance differences have been noted. If the wheat test weight is between 45 and 50 pounds per bushel, it appears that the feeding value drops to about 95 percent the feeding value of corn. Swine research has shown reductions in feed efficiency as wheat test weight decreases from 59 to 45 pounds per bushel (*Table 3*). Wheat is low in calcium, so an increase in the amount of limestone included for livestock diets would be appropriate.

Damaged wheat should be stored carefully. Moisture content should be low enough to ensure that mold does not grow within the storage structure. If the wheat must be stored at high moisture content, then it should be dried, aerated, preserved with a storage additive, or ensiled in an anaerobic state (like silage). Molds may produce toxins that affect feeding value through reduced palatability, intake and performance. Toxins may increase morbidity and abortions in pregnant cattle and, in some cases, may even cause death. If mold is present on kernels, a sample should be sent to a diagnostic laboratory for testing. Young animals, reproductive females and animals under nutritional stress are most vulnerable.

## Feeding Recommendations

- Damaged wheat and normal corn have similar feeding values, but damaged wheat contains more protein and rapidly fermented starch than corn or grain sorghum.
- Wheat should be coarsely processed to optimize digestibility in ruminants and ground to 700 microns in swine rations.
- Limit wheat to 30 to 50 percent of the complete diet for backgrounding and finishing cattle.
- Adapt ruminant animals to wheat-based diets incrementally, starting with low levels and adjusting the wheat content slowly to desired levels.
- Ionophores should be included in wheat-based finishing diets to improve feed efficiency and reduce the risk of acidosis.
- Buffers like limestone and sodium bicarbonate may be useful to reduce digestive upsets in ruminants.
- Feeding wheat to cattle on moderate- or low-quality forage-based diets should be carefully monitored.
- Inventory should be controlled so that wheat will be included in rations throughout the entire feeding period.
- Feed by weight not by volume.
- The value of damaged wheat is a simple relationship between corn and soybean meal prices (92 plus 8 percent, respectively).
- Proper storage will preserve the feeding value of damaged wheat.

## References

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**Table 1: Chemical composition and test weight of soft white winter wheat at various degrees of sprouting.**

| | Percentage of sprouted kernels | | | |
|---|---|---|---|---|
| | 0 | 25 | 50 | 75 |
| Bushel wt, lb | 59.3 | 56.2 | 55.8 | 54.2 |
| Crude protein, % | 10.5 | 10.6 | 10.9 | 10.9 |
| Crude fiber, % | 2.6 | 2.7 | 2.7 | 2.7 |
| Nitrogen-free extract, % | 74.8 | 74.4 | 73.7 | 73.8 |
| Ether extract, % | 1.32 | 1.40 | 1.37 | 1.42 |
| Ash, % | 1.33 | 1.53 | 1.54 | 1.60 |

Source: Murray, G.A. and D.M. Huber, 1968.

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

| | Non-sprouted | Sprouted |
|---|---|---|
| Bushel weight, lb | 60.4 | 55.9 |
| Crude protein, % | 12.32 | 13.16 |
| Fat, % | 0.79 | 0.88 |
| Crude fiber, % | 3.22 | 3.57 |

Murray and Huber, 1968.

**Table 3: Effect of test weight of hard red winter wheat on performance of finishing swine.**

| | Wheat test weight, lb | | |
|---|---|---|---|
| Item | 59 | 51 | 45 |
| ADG, lb/d | 1.78 | 1.79 | 1.81 |
| ADFI, lb/d | 6.53 | 6.98 | 7.16 |
| Feed/gain | 3.67 | 3.91 | 3.97 |

Hines and Pollman, 1982.

**Table 4: Weight gain and efficiency of yearling steers fed normal or sprouted wheat.**

| Proportion of sprouted wheat | Sprouted wheat kernels in ration | ADG, lb | Feed efficiency |
|---|---|---|---|
| 0% | 0% | 2.28 | 8.94 |
| 20% | 12% | 2.30 | 8.56 |
| 40% | 24% | 2.41 | 8.46 |
| 60% | 36% | 2.34 | 8.89 |

Murray and Huber, 1968.

**Table 5: Effect of level of sprouted wheat on performance of feedlot cattle.**

| | ADG, lb/day | Feed intake, lb/day | Feed efficiency |
|---|---|---|---|
| Barley control | 2.90 | 20.8 | 7.15 |
| 25% undamaged wheat | 2.97 | 20.9 | 7.03 |
| 50% undamaged wheat | 2.86 | 20.2 | 7.06 |
| 25% low-sprouted wheat | 2.81 | 19.7 | 6.96 |
| 50% low-sprouted wheat | 2.73 | 19.9 | 7.27 |
| 25% high-sprouted wheat | 2.99 | 20.9 | 6.99 |
| 50% high-sprouted wheat | 2.84 | 20.0 | 7.05 |

Washington State University, 1986.

Low-sprouted wheat = 9% sprouted kernels.
High-sprouted wheat = 58% sprouted kernels.

**Table 6: Weight gain and efficiency of weanling pigs fed normal or sprouted wheat.**

| Proportion of sprouted wheat | Sprouted wheat kernals in ration | ADG, lb/day | Feed efficiency | Relative value of sprouted wheat compared to control |
|---|---|---|---|---|
| 0% | 0% | 1.71 | 3.68 | |
| 20% | 10% | 1.65 | 3.83 | 92.5% |
| 40% | 20% | 1.64 | 3.95 | 87.5% |
| 60% | 30% | 1.72 | 3.99 | 85.6% |

Murray and Huber, 1968.



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