Feeding Value of Sprouted Grains

AS-647, (Revised September 1999)

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Adverse weather conditions can cause problems harvesting grain promptly. In North Dakota, it is not unusual to have wet weather conditions which delay harvest and can cause grain to sprout in the swath or in the head, making it unsuitable for use in the milling, brewing, and food industries. However, this grain can be fed to livestock.

Limited information on the feeding value of sprouted feed grains is available. There is some energy lost during the germination process as heat, CO_2, and moisture are produced. However, based on the animal feeding trials which have been conducted with sprouted grains, it does not appear that nutritive value of the grain is reduced or depressed. In some instances, it appears that sprouting may actually improve the feeding value of grain. Substantial sprouting will involve some reduction in energy available per kernel, with slight to moderate sprouting showing smaller effects on the feeding value of grains.

Swine and Poultry Research

Research conducted with swine at NDSU indicates that sprouted durum and hard red spring wheat support better levels of performance compared with barley-soybean meal control diets when fed in swine finishing rations (Table 1).

Table 1. Evaluation of sprouted grain in swine finishing rations.

	Barley Control	20% Sprouted Durum	40% Sprouted Durum	20% Sprouted HRSW	40% Sprouted HRSW
ADG (lbs/day)	1.65	1.98	1.72	1.68	1.65
Feed Efficiency	3.99	3.47	3.56	3.55	4.07
Bushel Weight, lb		58.6	56.7	57.4	56.0

NDSU data.

Average daily gain of all treatments was equal to or superior to the control ration. Feeding 20% sprouted durum ration significantly increased average daily gains compared with the other treatments. Feed efficiencies were similar for all treatments.

Additional work at NDSU utilized sprouted durum fed to early maturing market-type turkeys indicated no differences in average daily feed consumption or feed efficiency between treatments. Treatments consisted of hard red spring wheat, sprouted durum replacing wheat, and sprouted durum replacing corn.

Research conducted in Idaho with sprouted Gains wheat indicated the following reduction in energy value for swine as compared to normal non-sprouted wheat:

- 20% sprouted 92.5% of normal wheat
- 40% sprouted 87.2% of normal wheat
- 60% sprouted 85.6% of normal wheat

Wheat was used as 50% of a balanced growing-finishing ration for hogs. The wheat was 60% sprouted when fed so that sprouted kernels represented 0, 10, 20, or 30% of the growing-finishing ration. Pig gains were not affected but feed efficiencies were poorer (Table 2).

Table 2. Gains and feed conversions of weanling pigs fed normal or sprouted wheat.

Proportion of Sprouted Wheat	Sprouted Wheat in Ration	ADG (lbs/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	87.2%
60%	30%	1.72	3.99	85.6%
Idaho data.				

Data collected in the early 1950s at NDSU indicated that sprouted barley gave similar performance to non-sprouted barley when included in pig diets. Research conducted in Alberta with sprouted or frosted barley indicated no differences in pig performance when these grains were fed.

Use of Sprouted Grains for Cattle and Sheep

Value of sprouted grains for ruminants is similar to that of non-sprouted feed grains. Very little if any reduction in feeding value is noted in the sprouted grains. Data from Idaho, Washington, and Kansas, indicate that performance of cattle fed sprouted grains is similar to cattle fed normal grains.

Idaho researchers used non-sprouted and sprouted wheat at 60% of the ration, along with 38% roughage and 2% salt and minerals. Test weight of the sprouted wheat used in this study was 55.9 pounds per bushel compared with 60.4 pounds for the non-sprouted wheat. Nutrient levels in the sprouted wheat were higher compared to non-sprouted wheat, due to the concentration effect that occurs when energy is expended during the germination process (Table 3). No significant differences in cattle performance were detected when sprouted wheat was included in these diets (Table 4).

Table 3. Effect of sprouting on nutrient characteristics of wheat.

	Non-Sprouted	Sprouted
Bushel weight, lb	60.4	55.9
CP, %	12.32	13.16
Fat,%	0.79	0.88
Crude fiber, %	3.22	3.57
Idaho data.		

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

Proportion of "Sprouted" Wheat	Sprouted Wheat Kernels in Ration	ADG (lbs/day)	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
Idaho data.			

Data collected at Washington State University indicates that sprouted wheat compared favorably to a control barley-based finishing ration. Sound wheat (no sprouting), low-sprout wheat (9% sprouted kernels), and high-sprout wheat (58% sprouted kernels)were compared at either 25 or 50% of the diet. No differences in ADG, feed to gain, or carcass characteristics were detected (Table 5).

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

	ADG, (lbs/day)	Feed Intake (lbs/day)	Feed Efficiency
Barley Control	2.90	20.8	7.15
25% Sound Wheat	2.97	20.9	7.03
50% Sound Wheat	2.86	20.2	7.06
25% Low-Sprout Wheat	2.81	19.7	6.96
50% Low-Sprout Wheat	2.73	19.9	7.27
25% High Sprout Wheat	2.99	20.9	6.99
50% High Sprout Wheat	2.84	20.0	7.05
Washington State University, 1986. Low sprout wheat = 9% sprouted kernels, High sprout wheat = 58% sprouted kernels.			

Additional research conducted at Washington State University indicated that sheep ate more high-sprout wheat compared to sound wheat, but that digestibility and energy content of the sprouted grain was slightly lower compared with sound wheat.

Sprouted milo gave slightly better performance (ADG; feed efficiency) than non-sprouted milo in research conducted in Kansas (Table 6). The sprouted milo used in this trial had a test weight in excess of 60 pounds per bushel and was 51% sprouted.

Table 6. Feedlot performance of steers fed sprouted milo.

	Sprouted	Non-sprouted
ADG (lbs/day)	2.72	2.51
Feed Efficiency (lbs feed/lb gain)	8.93	9.18

Kansas State University, 1988.

The feeding value of sprouted and frosted barley was investigated in Alberta in 1987. Researchers found no difference in performance with frosted or sprouted grain compared with normal barley with no sprouting or frost damage (Table 7).

Table 7. Nutrient characteristics and feedlot performance of sprouted and frosted barleys.

	Sample					
	1	2	3	4	5	6
Type of Damage	None	Sprouted	Sprouted	Frosted	Frosted	Frosted
% Damaged Kernels	0.1	18.7	6.9	75	>75	>75
Bushel Weight, lb.	51	48	45	47	42	43
CP, %	12.1	13.3	11.0	11.4	11.7	12.3
	Steer Performance					
ADG, lb/day	2.71	2.84	2.68	2.79	2.62	2.97
Feed Intake, lb/day	17.95	17.82	17.51	16.87	17.49	18.13
Feed Efficiency (lbs feed/lb gain)	6.65	6.29	6.57	6.02	6.67	6.08

Research conducted in Montana with sprouted safflower indicated that the feed value was lower than feed barley. This may be expected since whole safflower has a relatively indigestible hull. At 10% of the ration, safflower had 92% the value of barley, but at 20% had only 70% the value of barley. Producers should limit sprouted safflower content of the diet to 10% or less in order to maintain acceptable levels of performance.

Other Management Consideration for Dealing with Sprouted Grain

Although molds and toxins were not reported to be a problem in any of the studies mentioned, the possibility exists that molds and toxins could develop if the sprouted grain is stored at moisture levels conducive to spoilage. Moisture level of sprouted grain should be tested before placing it in storage. If visible molds are present, a sample should be taken and sent to the Diagnostic Laboratory for mycotoxin analysis, prior to feeding. This is especially important if the moldy grain will be fed to young or gestating livestock.

Several options exist for storing sprouted grain which is too wet for normal storage channels, especially if the grain is intended to be fed to ruminants. Sprouted grain could be ensiled in a high moisture state, under anaerobic conditions. Bunker, trench, or upright silos could be used for this, along with commercial silage bags. If the sprouted grain is intended to be used in rations for cattle or sheep, producers may choose to mix or layer sprouted grain into bunker or trench silos as a more traditional silage crop is being ensiled.

Recommendations

- There appears to be little, if any, reduction in feeding value for sprouted grains.
- Grain should be processed similar to non-sprouted grain.
- Check for the presence of molds if the grain is stored in a bin. If there is any doubt about the presence of molds or toxins, have the feed screened by the Diagnostic Laboratory.
- Storage can be a problem with the wetter grain. Producers who can utilize high moisture grain should consider storage in a bunker, trench or upright silo. AgBags are also an option.
- An additional storage option for producers making silage is to simply layer or mix the sprouted grain with the silage as

its going into the bunker, similar to putting screenings in the silage pile.

- Care should be taken to ensure that grain is mixed evenly in the pile to ensure that digestive disturbances are not a problem and to prevent additional spoilage concerns.
- The amount of grain to blend in per ton of silage varies with desired end use of the mixture (feed for wintering cows vs. feed for growing or finishing cattle). If you do not have access to ration balancing software work with you local county agent, veterinarian, or nutritional professional to develop a balanced ration prior to ensiling.
- Bushel weight may be used as a rough indicator of feeding value, but in most cases the value of the sprouted grain is similar to sound grain.
- Feeding recommendations (maximum levels, etc.) should follow recommendations you normally follow for each respective grain.

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