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Corn grain is frequently harvested at a moisture content too high for safe keeping under conventional grain storage conditions. While this may be a desirable or necessary practice, the grain must be dried, stored under oxygen-limiting conditions, stored to produce ensiled grain or treated with an effective preservative to prevent spoilage during storage. Each of these methods is being used for preservation and storage of corn when harvested at a high-moisture content (20 to 30%) and used for feeding livestock. Total costs including storage structures, losses in processing and storage and comparative feeding value are factors involved in choice of processing and storage methods.

Several previous experiments have shown that feeding corn grain in the order of 25 to 30% moisture results in weight gain and feed efficiency equal to or slightly better than from corn dried to a moisture content for safe keeping under conventional storage conditions. More research has been conducted with untreated grain stored under various conditions than with grain treated with a preservative. Recently there has been considerable interest in treating high-moisture grains as a means of safe keeping for later feeding. Organic acids, primarily propionic or a mixture of propionic and acetic, have been shown to be effective for this purpose.

In the experiment reported here, cattle were fed high-grain finishing rations with corn grain harvested at a high moisture and dried or treated with propionic acid. The grain treatments were tested with cattle with and without a 36 mg zeranol implant at the beginning of the experiment.

Procedure

Twenty-four Hereford x Angus and 36 Hereford steers were purchased for the experiment. For a period of 1 to 2 weeks prior to the experiment, they were fed about 5 lb. per head daily of corn grain and a full feed of alfalfa-brome hay.

The steers were allotted into 4 pens of 15 each on basis of weight and breed group for two dietary treatments. Two pens of steers were fed corn grain which had been dried by a local elevator. The other two pens were fed corn grain which was treated with propionic acid by a commercial applicator. Each kind of corn grain was fed to appetite in the whole form along with chopped alfalfa hay. The hay was fed at 4 lb. per head daily at the beginning of the

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experiment. The steers would not consume the 4 lb. of hay daily when offered corn grain in amounts so some remained in the feed bunks at the next feeding. The daily level was reduced to 3 pounds. This lower level was consumed and was continued through the remainder of the experiment. The rations were considered to furnish an adequate amount of protein for cattle of the weight in the experiment. Therefore, no supplement was fed except for trace mineral salt and dicalcium phosphate offered on a free-access basis.

About 2000 bushels of wet corn were treated with propionic acid and stored in an enclosed wooden corn crib. The moisture content was about 22% at harvest. The acid was added at a rate of 15 lb. per ton of wet grain (0.75%). Storage was for about 8 months prior to beginning of the experiment. A similar quantity of corn was dried at a local elevator. However, the corn received from the elevator was not the same as that delivered. The dried corn was stored in steel bins.

At the beginning of the experiment, the steers in one of the pens from each grain treatment group were implanted with 36 mg zeranol.

Results

The cattle were fed for a period of 189 days before marketing. The ration of 3 lb. chopped alfalfa hay and a full feed of corn grain was considered to contain an adequate amount of protein for cattle of the weight used in this experiment. Other research would support this assumption. Therefore, no supplements were offered except for free access to trace mineral salt and dicalcium phosphate.

Upon termination of the experiment, some cattle showed signs of vitamin A deficiency. Weight gains during the last month were somewhat low and rather erratic in comparison to performance on previous weigh days. It was considered that performance at 158 days might more typically reflect comparative effects of treatments. Therefore, the data have been summarized on basis of weight and feed data for the experiment after 158 days.

Acid-treated vs. Dried Corn

Results of the experiment showing performance obtained from feeding corn grain harvested at about 22% moisture and treated with propionic acid at 15 lb. per ton of moist grain and from dried grain are shown in table 1. There were only small differences in rate of gain between the two treatment groups. Those fed the corn treated with 15 lb. of propionic acid per ton of moist grain consumed more corn.

The average dry matter content of the acid-treated grain as fed was 80% as determined by oven drying. This represented an increase of two percentage units from the dry matter content when harvested. The grain appeared to keep well during storage as evidenced by retention of color and the acid odor at feeding.

The dried grain had an average dry matter content as fed of 86%. On basis of the dry matter contents as fed, the cattle fed the acid-treated corn required 8.7% more corn dry matter per 100 lb. of gain. Since the amount of hay was fed at equal rates to both groups of steers and there were only small differences

in rates of gain, the difference in feed requirements between corn treatment groups was largely that of the corn grain. No measurements of shrinkage were taken for the methods of storage.

Zeranol

Results of the experiment showing effects of the implant treatment are also shown in table 1. Rate of gain for steers implanted with 36 mg zeranol exceeded that for implant controls by 0.25 lb. daily (10.2%) over the 158 days. The implanted steers consumed more corn daily but had lower feed requirements (8.4% less than implant controls).

Summary

Propionic acid at a rate of 15 lb. per ton of corn grain with about 22% moisture appeared to be effective in preserving the corn over a period of slightly over 1 year. Differences in weight gain were small, but steers fed acid-treated corn required 8.7% more corn dry matter per 100 lb. of gain.

Implanting steers of about 650 lb. initial weight with 36 mg zeranol resulted in an improved weight gain (10.2%) and feed efficiency (8.4%) over the 158-day experiment.

Other research data have often shown a more favorable response in feed efficiency for high-moisture corn, untreated or acid treated, in comparison to dried corn than obtained in this experiment. Further comparisons are planned between acid-treated and dried corn for finishing cattle with measures of shrinkage under the different methods.

Table 1. Corn Preservation and Implant Treatments for Finishing Cattle (June 10 to November 15, 1974--158 days)

	Corn treatment		Implant treatment	
	Acid-treated	Dried	Control	Zeranol (36 mg)
No. of animals	29	29	29	29
Init. filled wt., lb.	648	650	651	647
Final filled wt., lb.	1058	1051	1037	1073
Avg. daily gain, lb.	2.60	2.54	2.44	2.69
Avg. daily feed, lb.				
Corn				
As fed	21.98	18.36	20.06	20.28
Dry	17.58	16.47	---	---
Alfalfa hay	3.39	3.40	3.40	3.39
Feed/100 lb. gain, lb.				
Corn				
As fed	845	723	822	754
Dry	676	622	---	---
Alfalfa hay	130	135	139	126