Comparative Feeding Value of Sorghum Grain Reconstituted by Different Methods for Dairy Cows

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Story in Brief

Since grain comprises a significant part of dairy cow rations, it is important to obtain information on the effect of different methods of processing on its feeding value. In this trial, sorghum grain reconstituted by two different methods was compared to finely ground grain.

The grain was reconstituted by addition of water to 30% moisture content, with subsequent storage under anaerobic conditions, or by addition of water to give 28% moisture content plus 2% organic acids, with storage in an open bin. With grain intake equalized on a dry matter basis, milk yield was essentially the same for cows fed either reconstituted or finely ground grain. Feed efficiency values and apparent digestibility of ration components also were quite similar for all groups. On an "as-fed" basis, the feeding value of 100 lb. of reconstituted grain was only equal to about 80 lb. of finely ground grain.

The acid reconstituted grain was well preserved in an open bin where it was exposed to the air.

Introduction

In previous research at this station, the relationship between particle size of ground sorghum grain and milk production response of dairy cows was established (Okla MP-90, 1973). Since very finely ground grain resulted in maximum milk yield, grain so processed has been used as a control with which other processing treatments have been compared.

A very limited amount of research on the value of reconstituted sorghum grain for dairy cows has been reported. In Texas work (1973), no appreciable differences were observed in yield of 4% fat-corrected milk

due to reconstituting grain to 30% moisture content with water, or an acetic acid solution which resulted in 2% acetic acid in the grain, in comparison to dry ground grain. However, an increase of about 5% in efficiency of actual milk production above maintenance due to reconstituting with water was reported. At the Mississippi station (1973), no difference was observed in the production of cows fed high moisture sorghum grain preserved with 1.0-1.2% mixed organic acids (ChemStor) and those fed grain dried to 10-13% moisture.

The purpose of this trial was to provide a critical evaluation of production responses of dairy cows that may be expected from reconstituting sorghum grain, with and without the addition of organic acids, in comparison to that obtained by simply grinding dry grain to an optimum degree of fineness.

Materials and Methods

Thirty lactating cows (Holsteins and Aryshires) were used in a switchback trial to compare rations containing sorghum grain processed as follows: (a) finely ground (1/16 inch screen), (b) reconstituted to 30% moisture content, and (c) reconstituted to contain 28% moisture plus 2% organic acids (ChemStor). The grain reconstituted with water was stored under anaerobic conditions, whereas grain with acid added was exposed to the air.

Sorghum grain comprised 80% of the concentrate mixture (Table 1) which was fed in a 50:50 ratio with high quality alfalfa hay. The cows were challenge fed during a 2 to 3-week adjustment period in early lactation to establish the maximum production level for each cow. Then, at 8 to 9 weeks after calving the cows were assigned to the experimental rations, with allowances calculated to meet 1971 NRC requirements. Due consideration was given to body size, lactation number, milk yield and fat test in calculating allowances for the first period of the

Table 1. Concentrate Mixture

Ingredient	lb/Ton	Percent
Sorghum Grain	1,600	80.0
Soybean Meal (44%)	200	10.0
Barley, Crimped	110	5.5
Dried Molasses	60	3.0
Dicalcium Phosphate	20	1.0
Salt	10	0.5
	2,000	100.0

trial, and the amount for each cow reduced by 10% at the beginning of the second and third 6-week periods.

The reconstituted grain was rolled before feeding, and mixed with an appropriate amount of supplement at the time of feeding to give the same proportion of ingredients as in the dry ground mixture on a dry basis. Thus, the amount of grain fed was equalized on a dry matter basis.

Milk production was recorded twice daily, and samples taken at four consecutive milkings each week were composited for analysis of total solids and fat percentage. Body weights were recorded on three consecutive days at the beginning of the trial and during the last week of each comparison period. Digestibility of ration components was determined during the 6th week of each period by using chromic oxide as an indicator.

Results and Discussion

Milk production of cows fed reconstituted grain was nearly the same as that of cows fed finely ground grain (Table 2). Likewise, there was virtually no difference between the groups fed grain reconstituted with water in a conventional manner and grain reconstituted with organic acids added. Contrary to observations reported from another station, the fat percentage of milk from cows fed water reconstituted grain was slightly higher than that of cows fed finely ground or acid reconstituted grain. Although it was a consistent observation in this trial, the difference in fat test was not of sufficient magnitude to be considered of practical importance. The important point is that under feeding conditions where sufficient forage is fed to maintain normal milk composition, no depres-

Table 2. Responses of Cows Fed Sorghum Processed by Different Methods.

Item	Ration		
	Finely ground	H_2O recon.	Acid recon.
Feed DM intake			
Hay, lb/day	15.3	16.0	15.2
Grain, lb/day	15.5	16.2	15.5
Milk production			
Yield, lb/day	40.1	40.0	40.2
Fat test, %	3.75	3.81	3.74
Non-fat solids, %	8.91	8.94	8.95
Feed efficiency			
Milk/total feed DM	1.29	1.27	1.28
Milk/net feed DM	2.33	2.37	2.52
Weight change, lb/6 wk.	—3.6	0.6	11.0

sion of fat test should be expected as a result of feeding reconstituted sorghum grain.

Efficiency of feed utilization, expressed as pounds of milk produced per pound total feed dry matter intake was essentially the same for all treatment groups. Moreover, net feed efficiency, calculated as the amount of milk produced per unit of feed dry matter above that required for maintenance and body weight change, was similar for all groups. Apparent digestibility of different components of the total ration was also similar for all three rations (Table 2). Thus, all indications from this trial were that the feed dry matter was used with equal efficiency regardless of the manner in which the sorghum grain was processed.

Finely ground and reconstituted sorghum grain were found to have equal feeding value for lactating dairy cows on a dry matter basis. On an "as fed" basis, 125 to 130 lb. of reconstituted grain with 70% dry matter would be required to equal the feeding value of 100 lb. of ground sorghum grain with about 90% dry matter (i.e., $90 \div .7 = 128.5$). Or, one may calculate that it takes only 80 lb. of finely ground grain to equal 100 lb. of reconstituted grain on an "as fed" basis (i.e., $80 \times .9 = 72$ *vs.* $100 \times .7 = 70$ lb. dry matter).

Another point that merits consideration is that the comparison in this experiment was reconstituted grain with finely ground grain, obtained using a 1/16 inch hammermill screen. In previous trials, coarsly ground sorghum grain was found to be around 7 to 9% lower in feeding value than finely ground grain. Thus, it follows that reconstituted grain would be expected to have 7 to 9% higher feeding value than coarsely ground or dry rolled sorghum grain on a dry basis.

Table 3. Digestibility of Ration Components

Component	Ration		
	Control	H_2O recon.	Acid recon.
		—%—	
Dry Matter	63.4	64.9	62.8
Protein	61.5	63.9	62.3
Organic Matter	65.9	67.8	65.1