Dry Heat Processing of Sorghum Grain For Finishing Beef Cattle

Don Croka and Donald G. Wagner

Story in Brief

Two methods of processing milo in high concentrate rations for finishing beef cattle were compared. The treatments investigated were 1) micronized milo and 2) dry rolled milo. Two feeding trials were conducted. Trial 1 was a 150 day feeding trial with steers and trial 2 an 84 day feeding experiment with heifers. In trial 1, average daily feed intakes were 16.6 and 18.4 lb. (90 percent D.M. basis) on the micronized and dry rolled milo treatments, respectively. In trial 2, the intakes were 17.8 and 19.6 lb. on the same treatments, respectively.

Average daily gains were 2.74 and 2.75 lb. on the micronized vs. dry rolled treatment in trial 1 and 2.34 and 2.40 lb. in trial 2. The pounds of feed required per pound of gain were 6.05 vs. 6.72 in trial 1 and 7.67 vs. 8.42 pounds in trial 2 for micronized and dry rolled treatments, respectively. The values for average daily feed intake, daily gain and pounds of feed per pound of gain were not significantly different ($P>.05$) between treatments in either trial, although feed per unit of gain in trial 1 and feed intake in trial 2 approached significance ($P<.10$).

Introduction

Grains are added to the rations of finishing cattle to increase digestible energy intake. Modern day finishing rations may contain as much as 80 percent grain. The grain may supply up to 90 percent of the usable energy of the ration. Any improvement in the efficiency of utilization of the grain will be reflected in reduced feed requirement and possibly improved gain. Processing imparts certain physical and chemical changes which increase nutrient digestibility. Until recent years, dry heat processing of sorghum grain has not been widely used. The purpose of these studies, therefore, was to investigate the use of dry heat treatment, micronization, for processing sorghum grain in finishing rations for feedlot cattle.

Materials and Methods

Two trials were conducted to compare micronized and dry rolled sorghum grain. In the first trial, 16 Charolais crossbred feeder steers averaging 684 pounds were selected. They were gradually adapted to a

90 percent concentrate ration during a three week preliminary period. After the preliminary period, the steers were randomly assigned to two treatments with four animals per pen and two pens per treatment. Self-feeders were used in this trial.

The second trial was conducted with thirty Angus X Hereford cross-bred feeder heifers averaging 648 pounds. The heifers were adapted to a 90 percent concentrate ration during a three week preliminary period. Following the preliminary period, the heifers were randomly allotted to the two treatments with three animals per pen and five pens per treatment. The treatments used in the two trials were as follows:

1) Dry rolled milo
2) Micronized milo

In this trial the heifers were fed daily in quantities which permitted availability of feed until the next feeding.

The equipment used for micronizing the milo was a reciprocating steel table. The table was ½ inch thick, 46½ inches wide and 13 feet long activated by a ½-horsepower electric motor. Eight gas-fired infrared generators, rated at 50,000 BTU per hour each and suspended approximately 6 inches above the table, were used to heat the milo as it passed over the table. Before being metered onto the table, the milo was cleaned by using a Clipper cleaner, model 27, to assure an even flow free of foreign materials for efficient operation of the machine. The milo after being passed under the gas-fired generators then dropped directly through a 8½ X 30 inch roller mill with a roller spacing of .003 inch.

The dry rolled milo was cleaned and rolled through the same roller mill as the micronized milo.

The composition of the experimental rations are given in Table 1.

Table 1. Ration Composition[1]

Ingredient	Dry Rolled Milo	Micronized Milo
Milo	80.0	80.0
Cottonseed hulls	5.0	5.0
Alfalfa meal pellets	5.0	5.0
Molasses	4.0	4.0
Soybean meal	4.0	4.0
Urea	0.7	0.7
Salt	0.5	0.5
Dicalcium Phosphate	0.4	0.4
Calcium carbonate	0.4	0.4
Aurofac-50	225 gm	225 gm
Stilbestrol-2	600 gm	600 gm
Vitamin A (30,000 IU/gm)	200 gm	200 gm

[1] Formulated on a 90% D.M. basis.

The rations were all formulated to contain the composition indicated on a 90 percent D.M. basis. The experimental rations were formulated to contain 90 percent concentrate-10 percent roughage. At two separate times during each feeding trial, rumen samples were collected from each animal. The rumen fluid pH values were determined immediately, and a small amount was saved for VFA analyses.

Initial and final weights were taken full with a 4 percent pencil shrink. Intermediate full weights were recorded every 28 days for both trials. The feeding period lasted 150 days for trial 1 and 84 days for trial 2. At the termination of the feeding trials, carcass data was collected from each animal.

Results

The proximate analysis data for the milo used for both treatments are presented in Table 2. The average moisture content for the micronized milo was 9.7 percent compared to 12.7 percent for the dry rolled milo. The average density for the micronized milo was 25 lb. per bushel.

Trial 1

The feedlot performance data for the 150 day feeding period are shown in Table 3. The average daily feed intakes (90 percent D.M.) on the micronized and dry rolled treatments were 16.6 and 18.4 lb., respectively ($P>.05$). The average daily gains on the micronized and dry rolled treatments were 2.74 and 2.75 lb., respectively. ($P>.05$). The pounds of feed required per pound of gain for the micronized and dry rolled treatments were 6.05 and 6.72, respectively. The difference in feed requirement per unit of gain approached significance ($P<.10$). The carcass data for this trial are shown in Table 4. There were no significant differences ($P>.05$) between treatments for any of the carcass traits measured.

Rumen pH values on the micronized and dry rolled treatments were 5.5 and 5.7 for the first sampling and 5.5 and 5.5 for the second sampl-

Table 2. Promixate Analysis of Milo

Feed[1]	Dry Matter	Crude Protein[1,2]	Ash[1]	Ether Extract[1]	Total CHO[1,3]
Dry rolled	87.3	10.66	0.87	3.46	83.97
Micronized	90.3	11.42	1.68	2.93	84.03

[1] Values expressed on 100% D.M. basis.
[2] 6.25 X percent Nitrogen=percent crude protein.
[3] 100—(Sum of figures for crude protein, ash and ether extract).

Table 3. Feedlot Performance

	Dry Rolled	Micronized
Trial 1 (150 days)		
No. of animals	8	8
Initial weight, lb.	684	642
Final weight, lb.	1082	1082
Daily feed, lb.[1,2]	18.4	16.6
Daily gain, lb.[2]	2.75	2.74
Feed/lb. gain, lb.[1,2]	6.72[1]	6.05[2]
Trial 2 (84 days)		
No. of animals	15	15
Initial weight, lb.	638	658
Final weight, lb.	840	658
Daily feed, lb.[1,2]	19.6[1]	17.8[2]
Daily gain, lb.[2]	2.40	2.34
Feed/lb. gain, lb.[1,2]	8.40	7.67

[1] Expressed on a 90% D.M. basis.
[2] Values with different superscripts were significantly different at the .10 level of probability.

ing, respectively. These values did not differ significantly between treatments.

Trial 2

The feedlot performance data for the 84 day feeding period are presented in Table 3. Average daily feed intake (90 percent D.M) on the micronized and dry rolled treatments were 17.8 and 19.6 lb., respectively, ($P<.10$). The average daily gains were 2.34 and 2.40 lb., and the pounds of feed required per pound of gain were 7.67 and 8.42 (90 percent D.M.), respectively on the micronized and dry rolled milo treatments.

Carcass characteristics, percent cutability and dressing percentage are shown in Table 4. There were no significant differences ($P>.05$) observed between carcass traits.

Rumen fluid pH values obtained on the micronized and dry rolled treatments were 5.6 and 5.7 for the first sampling and 5.7 and 5.8 for the second sampling, respectively ($P>.05$).

Discussion

As indicated, the average daily gains were quite similar on the dry rolled and micronized milo treatments in both experiments, being 2.75 vs. 2.74 lb. in trial 1 and 2.40 vs. 2.34 in trial 2 on the dry rolled and micronized milo treatments, respectively. In general, feed intakes and gains were depressed on the micronized milo treatment early in the feeding period in both trials with adaptation and compensation occur-

Table 4. Slaughter and Carcass Information

	Dry Rolled	Micronized
Trial 1		
Dressing, %[1]	67.3	66.6
Carcass grade[2]	7.4	7.3
Ribeye area, sq. in.	14.92	13.97
Fat thickness, in.[3]	0.51	0.57
Marbling[4]	10.0	10.1
Cutability, %	51.61	51.10
Trial 2		
Dressing, %[1]	64.4	64.2
Carcass grade[2]	8.5	7.9
Ribeye area, sq. in.	10.99	11.09
Fat thickness, in.[3]	0.74	0.71
Marbling[4]	12.1	11.1
Cutability, %	48.90	49.43

[1] Calculated on basis of live shrunk weight and hot carcass weight.
[2] U.S.D.A. carcass grade converted to following numerical designations: high prime-15, average prime-14, low prime-13, high choice-12, average choice-11, low choice-10, high good-9, average good-8, low good-7.
[3] Average of three measurements determined on tracing at the 12th rib.
[4] Marbling scores: 1 to 30, 11=slight, 14=small, 17=modest.

ring thereafter. Possibly a higher level of roughage during this period would have been beneficial.

The average daily intake (90 percent D.M.) was 1.8 lb. lower on the micronized milo treatment in both trials 1 and 2. A lower feed intake with nearly the same rate of gain is generally accompanied by a lower feed requirement per unit of gain. In this respect, the micronized milo showed a trend to be more efficient than dry rolled milo requiring .67 and .75 lb. less feed per pound of gain in trials 1 and 2, respectively. These reductions in feed/unit of gain correspond to 11.1 and 9.8 percent improvements in feed efficiency (total ration) for the micronized milo over the dry rolled milo in trials 1 and 2, respectively.

Assuming that the improvements in feed utilization can be attributed to processing of the milo fraction of the ration (80 percent milo in each ration), the corresponding improvement would be 13.9 percent (11.1/80) and 12.2 percent (9.8/80) for the micronized grain in trials 1 and 2, respectively. The magnitude of such improvements would compare favorable with improvements obtained from some other methods of milo processing previously studied.