Influence of Steaming Time on the Nutritive Value of Steam Flaked Milo

Donald G. Wagner, William Schneider and Robert Renbarger

Story in Brief

Five methods of processing milo were compared in high concentrate feedlot rations to study the influence of steaming time under atmospheric conditions on the feeding value of steam flaked milo. The milo treatments investigated were (1) dry rolled, (2) steamed 15 minutes—rolled, (3) steamed 25 minutes—rolled, (4) steamed 35 minutes—rolled and (5) steamed 45 minutes—rolled.

In a 112 day feeding experiment, the steam flaked treatments each produced a significant ($P<.05$) improvement in feed efficiency over dry rolled milo. The improvements in feed efficiency were 10.5, 12.3, 7.0 and 12.3 percent for the 15, 25, 35, and 45 minute steam flaked treatments, respectively over dry rolled milo.

Introduction

Previous work at various experiment stations, including Oklahoma, has shown that steam flaking of milo improves its nutritive value for fattening beef cattle. Hale *et al.*, (1966) reported that milo which was steamed for about 20-25 minutes, followed by rolling into a flake, produced significantly greater gains and feed efficiency than dry processed milo. Improvements in feed efficiency have also been noted for some other grains. Steam flaking is now a rather common method of processing grain, particularly milo, in Oklahoma feedlots. Based on the above and other reports, a wide variety of steaming times, roller mill volumes (tons of grain processed through a given roller mill per unit of time), and degrees of flaking are now in use in the feedlot industry, although many of these variations are documented by little or no research evidence. Steam exposure times may vary from about 10 minutes or less to well over one hour and roller mill volumes may vary several fold. The objective of this experiment, therefore, was to determine the influence of steam time under atmospheric conditions on the feeding value of milo for fattening beef cattle.

*In cooperation with USDA Agri. Research Service, Animal Husbandry Research Division.

Materials and Methods

Sixty choice Angus and Hereford feeder steers, weighing approximately 500 pounds, were selected. The steers were gradually adapted to 90 percent concentrate ration during a three-week preliminary period by gradually decreasing the quantity of roughage in the ration. Stilbestrol was implanted at the 12 mg level prior to placing the animals on the experimental rations and again after 84 days on feed.

Following the preliminary period, the steers were blocked into four groups on the basis of breed and weight and then randomly allotted within blocks to five treatments with three steers per pen (12 animals per treatment). The milo for each treatment was processed as follows:

1 Dry rolled
2 Steamed 15 minutes — rolled
3 " 25 " — "
4 " 35 " — "
5 " 45 " — "

The milo was rolled through an 18 X 24" roller mill with a cold roller spacing of .003 inch. The experimental rations consisted of a 90 percent concentrate mixture as indicated in Table 1. The ration ingredients other than milo were combined in a premix and mixed with the processed grain prior to feeding. Rations were formulated and mixed on a 90 percent D.M. basis. Feed was prepared and fed daily in amounts which would permit availability of feed until the next feeding. Unconsumed portions were weighed and removed to permit fresh feed at all times.

Results and Discussion

The proximate analysis of the processed milo is shown in Table 2 and the particle size and density data in Table 3. As noted, little dif-

Table 1. Ration Composition

Ingredient	Amount[1] Percent
Milo	84.0
Ground alfalfa hay	4.8
Cottonseed hulls	4.8
Cottonseed meal	4.6
Urea	0.6
Salt	0.6
Bonemeal	0.6
	100.0
Added per lb. of ration:	
Vitamin A	1600 I.U.
Aureomycin	5 mg

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

Table 2. Proximate Analysis (Dry Matter Basis)

Feed	Dry[1] Matter	Ash[2]	Crude[2] Protein	Ether[2] Extract	Carbohydrate[3]
	Percent				
Milo					
Dry rolled	85.4	1.65	9.50	3.13	85.72
Steam 15 min. flaked	80.2	1.33	9.26	2.57	86.84
Steam 25 min. flaked	80.5	1.44	9.23	2.41	86.72
Steam 35 min. flaked	80.3	1.38	9.20	2.42	87.00
Steam 45 min. flaked	80.1	1.32	9.12	2.45	87.11

[1] Average of determinations of 12 samples.
[2] Average of 2 determinations.
[3] 100—(Sum of figures reported for ash, crude protein, and ether extract).

Table 3. Particle Size and Density of Milo

Process	Screen Size 8mm	4mm	2mm	1mm	500 Mics.	250 Mics.	250 Mics.	Wt.[1] Per Bu.
	Percent Retained on Screen						Thru	Lb.
Dry rolled	0	.1	42.4	33.7	15.0	6.2	2.6	37.0
Steam 15 min. flaked	.1	86.0	13.6	.1	.1	.1	--	19.0
Steam 25 min. flaked	.1	84.7	14.9	.1	.1	.1	--	18.5
Steam 35 min. flaked	.1	86.3	13.3	.1	.1	.1	--	18.5
Steam 45 min. flaked	.1	79.4	16.7	.1	.1	.1	--	17.5

[1] Test weights based on 90% dry matter basis.

ference existed in the moisture content of the milo for the different steam treatments or in particle size distribution, except in that the 45 minute steaming times caused some increase in finer patricles, due apparently to somewhat increased flake fragility.

The feedlot performance data for the first 112 days of the experiment are depicted in Table 4. Data are reported for only the first 112 days of the experiment because health problems were encountered with the cattle beyond that point which caused serious disruption of the experiment. Due to unknown reasons, polioencephalomalacia was observed in numerous cattle in all treatments, causing considerable weight loss and reduced performance.

During the first 112 days, the steam flaked treatments produced significantly ($P<.05$) greater feed efficiency than dry rolled milo. The improvements in feed efficiency were 10.5, 12.3, 7.0 and 12.3 percent for the 15, 25, 35 and 45 minute steam flaked treatments, respectively. Further studies are in progress to determine the relationships between steaming time, roller mill pressure or volume, level of gelatinization, and

other variables which may influence the efficiency of nutrient utilizatior from steam processed grains and to more fully elucidate the manner ir which nutrient utilization is improved by steam processing.

Table 4. Feedlot Performance (112 Days)

	Dry Rolled	Steam 15 min. Flaked	Steam 25 min. Flaked	Steam 35 min. Flaked	Steam 45 min Flake
No. steers	12	12	12	12	12
Initial weight, lb.[1]	487	500	490	506	506
112 day weight, lb.[2]	773	782	773	800	823
Daily gain, lb.	2.54	2.52	2.53	2.62	2.8
% change[3]	----	—.7	—.4	+3.1	+11.4
Daily feed, lb.	14.3	12.9	12.8	13.7	14.9
Feed/lb. gain, lb.[4]	5.6[a]	5.1[b,c]	5.0[b]	5.3[c]	5.0
% change[3]	----	+10.5	+12.3	+7.0	+12.3

[1] Cattle were taken off feed and water 16 hours prior to weighing.
[2] Cattle were taken off water only, 16 hours prior to weighing.
[3] Improvement compared with dry rolled milo.
[4] Any 2 averages without a common letter differ significantly ($P < .05$).

Studies on the Nutritive Value of High Moisture Milo Head Chop

Donald G. Wagner, William Schneider and Robert Renbarger

Story in Brief

Two treatments of high moisture milo head chop were compared with dry rolled milo to determine the relative feeding value of such material for fattening beef cattle. The high moisture milo head chop was prepared by harvesting the entire head and a portion of the stalk when the grain contained approximately 30 percent moisture. The head chop material consisted of approximately 70 percent grain and was fed with two different supplements in comparison with a 90 percent concentrate ration containing dry rolled milo. Both head chop treatments produced significantly ($P < .05$) faster rates of gain than the dry rolled

*In cooperation with USDA Agri. Research Service, Animal Husbandry Research Division.