Influence Of Storage Time And Moisture Level On Feeding Value Of Whole Reconstituted Milo For Fattening Cattle

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Story in Brief

Five methods of processing milo were compared in high concentrate (90 percent) feedlot rations with finishing heifers to study the influence of storage time and moisture level on the feeding value of whole reconstituted milo. The treatments compared were as follows: (1) dry rolled, (2) reconstituted whole—stored 10 days at 30 percent moisture; (3) reconstituted whole—stored 10 days at 38 percent moisture, (4) reconstituted whole—stored 20 days at 30 percent moisture and (5) reconstituted whole—stored 20 days at 38 percent moisture. Dry milo which was reconstituted in the whole form and stored for 10 days—30 percent H_2O, 10 days—38 percent H_2O, 20 days—30 percent H_2O or 20 days—38 percent H_2O each showed significant ($P<.05$) improvements in feed efficiency of 12.9, 15.6, 15.6, and 15.6 percent, respectively, over dry rolled milo rations. No significant differences ($P<.05$) in feed efficiency existed among the four reconstituted milo treatments.

Introduction

Previous work at Oklahoma and Texas has indicated that reconstitution of milo grain stored in the whole form improves the utilization of milo substantially by fattening cattle. The influence of storage time and moisture level during storage on the feeding value of milo has not been well established. Previous work at Oklahoma has indicated that higher moisture levels, approximately 30 percent or more, and storage times of approximately 20 days or longer produced the greatest improvement in feed utilization. Moisture contents of 30 percent produced significantly greater improvements in feed utilization than reconstitution at moisture levels of 22 percent; however, reconstitution at moisture levels above 30 percent, for example 38 percent, tend to produce only a slight additional response beyond that obtained with 30 percent moisture.

Numerous factors might influence the storage time required, including moisture level, temperature, type of grain and the like. Shorter storage times would be highly advantageous for lowering the cost of reconstitution in that more grain could be cycled through an expensive storage structure in a given time. On the other hand, attempts to reconstitute whole sorghum grain using very high moisture levels presents practical problems in obtaining the desired grain moisture content in a satisfactory period of time. The objective of this experiment, therefore, was to determine if very high moisture levels would be beneficial in reducing the time required to obtain the benefits of reconstitution.

Materials and Methods

Choice Angus heifers, weighing approximately 440 pounds, were selected for use in a 140 day feeding period. The heifers were gradually adapted to a high-concentrate (90 percent) ration during a three week preliminary period. At the beginning of the preliminary period, the heifers were vaccinated for IBR, blackleg-malignant edema, leptospirosis and parainfluenza.

Following the preliminary period, the heifers to be used were divided into two blocks on the basis of weight. A slaughter sample was selected at random from each block to permit net energy values of the experimental rations to be determined by specific gravity using the comparative slaughter technique. The remaining 50 heifers were then allotted within blocks to five treatments, giving five animals per pen and 10 animals per treatment. The milo for each of the treatments was processed as follows:

1. Dry rolled
2. Reconstituted in whole form—stored 10 days at 30 percent moisture
3. Reconstituted in whole form—stored 10 days at 38 percent moisture
4. Reconstituted in whole form—stored 20 days at 30 percent moisture
5. Reconstituted in whole form—stored 20 days at 38 percent moisture

Reconstituted milo containing 30 percent moisture was acquired by mixing dry milo with water and stirring in a cement mixer for approximately 45 minutes. Reconstituted milo containing approximately 38 percent moisture was obtained by steeping or soaking dry milo in water for 12 hours. All reconstituted milo treatments were then stored in air tight plastic bags for the number of days indicated. Prior to feeding, the milo in all treatments was rolled through a 12 x 18 inch roller mill.

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 then mixed with the processed milo in a combination of 84 percent milo and 16 percent premix on a 90 percent dry matter basis at the time of feeding. Samples were collected at frequent intervals to permit accurate formulation of ingredients on a 90 percent dry matter basis. The rations were fed one time daily in quantities which would assure availability of feed until the next feeding. Unconsumed feed was weighed back each day to assure a supply of fresh feed at all times.

Stilbestrol was implanted at the 12 mg level at the beginning of the feeding period. Initial and final weights were taken after a 16 hour shrink off feed and water.

Results and Discussion

The proximate analysis and moisture composition data for the processed milo are shown in Table 2. As indicated, the actual moisture con-

Table 1. Ration Composition

Ingredient	Amount[1]
	%
Milo	84.0
Dehydrated alfalfa meal pellets	5.0
Cottonseed hulls	5.0
Soybean meal (44%)	4.2
Urea (45% N)	0.6
Salt	0.4
Dicalcium phosphate	0.4
Calcium carbonate	0.4
	100.0
Add per lb. of ration:	
Vitamin A	1600I.U.
Aureomycin	5 mg.

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

Table 2. Proximate Analysis

Feed	Dry Matter	Crude Protein	Ash	Ether Extract	Carbohydrates
	%				
Milo		10.74[1]	1.20[1]	2.79[1]	85.27[1,2]
Dry rolled	85.3				
10 Days — 30% H_2O	71.1				
10 Days — 38% H_2O	63.4				
20 Days — 30% H_2O	70.7				
20 Days — 38% H_2O	64.2				

[1] Values expressed on a 100% D.M. basis.
[2] 100 – (Sum of figures for crude protein, ash and ether extract).

tents were 28.9, 36.6, 29.3, and 35.8 percent for the 10 Day—30 percent, 10 Day—38 percent, 20 day—30 percent and 20 day—38 percent treatments, respectively, being slightly lower than intended in all cases.

The particle size and density data are presented in Table 3. In all cases, the reconstituted milo treatments were much bulkier than the dry rolled milo, with little difference among the wet treatments.

The feedlot performance data for feed intake, rate of gain and feed efficiency are given in Table 4. No significant differences existed among treatments in rate of gain. The concern is occasionally expressed by cattle feeders that reconstituted feeds are sometimes detrimental to feed intakes and rate of gain. As noted in Table 4, the daily gains on all four wet or reconstituted treatments were at least as high as on the dry rolled milo treatment. Problems associated with poor gains on reconstituted grains as sometimes observed in the field are probably associated with such factors as improper ration formulation, feed spoilage, poor bunk line management and the like. Feed intakes tended, however, to be lower, although not significantly different at the .05 level, on the four wet treat-

Table 3. Particle Size and Density of Processed Milo

Process	Screen Size						Wt.[1] per Bu.
	4.0 mm	2.0 mm	1.0 mm	500 micron	250 micron	250 micron	
		Percent Retained on Screen				Through	lb.
Dry rolled	0	8.4	66.8	12.1	11.8	0.9	48
10 Day — 30% H_2O	36.2	43.5	8.3	5.4	5.8	0.8	33
10 " — 38% "	33.1	46.8	8.7	6.8	4.4	0.2	33
20 " — 30% "	35.1	40.5	9.1	7.0	8.0	0.3	35
20 " — 38% "	16.9	56.6	9.7	10.4	6.4	0.1	35

[1] Test weights reported on a 90% D.M. basis.

	Dry Rolled	Reconstituted Whole & Stored			
		10 Days		20 Days	
		30% H_2O	38% H_2O	30% H_2O	38% H_2O
No heifers	10	10	10	10	10
Initial weight, lb.	440	444	438	438	440
Final weight, lb.	773	805	787	800	778
Daily feed, lb.[1]	17.1	16.7	15.6	16.3	15.1
Daily gain, lb.	2.38	2.58	2.50	2.59	2.42
Feed/lb. gain, lb.[2]	7.43[1]	6.47[2]	6.27[2]	6.28[2]	6.28[2]
% Improvement in[3] Feed Efficiency		+12.9	+15.6	+15.6	+15.6

[1] Expressed on a 90% D.M. basis.
[2] Any two averages without a common letter differ significantly ($P \leq .05$)
[3] Improvement over dry rolled.

Table 5. Slaughter and Carcass Information

	Dry Rolled	Reconstituted Whole & Stored 10 Days 30%	10 Days 38%	20 Days 30%	20 Days 38%
Dressing %[1,5]	61.8	61.6	61.5	62.0	62.6
Carcass grade[2,5]	9.5	10.0	9.6	9.7	10.3
Ribeye area, sq. in.[5]	10.4	10.8	10.2	10.9	11.0
Fat Thickness, in.[3,5]	0.75	0.74	0.82	0.70	0.69
Marbling[4,5]	12.1	13.6	12.7	13.0	15.2

[1] Calculated on basis of live shrunk weight and chilled carcass weight.
[2] U.S.D.A. carcass grade converted to following numeral 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.
[5] None of the above differences were significant at .05 level of probability.

ments. The lower feed intakes on the reconstituted treatments were reflected in significantly better ($P<.05$) feed efficiencies of 12.9, 15.6, 15.6 and 15.6 percent on the 10 day—30 percent, 10 day—38 percent, 20 day—30 percent and 20 day—38 percent treatments, respectively over dry rolled milo.

No statistically significant differences in feed efficiencies existed, however, among the four reconstituted milo treatments. Net energy values, using the comparative slaughter technique, are also being determined on the above treatments. Furthermore, dry rolled milo and 20 day—38 percent reconstituted milo treatments are being compared using respiration calorimetry. Although no statistically significant differences in feed efficiency existed among the four reconstituted treatments in this experiment, the data in this study together with some additional laboratory and animal performance data might suggest that longer storage times, approximately 20 days or more, may be most beneficial for deriving the maximum benefit from reconstitution of milo at 30 percent moisture, and that increased moisture levels may decrease the time required. From a practical standpoint, however, it would appear questionable if moisture levels much over 30 percent can be justified due to the difficulties associated with achieving moisture contents as high as 38 or 40 percent when reconstituting milo.

Carcass characteristics and dressing percentage were not significantly affected by processing method ($P<.05$).