Influence of Storage Time on Feeding Value of Whole Reconstituted Milo

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Story in Brief

Five methods of processing milo were compared in high concentrate feedlot rations with finishing heifers to study the influence of storage time on the feeding value of reconstituted milo and to determine the value of steeping whole milo. The treatments compared were as follows: (1) dry rolled, (2) reconstituted whole to 30 percent moisture—stored 5 days, (3) reconstituted whole to 30 percent moisture—stored 10 days, (4) reconstituted whole to 30 percent moisture—stored 20 days, and (5) steeped in water for 48 hours, followed by draining 24 hours prior to feeding. Dry milo which was reconstituted in the whole form to a moisture level of 30 percent and stored for either 5, 10, or 20 days or steeped in water for 48 hours showed improvements in feed efficiency of 3.7, 3.0, 12.0, and 7.2 percent, respectively over dry rolled milo. Little difference was observed in rate of gain among treatments. The results of this experiment would indicate that whole milo which is reconstituted to a moisture level of 30 percent should be stored for a minimum of 20 days to obtain the desired improvement in feed efficiency.

Introduction

Previous work at Oklahoma and Texas has shown that reconstitution of milo grain substantially improves feed efficiency. In most studies with reconstituted milo, the milo has been reconstituted for about 20 days or longer at moisture levels of approximately 30 percent. The influence of storage time on the feeding value of reconstituted milo has not been well determined. Other variables such as the moisture content of the grain during storage may also influence the length of storage time required. Shorter storage times would be highly advantageous for lowering the cost of reconstitution in that more grain could be cycled through

a storage structure in any given period of time. The objective of this experiment, therefore, was to determine the influence of storage time on the feeding value of milo reconstituted in the whole form to a moisture level of 30 percent and to determine the effect of steeping milo in water for 48 hours on its relative feeding value.

Materials and Methods

Fifty choice Angus and Angus-Hereford crossbred heifers, weighing approximately 440 pounds were used in a 114 day feeding trial. The heifers were gradually adapted to a high-concentrate ration during a three week preliminary period. At the beginning of the preliminary period, the animals were vaccinated for IBR, blackleg-malignant edema, leptospirosis, and parainfluenza. Stilbestrol was implanted at the 12 mg level prior to placing the animals on the experimental rations.

Following the preliminary period, the heifers were divided into two blocks on the basis of shrunk weight and then randomly allotted within blocks to five treatments. Two pens of five heifers each were assigned to each treatment. The milo for each treatment was processed as follows:

1 Dry rolled
2 Reconstituted in whole form at 30 percent moisture — stored 5 days.
3 Reconstituted in whole form at 30 percent moisture — stored 10 days.
4 Reconstituted in whole form at 30 percent moisture — stored 20 days.
5 Steeped in water for 48 hours, followed by draining 24 hours prior to feeding.

The milo which was reconstituted and stored at 30 percent moisture was placed in air tight plastic bags containing 90 pounds per bag for the number of days indicated. All milo treatments were rolled through a 12 x 18 inch roller mill prior to feeding. The experimental rations consisted of a 90 percent concentrate mixture as indicated in Table 1. All 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. Feed samples were obtained at frequent intervals to permit accurate ration formulation of ingredients on a 90 percent dry matter basis. The rations were fed daily in amounts which would assure availability of feed until the next feeding. Unconsumed feed was weighed back daily to assure a fresh feed supply at all times.

Table 1. Ration Composition

Ingredient	Amount[1] Percent
Milo	84.0
Dehydrated alfalfa meal pellets	5.0
Cottonseed hulls	5.0
Soybean meal (44%)	4.2
Urea (282)	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.

Initial and final cattle weights were taken after a 16 hour overnight shrink off feed and water. Intermediate weights were taken at 28 day intervals with the animals being removed from water only (feed available) 16 hours prior to weighing.

At the termination of the feeding period, the animals were slaughtered for collection of carcass data. Carcass specific gravity determinations were also made on each carcass to permit determination of net energy values.

Results and Discussion

The proximate analysis of the processed milo is shown in Table 2. As indicated, the average moisture contents of the dry rolled, 5-day reconstituted, 10-day reconstituted, 20-day reconstituted, and steeped processed milo were 13.0, 30.9, 30.0, 28.6, and 39.3 percent, respectively.

The particle size and density data for the processed milo treatments are presented in Table 3. As noted, the wet milo treatments were much bulkier than the dry processed milo, with little difference among the wet grains except in that the steeped milo produced the lowest weight per bushel.

The feedlot performance data for feed intake, rate of gain and feed efficiency are shown in Table 4. Little difference existed among treatments in rate of gain. Gain was not depressed on the steeped milo treatment in which the milo contained approximately 40 percent moisture. The concern is sometimes expressed by some cattle feeders that high ration moisture contents are detrimental to feed intakes and rates of gain. Such did not appear to be the case for the moisture levels used in this experiment. Significant ($P<.05$) differences were observed in daily

Table 2. Proximate Analysis (Dry Matter Basis)

Process	Dry[1] Matter	Ash[2]	Crude[2] Protein	Ether[2] Extract	Carbohydrates[3]
			Percent		
Dry Rolled	87.0	1.5	10.4	3.2	84.9
Reconstituted Stored 5 days	69.1	1.6	10.7	3.4	84.3
Reconstituted Stored 10 days	70.0	1.6	10.8	3.1	84.5
Stored 20 days	71.4	1.6	10.6	3.3	84.5
Steeped	60.7	1.5	10.1	3.4	85.0

[1] Average of 12 determinations
[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 Processed Milo

Process	Screen Size 4.0mm	2.0mm	1.0mm	500 Micron	250 Micron	250 Micron	Wt.[1] Per Bu.
	Percent Retained on Screen					Through	Lb.
Dry Rolled	0	16.1	67.1	8.7	6.9	1.2	41.6
Reconstituted Stored 5 days	61.8	31.5	2.2	3.4	1.1	0.0	28.4
Reconstituted Stored 10 days	60.0	35.6	2.2	2.2	0.0	0.0	29.6
Reconstituted Stored 20 days	63.7	27.5	3.3	4.4	1.1	0.0	29.4
Steeped	59.3	36.3	2.2	1.1	1.1	0.0	25.0

[1] Test weights reported on a 90% Dry Matter Basis.

Table 4. Feedlot Performance (114 Days)

	Dry Rolled	Reconstituted Whole & Stored 5 Days	10 Days	20 Days	Steeped[4]
No heifers	10	10	10	10	10
Initial weight, lb.	441	448	439	445	438
Final weight, lb.	750	734	737	752	740
Daily feed, lb.[1,2]	18.8[a]	16.8[c,d]	17.6[b]	16.4[d]	17.1[b,c]
Daily gain, lb.	2.71	2.51	2.61	2.69	2.65
Feed/lb. gain, lb.[1]	6.94	6.68	6.73	6.11	6.45
%Improvement in Feed Efficiency[3]	----	+3.7	+3.0	+12.0	+7.2

[1] Expressed on a 90% D.M. Basis.
[2] Any 2 averages without a common letter differ significantly ($P < .05$)
[3] Improvement over dry rolled.
[4] Steeped in water for 48 hours, followed by draining for 24 hours prior to rolling and feeding.

feed intake, the greatest intake being obtained on the dry rolled milo. The lower intakes on the wet grains were reflected in improved feed efficiencies of 3.7, 3.0, 12.0, and 7.2 percent for the 5-day, 10-day, 20-day, and steeped milo treatments, respectively over dry rolled milo. The results of this experiment would indicate that storage times of 20 days or longer are needed to derive the maximum improvement in feed efficiency when whole milo is reconstituted at a moisture level of 30 percent. Perhaps higher moisture levels would permit improvement in a shorter period of time as suggested by the 7 percent increase in feed efficiency obtained with steeped milo. The process whereby feed efficiency is improved via reconstitution may be similar to that of germination in which the embryo and seed coat layers are involved in enzymatic alteration of the starch to a more available form.

Carcass characteristics and dressing percentage were not significantly ($P<.05$) affected by processing method (Table 5).

Table 5. Slaughter and Carcass Information (114 Days)

	Dry Rolled	Reconstituted Whole & Stored			Steeped
		5 Days	10 Days	20 Days	
Dressing %[1]	59.9	59.4	59.9	59.4	58.9
Carcass grade[2]	11	11	11	11	10
Ribeye area, sq. in.[3]	9.9	10.1	10.7	9.9	9.5
Fat thickness, in.[4]	.63	.67	.61	.65	.61
Marbling[5]	17	16	17	17	15
Cutability, %[6]	50.91	51.21	50.37	49.92	51.11

[1] Calculated on basis of Stillwater 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, good—9, average good—8, low good—7.
[3] Determined from tracings at the 12th rib.
[4] Average of three measuremnts determined on tracing at the 12th rib.
[5] Marbling scores: 1 to 30, 11 — slight, 14 = small, 17 = modest.
[6] Percent of boneless trimmed retail cuts on carcass basis = 51.34 — 5.78 (fat thickness) — .462 (% kidney fat) + .740 (ribeye areas) — .0093 (chilled carcass weight).