Grinding Milo Before vs After Reconstitution

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Story in Brief

Milo reconstituted and stored in the whole form, then ground before feeding (reconstituted-ground), was compared to milo which was ground before being reconstituted and stored (ground-reconstituted) and both were contrasted to dry finely ground milo. Compared to dry milo, the reconstituted-ground milo produced 11.6 percent greater gain and 9.0 percent better feed efficiency, whereas the ground-reconstituted milo produced 1.8 and 3.5 percent decrease in gain and efficiency, respectively. Apparently, at the moisture level used in this trial, milo must be in the whole form to benefit from reconstitution.

Introduction

Milo is the best source of feed grain for fattening cattle in the Southwest; as the number of cattle fed in the Southwest increases, milo will increase in importance as an energy source.

High moisture processing (both high moisture harvesting and reconstituting) of milo has received considerable attention as a method of improving utilization over the dry product. Reconstituting milo (adding water to air-dry milo to raise the moisture to about 30 percent, followed by storage under oxygen-free conditions) has increased feed efficiency an average of 8 percent in previous research. In some comparisons the improvement has been greater. There are still many unanswered questions concerning the optimum conditions of harvesting storing, processing and feeding high moisture milo.

Reconstituted milo is usually stored in either an upright air-tight structure or packed in a trench silo to exclude air. The upright structure is versatile in that the wet grain can be stored in either whole or ground form. However, due to packing problems, the wet whole grain cannot be satisfactorily stored in a trench silo without considerable spoilage.

This experiment was designed to determine the effect of storage form (ground vs. whole) on the subsequent utilization of milo in a fattening ration. The following three milo processing methods were compared: (1) fine ground, grinding of dry milo, (2) reconstituting of whole milo, followed by storage for 21 days, followed by grinding before feeding (reconstituted-ground), and (3) grinding of dry milo, followed

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by reconstitution and storage for 21 days before feeding (ground-reconstituted).

Materials and Methods

Thirty-six Hereford, Angus, and crossbred (Hereford x Angus) steers and heifers with an average weight of 415 lb. and an average age of 8 months were started on trial November 16, 1967. The calves were from the Oklahoma State University experimental herds. The calves were started on feed one week before the trial began on a starter ration consistng of 50.0 percent dry ground milo, 24.0 percent cottonseed hulls, 20.0 percent dehydrated alfalfa pellets, 5.0 percent cottonseed meal, 0.5 percent bonemeal and 0.5 percent salt.

The calves were divided into three blocks on the basis of sex, breed, weight and age of dam and randomly alloted to the three treatments within each block. Three pens of four calves each were assigned to each treatment. The three types of processed milo were fed in a high concentrate ration, shown in Table 1. All ingredients other than milo were combinded into a premix which was mixed with the processed milo in the ratio of 83 percent milo to 17 percent premix. Proximate analyses of the processed milo grains and premix are shown in Table 2.

Grain Processing Methods

The reconstituted milo was produced by adding water to dry milo and mixing in a cement mixer to bring the moisture level to approximately 30 percent. The reconstituted-ground milo was prepared by adding water to the whole grain. The ground-reconstituted milo was ground through a 1/8 inch screen before the addition of water. Both treatments were then stored for 21 days in airtight plastic bags containing 90 lb. per bag. The dry ground milo and reconstituted-ground milo were ground through a 1/8 inch screen just prior to feeding.

Table 1. Ration Composition.

Ingredient	Amount (Percent)
Milo	83.0
Dehydrated alfalfa pellets (17% C.P.)	6.4
Cottonseed hulls	4.2
Cottonseed meal (41% C.P.)	4.2
Urea (45% Nitrogen)	1.0
Salt	0.6
Steamed bonemeal	0.6
	100.00
Added, per lb. of ration	
Vitamin A	2040 I.U.
Aureomycin	5 mg.

Table 2. Proximate Analyses in Percent.

Feed	Dry[1] Matter	Ash[2]	Crude[2] Protein	Ether[2] Extract	Crude[2] Fiber	NFE[3]
Milo						
Dry-finely ground	87.4	1.43	9.92	3.55	2.80	82.30
Recon.-ground	71.8	.89	8.53	2.70	1.85	86.03
Ground-recon.	67.6	.95	8.68	3.25	2.00	85.12
Premix	90.5	11.55	29.73	6.35	22.80	29.57

[1]Average of 24 determinations.
[2]Average of 2 determinations.
[3]100 - (sum of figures reported for ash, crude protein, ether extract, and crude fiber).

Feeding

The three rations were fed daily in quantities to assure availability of feed until the next feeding. Unconsumed feed was weighted back frequently to assure that fresh feed was available at all times. The reconstituted-ground milo was ground daily except that enough was processed on Friday to supply the amount needed over the weekend. The calves had access to open-sided sheds and outside lots, with water (warmed in winter) available at all times.

Data Obtained

Feed samples were taken at regular intervals during each 28-day period for proximate analysis and dry matter determination. Dry matter percentages were used to adjust all rations to a 90 percent dry matter basis. The grains were sieved and test weights were taken to determine particle size and density, respectively as shown in Table 3.

Initial and final weights were taken after a 16-hr. shrink off feed and water. Intermediate weights were taken at 28-day intervals, after a 16-hour shrink with no water (feed was available). The calves were fed 189 days, then slaughtered the following day; carcass data was collected after a 36-hr. cooler chill.

Table 3. Particle Size[1] and Density[2] of Processed Milo.

Process	Screen Size, in. 8/64	1/12	1/18	1/25	40 Mesh	40 Mesh	Wt.[2] Per Bu.
	% Retained on Screen					Through	lb.
Finely ground	0	0.2	8.4	37.2	32.4	21.8	42.7
Recon.-ground	7.1	27.1	28.3	14.6	17.6	5.3	26.4
Ground-recon.	1.5	2.2	17.8	37.9	34.4	6.2	34.9

[1] Particle size: Four 100 gm. samples of each grain were sieved.
[2] Test weight's reported are the average of four determinations and are on a 90% dry matter basis.

Results and Discussion

The moisture percentage of the dry ground, reconstituted-ground and ground-reconstituted milos averaged 12.6, 28.2 and 32.4 percent, respectively. The reconstituted-ground and ground-reconstituted milos were 38 and 18 percent less dense, respectively, than dry ground milo. The amount of fine material was reduced considerably in the reconstituted grains.

Feedlot performance, including daily gain, feed intake, and feed efficiency, is summarized in Table 4. The cattle fed reconstituted-ground milo gained considerably faster than those fed dry ground or ground-reconstituted milo, and required 9 and 12 percent less feed per pound of gain, respectively, than the cattle on dry ground and reconstituted-ground milo. Feed intake, adjusted to a 90 percent dry matter basis, was almost identical for all three treatments.

Carcass information is shown in Table 5. Differences in carcass merit were small and apparently not affected by grain processing method.

These results indicate that, at a moisture level of approximately 30 percent, milo grain must be reconstituted and stored in the whole form in order to obtain an improvement in feed efficiency. The reconstitution of whole grain apparently results in partial germination which converts the starch into simpler carbohydrates more available to the rumen microorganisms. The milo carbohydrates, after partial germination, may be in a form similar to that of high moisture harvested milo. This would explain the similarities in feeding value of the two forms of milo. In ground-reconstituted milo the enzyme system necessary for the germination process has apparently been disrupted. This would explain the lack of improvement in feed efficiency with this process.

Extensive laboratory analysis of several reconstituted and high moisture harvested milo samples is currently underway to determine changes in the various chemical constituents of the grain.

Table 4. Feedlot Performance (189 days).

	Milo Processing Method		
	Dry Ground	Recon.-Ground	Ground-Recon.
No. steers	12	12	10
Av. initial wt. lb.	410	416	419
Av. final wt. lb.	812	900	851
Av. daily gain, lb.[1]	2.25[a,b]	2.51[b]	2.20[a]
% change[2]		11.6	—1.8
Av. daily feed, lb.	14.6	14.6	14.8
Feed/lb. grain, lb.	6.34	5.77	6.56
% change[2]		9.0	—3.5

[1] Any 2 averages without a common letter differ significantly ($P < .05$).
[2] Compared to dry finely ground.

The specific gravity of each carcass was determined to allow calculation of the net energy value of the grains. These will be reported later.

Table 5. Slaughter and Carcass Information.

	Method of Processing Milo		
	Finely Ground	Recon.-Ground	Ground-Recon.
Dressing %[1]	61.29	61.72	61.89
Carcass grade[2]	10.54	10.05	9.87
Ribeye area, sq. in.[3]	11.14	10.38	10.30
Fat thickness, in.[4]	0.83	0.83	0.73
Marbling[5]	13.28	15.54	12.73
Cutability, %[6]	48.02	48.25	48.91

[1] Calculated on basis of Stillwater live shrunk weight and chilled 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, av. choice—11, low choice—10 good—9, av. good—8, low good—7.
[3] Determined from tracings at the 12th rib.
[4] Average of three measurements determined on tracing at th 12th rib.
[5] Marbling scores: 1 to 30, 11=slight, 12=slight plus, 13=small minus, 14=small, 15=small plus.
[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 wt.).

The Effect of Moisture Level on the Feeding Value of Reconstituted Milo

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Story in Brief

Five methods of processing milo were compared in a high concentrate ration for finishing heifers: (1) dry rolled, (2) reconstituted to 22 percent moisture — stored 21 days, (3) reconstituted to 30 percent moisture — stored 21 days, (4) reconstituted to 38 percent moisture — stored 21 days, and (5) reconstituted to 38 percent moisture — stored 1 day. Differences in rate of gain were not significant. Heifers on 30 and 38 percent reconstituted milo stored 21 days utilized their feed 11.8 and 12.1 percent more efficiently, respectively, than heifers fed dry rolled milo. Utilization

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