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

Dennis White and Robert Totusek

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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of milo reconstituted to 22 percent and stored 21 days, or 38 percent and stored 1 day was not improved significantly over dry milo. These results suggest (1) a definite advantage in raising the moisture level of reconstituted milo from 22 to 30 percent, but no advantage in an additional moisture increase to 38 percent, and (2) storage of reconstituted milo for one day is not sufficient to improve utilization appreciably.

Introduction

Previous work at the Oklahoma and Texas Stations has shown that reconstituting of milo markedly improved feed efficiency. In most studies, milo has been reconstituted to a moisture level of approximately 30 percent, but the optimum moisture level for reconstituted milo has not been identified. Some preliminary *in vitro* digestibility work with the "artificial rumen" at this station indicated (1) that as the moisture level of high moisture milo increased, to a level of 38 percent, digestibility also increased, and (2) a large part of the improvement in digestibility occurred the first day following reconstitution. The objective of this experiment was to determine the optimum moisture level for reconstituted milo in order to realize the greatest benefit from the reconstituting process. The five milo treatments were as follows: dry rolled, 22 percent moisture — stored 21 days, 30 percent moisture — stored 21 days, 38 percent moisture — stored 21 days, and 38 percent moisture — stored 1 day.

Methods and Materials

Fifty Hereford, Angus and crossbred (Hereford x Angus) heifers with an average weight of 377 lb. were started on trial July 2, 1968. The heifers were purchased at the Oklahoma City stockyards. The calves were divided into two blocks on the basis of weight, breed and condition score and randomly allotted to the five treatments within each block. Two pens of five calves each were assigned to each treatment.

The calves were placed on a starter ration consisting of 40 percent dehydrated alfalfa pellets, 10 percent cottonseed meal, 48 percent cottonseed hulls, 1 percent salt and 1 percent bonemeal for 20 days prior to the start of the trial. At this point, the processed milo was introduced into the ration at the rate of 10 percent. The milo was increased 5 percent per day until the calves were on full feed. The five types of processed milo were fed in a high concentrate ration as shown in Table 1. All ingredients other than milo were combined into a premix, which was mixed with the processed milo in the ration of 84 percent milo to 16 percent premix.

Table 1. Ration Composition

Ingredient	Amount Percent
Milo	84.0
Dehydrated alfalfa pellet crumbles (17% C.P.)	4.93
Cottonseed hulls	4.93
Soybean meal crumbles (44% C.P.)	4.30
Urea (45% nitrogen)	0.64
Salt	0.60
Bonemeal	0.60
	100.00
Added, per lb. of ration	
Vitamin A	1600 I.U.
Aureomycin	5.0 mg.

Grain Processing Methods

The 22 and 30 percent reconstituted milo was produced by adding water to dry milo and mixing in a cement mixer to bring the moisture to the desired level. The 38 percent reconstituted milo was produced by soaking the dry milo in an open container for approximately 10 hours. The excess water was then drained off. The reconstituted milo that was stored for 21 days was placed in airtight plastic bags containing 90 lb. per bag. The 38 percent-1-day milo was allowed to stand 24 hr. in an open container prior to feeding. The dry and reconstituted milo was rolled with a roller tolerance of approximately .003 in. just prior to feeding.

Feeding

The five rations were fed daily in quantities to assure availability of feed until the next feeding. Unconsumed feed was weighed back daily to assure that fresh feed was available at all times. All rations were processed daily. The calves had access to open-sided sheds and outside lots with water 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 at 28-day intervals, after a 16-hr. shrink with no water (feed was available). Performance data was summarized after an average of 112 days on feed. The heifers were then taken to the Live Animal Evaluation Center where they were subjected to measurement by the K^{40} counter and ultrasonic equipment.

They were then slaughtered and carcass data was collected after a 24-hr. cooler chill. Specific gravity determinations were made on each carcass to allow calculation of net energy values, which will be reported later.

Results and Discussion

The moisture level of the dry rolled, 22, 30, 38, and 38 percent-1-day averaged 86.9, 77.3, 68.6, 62.0 and 64.7 percent, respectively, for the five treatments.

The density of the milo was reduced 33 to 45 percent by reconstituting and rolling, compared to the dry rolling. The particle size (Table 2) was very similar for the 22, 30 and 38 percent reconstituted milo.

A complete sumary of feedlot performance is shown in Table 3. The differences in average daily gain were not statistically significant. The heifers on 22 percent milo gained 8 percent faster, while the heifers on 30, 38 and 38 percent-1-day milo gained 2.4, 7.6 and 2.4 percent slower,

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

Process	Screen Size, in.								Wt.[2] Per Bu.
	.315	.157	.079	.039	.020	.010	.005	.005	
	% Retained on Screen							% Thru	lb.
Dry rolled	0	0.3	30.9	61.8	3.0	3.0	0.5	0.5	40.7
Recon.—22%	0	42.8	43.8	6.1	2.8	3.1	1.4	0	27.2
Recon.—30%	0	41.4	35.5	8.6	9.3	4.9	0.3	0	24.5
Recon.—38%	0	50.2	38.7	5.9	4.2	1.0	0	0	22.3
Recon.—38%-1-day	0	0.3	43.3	41.6	8.2	4.5	2.1	0	23.1

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

Table 3. Feedlot Performance (112 days)

	Method of Processing Milo				
	Dry rolled	Recon. 22%	Recon. 30%	Recon. 38%	Recon. 38%-1-day
No. heifers	10	10	10	10	10
Initial wt., lb.	380	376	381	366	381
Final wt., lb.	660	680	656	638	654
Daily gain, lb.	2.51	2.71	2.45	2.32	2.45
% change[1]		8.0	—2.4	—7.6	—2.4
Daily feed, lb.	16.8	17.4	14.3	13.6	16.1
Feed/lb. gain, lb.[2]	6.78[a]	6.51[a]	5.98[b]	5.96[b]	6.62[a]
% change[1]		4.0	11.8	12.1	2.4

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

respectively, than the heifers on dry rolled milo. It is interesting to note that the heifers on 30 and 38 percent milo consumed 15.0 and 19.1 percent less feed, but because of similar gain, were 11.8 and 12.5 percent more efficient in utilizing feed, respectively, than the heifers on dry rolled milo. This advantage in feed efficiency was statistically significant. Feed intake and feed efficiency for the heifers on dry rolled, 22 and 38 percent-1-day milo were similar.

Apparently, the energy in the 30 and 38 percent reconstituted grain stored for 21 days was utilized more efficiently that that in the other milo treatments. The results suggest that there is a real advantage in reconstituting to a moisture level of 30 percent, but no additional advantage in raising the moisture level to 38 percent. Carcass merit was apparently unrelated to treatment for any of the criteria shown in Table 4.

The results of this trial further indicate that the storage of 38 percent moisture milo for one day is not sufficient to benefit from the reconstituting process.

Additional screening work is now under way using the *in vitro* system to determine the feasibility of reconstituting both whole and ground grains at even higher moisture levels.

Table 4. Slaughter and Carcass Information

	Method of Processing Milo				
	Dry rolled	Recon. 22%	Recon. 30%	Recon. 38%	Recon. 38%-1-day
Dressing %[1]	59.30	59.39	59.42	58.80	59.21
Carcass grade[2]	9.8	9.9	9.3	10.2	9.8
Ribeye area, sq. in.[3]	9.08	9.46	9.59	8.57	9.08
Fat thickness, in.[4]	0.60	0.63	0.56	0.61	0.61
Marbling[5]	13.7	14.3	13.8	15.1	13.6
Cutability[6]	50.00	50.22	50.41	49.64	50.24

[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, high good-9, av. good-8, low good-7.
[3] Determined from tracing at the 12th rib.
[4] Average of three measurements on tracing at the 12th rib.
[5] Marbling scores: 1 to 50, 11=slight, 12=slight plus, 13=small minus, 14=small, 15=small plus.
[6] Percent of boneless trimmed retail cuts on carcass base=51.34–578 (fat thickness) – .462 (% kidney fat) + .740 (ribeye areas) – .0093 (chilled carcass wt.).