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Effects of Organic Acids on the Preservation and Feeding Value of Dry and High-moisture Milo[1]

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Summary

The four milo treatments studied were: (1) artificially dried, (2) artificially dried + organic acids, (3) high-moisture ensiled and (4) high-moisture + organic acids. The dry milo and high-moisture milo contained 14 and 24 percent moisture, respectively. Milo in treatments 1, 2, and 4 was stored in unlined concrete bins; milo in treatment 3 was ensiled in an air-tight silo.

Each of the four grain treatments was fed to 15 yearling steers (avg. weight - 700 lb.) for 104 days. The final rations contained 82 percent of the appropriate milo, 13 percent silage and 5 percent supplement, Steers receiving high-moisture milo rations gained faster and more efficiently and had higher dressing percentages than steers receiving dry milo rations. Steers fed organic acid-treated milo rations consumed more feed but were less efficient than steers fed untreated milo rations. Carcass quality and yield grades were not affected by grain treatment.

After three months of storage, high-moisture milo treated with organic acids had developed some mold and spoilage adjacent to the bin wall. Moving the grain to a polyethylene-lined bin prevented further deterioration.

Introduction

The effectiveness of an organic acid mixture[3] as a preservative for reconstituted milo was reported in the 1972 Cattleman's Day Bulletin (557). Steers fed reconstituted milo either ensiled in an air-tight silo or treated with organic acids had similar feedlot performance.

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[1]Organic acids and financial support provided by Celanese Chemical Company, Corpus Christi, Texas,
[2]USDA Grain Marketing Research Center and Department of Plant Pathology.
[3]Organic acid mixture (trade name - ChemStor) contains 60% acetic and 40% propionic acids.

The purposes of this study were: (1) to evaluate the organic acid mixture[4] as a preservative for field-harvested, high-moisture milo and (2) to determine the feeding value of the preserved grain for finishing beef cattle.

Experimental Procedures

Sixty yearling steers of Hereford and Angus breeding weighing an average of 700 lb. were randomly allotted by weight to twelve pens of five steers each. Three pens were randomly assigned to each of the following milo treatments: (1) artificially dried, (2) artificially dried + organic acids, (3) high-moisture ensiled and (4) high-moisture + organic acids.

All grain was harvested from one source at approximately 24 percent moisture and divided into four 1,000-bushel lots. Lots 1 and 2 were artificially dried to 14 percent moisture and stored in concrete bins; lot 2 was treated with the organic acid mixture at 1.4 percent by weight before storage. Lot 3 was ensiled in an air-tight silo, and lot 4 was treated and stored similarly to lot 2. All grain was stored whole and rolled before being fed.

The steers received a starting ration containing 50 percent of the appropriate milo, 45 percent forage sorghum silage and 5 percent supplement (table 1). Milo was gradually substituted for silage the first 14 days until the steers were on the final full-feed rations containing 82 percent milo, 13 percent silage and 5 percent supplement on a dry matter basis. All rations were mixed and fed twice daily. Urea supplied 60 percent of the crude protein equivalent in the supplement. Each steer was implanted with 30 mg of stilbesterol two weeks before the 104-day feed period began.

Initial and final weights of the steers were taken full on two consecutive days. Final live weights were adjusted to a 59.95 percent dress and feedlot performance was calculated on that basis.

Results

Feedlot performance is presented in table 2. Steers fed high-moisture milo (rations 3 and 4) gained faster ($P<.10$), consumed less feed ($P<.01$), were more efficient ($P<.01$) and dressed higher ($P<.01$) than steers fed dry milo (rations 1 and 2). Steers fed dry milo or high-moisture milo treated with organic acid (rations 2 and 4) consumed more feed ($P<.01$) and were less efficient ($P<.10$) than steers fed dry milo or high-moisture ensiled milo (rations 1 and 3). Treating milo with organic acid

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[4]Organic acid mixture (trade name - ChemStor) contains 60% acetic and 40% propionic acids.

did not affect daily gain of steers receiving either dry or high-moisture rations. Neither dressing percentage, carcass quality nor yield grades were influenced by organic acid treatment.

Some heating and molding occurred in the high-moisture milo treated with organic acid. It was limited to within five or six inches of the concrete wall. Such spoilage was observed in reconstituted milo that was treated and stored in a similar manner (1972 Cattleman's Day - Bulletin 557). In the study reported here, moving the mold-free grain to a polyethylene-lined concrete bin prevented further spoilage. Total storage time for the grain was approximately ten months.

Table 1. Composition of the Supplement.

Ingredient	% (dry matter basis)
Soybean meal	56.75
Urea	15.15
Dicalcium phosphate	3.85
Limestone	14.20
Salt	7.50
Fat	1.00
Trace mineral premix	0.40
Chlortetracycline[a]	0.88
Vitamin A premix[b]	0.28

[a] Formulated to supply 70 mg per steer daily.
[b] Formulated to supply 30,000 IU per steer daily.

Table 2. Steer Performance and Carcass Data (104 days: April 6 to July 19, 1972)

Item	Ration no. and treatment			
	1 Dry milo	2 Dry milo + organic acid	3 24% milo ensiled	4 24% milo + organic acid
No. of steers	15	15	15	15
Initial wt., lb.	704	694	704	698
Final wt., lb.[a]	998	986	1013	1004
Avg. daily gain, lb.	2.82	2.82	3.00	2.95
Avg. daily feed, lb.[b]	21.8	23.0	20.8	21.8
Feed/lb. gain, lb.	7.75	8.16	6.94	7.38
Dressing %	59.1	59.3	60.0	61.0
Quality grade[c]	10.7	10.3	10.8	10.1
Yield grade[d]	2.33	2.34	2.40	2.80

[a] Adjusted to 59.95% dress.
[b] Dry matter basis.
[c] Quality grade assigned, 10 = low choice, 11 = average choice.
[d] 2.50 + (2.5 x adj. fat thickness) + (0.2 x % KK) + (0.0038 x hot carcass wt.) - (0.32 x L.E.A.).