other variables which may influence the efficiency of nutrient utilizatio from steam processed grains and to more fully elucidate the manner i which nutrient utilization is improved by steam processing.

Table 4. Feedlot Performance (112 Days)

	Dry Rolled	Steam 15 min. Flaked	Steam 25 min. Flaked	Steam 35 min. Flaked	Steam 45 min Flake
No. steers	12	12	12	12	12
Initial weight, lb.[1]	487	500	490	506	506
112 day weight, lb.[2]	773	782	773	800	823
Daily gain, lb.	2.54	2.52	2.53	2.62	2.8
% change[3]	----	—.7	—.4	+3.1	+11.4
Daily feed, lb.	14.3	12.9	12.8	13.7	14.9
Feed/lb. gain, lb.[4]	5.6[a]	5.1[b,c]	5.0[b]	5.3[c]	5.0
% change[3]	----	+10.5	+12.3	+7.0	+12.3

[1] Cattle were taken off feed and water 16 hours prior to weighing.
[2] Cattle were taken off water only, 16 hours prior to weighing.
[3] Improvement compared with dry rolled milo.
[4] Any 2 averages without a common letter differ significantly ($P < .05$).

Studies on the Nutritive Value of High Moisture Milo Head Chop

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Story in Brief

Two treatments of high moisture milo head chop were comparec with dry rolled milo to determine the relative feeding value of sucl material for fattening beef cattle. The high moisture milo head cho was prepared by harvesting the entire head and a portion of the stall when the grain contained approximately 30 percent moisture. The heac chop material consisted of approximately 70 percent grain and was fec with two different supplements in comparison with a 90 percent con centrate ration containing dry rolled milo. Both head chop treatment produced significantly ($P < .05$) faster rates of gain than the dry rollec

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milo control. However, the dry rolled milo control produced significantly ($P<.05$) better feed efficiency than did the head chop treatments, due probably to the higher levels of roughage present in the head chop rations. The results of this study would suggest that harvesting milo as a high moisture head chop product might prove beneficial in some cases for increasing the total quantity of beef produced per acre of harvested milo.

Introduction

Previous work at Oklahoma and elsewhere indicates that high moisture harvested milo, which is combined from the field at a moisture content of approximately 30 percent or higher, produces a significant improvement in feed efficiency over dry milo for fattening beef cattle. Most research and practical experience indicate that some roughage in feedlot rations is necessary for obtaining optimum feedlot performance and for reducing the incidence of acidosis, founder, off-feed, liver abscesses and other undesirable conditions. In the high plains feedlots, however, roughage often represents a rather costly ration ingredient, at least from the standpoint of nutrient content of the roughage component. Therefore, high-concentrate fattening rations are commonly fed in which the roughage levels are frequently restricted to somewhere near the minimum level compatible with producing optimum feedlot performance.

Since high moisture harvested milo grain results in improved feed efficiency over dry milo, it would appear that if the high moisture grain were to be harvested simultaneously with a portion of the sorghum stalk, a rather complete concentrate and roughage mixture could be harvested, stored, and fed. Such a product would require no roughage addition at the time of feeding and, furthermore, might permit more total pounds of beef to be produced per acre of harvested milo. The objective of this experiment, therefore, was to evaluate the feeding value of high moisture milo head chop for fattening beef cattle.

Materials and Methods

Thirty-six choice Angus and Hereford feeder steers, weighing approximately 500 pounds, were used in this experiment. The steers were gradually adapted to a high concentrate ration containing dry rolled milo during a four-week preliminary period. Stilbestrol was implanted at the 12 mg level at the beginning of the experimental feeding period and again 84 days after initiation of the experiment.

Following the preliminary period, the steers were blocked into four groups on the basis of breed and weight and randomly allotted within blocks to three treatments, with three steers per pen (12 steers per treat ment). The three treatments were as follows:

(1) Dry rolled milo + premix No. 1 (see Table 1)
(2) High moisture head chop + premix No. 1 (see Table 1)
(3) High moisture head chop ÷ premix No. 2 (see Table 1)

The high moisture milo head chop material was harvested from th field when the grain contained approximately 30 percent moisture. A conventional silage cutter was used to remove the material from th field. The cutter bar was elevated to permit removal of the plant materia at approximately the first leaf junction below the plant head. After re moval from the field, the cut material was processed through a hammer mill containing a recutter to further reduce the particle size of th fibrous portion and to grind or break the milo kernels as the head chop material was being blown into an air-tight (oxygen limiting) storage struc ture. The head chop material was estimated to contain approximatel 70 percent grain. The dry milo used in this experiment was of the same variety (Northrup King 222) and was harvested from the same field a the head chop material.

The composition of the experimental rations is indicated in Table 1 All rations were formulated on a 90 percent D.M. basis. All rations were mixed and fed daily. The ration ingredients other than milo or head chop were combined in a premix and mixed with the grain or head chop material prior to feeding. Feed samples were obtained at routine intervals to permit accurate formulation of ration ingredients on a 90 percent D.M. basis. The rations were fed daily in amounts to permi availability of feed until the next feeding. Unconsumed feed wa weighed back daily to permit fresh feed at all times.

Table 1. Ration Compositions

Ingredient	Dry Rolled[1] Milo	Head Chop[1] Ration—1	Head Chop[1] Ration—2
Milo	84.0	---	---
High Moisture Milo Head Chop	---	84.0	98.8
Ground Alfalfa Hay	4.8	4.8	---
Cottonsed Hulls	4.8	4.8	---
Cottonseed Meal (41%)	4.6	4.6	---
Urea (282)	0.6	0.6	---
Salt	0.6	0.6	0.6
Steamed Bonemeal	0.6	0.6	0.6
	100.0	100.0	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 (not feed) 16 hours prior to weighing.

The experimental feeding period was terminated at the end of 140 days, by necessity, due to an insufficient quantity of the high moisture head chop material.

Results and Discussion

The proximate analysis of the grain and the head chop material is shown in Table 2. As noted, the high moisture head chop material contained 46.1 percent moisture on an as-fed basis. On a dry matter basis, it contained 11.5 percent protein and 9.5 percent crude fiber. Due to the relatively high crude protein content of the head chop material, no supplementary nitrogen was included in treatment No. 3.

The feedlot performance data for feed intake, rate of gain and feed efficiency are shown in Table 3. The steers receiving the high moisture head chop treatments gained significantly faster ($P < .05$) than the cattle

Table 2. Proximate Analysis

Feed	Dry Matter[1]	Crude Protein	Ether Extract	Ash	Crude Fiber	Neutral Detergent Fiber	N.F.E.
	Dry Matter Basis						
Dry Rolled Milo[2]	85.4	9.5	3.13	1.65	2.2	---	83.57[3]
Head Chop	53.9	11.5	3.0	4.7	9.5	16.1	71.3 [3]

[1] Average of determinations of 12 samples.
[2] Neutral Detergent Fiber not determined on Dry Rolled Milo.
[3] 100—(Sum of figures reported for ash, crude protein, and ether extract).

Table 3. Feedlot Performance (140 Days)

	Dry Rolled	Head Chop plus Premix #1	Head Chop plus Premix #2
No. Steers	11[1]	12	12
Initial weight, lb.	488	501	518
140 Day weight, lb.	795	852	885
Daily gain, lb.[2]	2.19[a]	2.51[b]	2.62[c]
Daily feed, lb.[2]	14.0 [a]	20.9 [b]	19.9 [b]
Feed/lb. gain, lb.[2]	6.39[a]	8.33[b]	7.60[c]

[1] One of original 12 steers died from bloat after 118 days on feed.
[2] Any 2 averages without a common letter differ significantly ($P < .05$).

on dry rolled milo. On the other hand, the animals on the dry rolled milo ration required significantly less feed ($P<.05$) per pound of weight gain than cattle on either of the head chop treatments. This can likely be accounted for by the fact that the cattle on dry rolled milo were receiving only 10 percent roughage in the ration as compared with approximately 40 percent roughage and 30 percent roughage, respectively in the two head chop treatments. Nevertheless, the feed conversions obtained on the head chop treatments, particularly the treatment containing in excess of 98 percent head chop material in the ration, appear very acceptable. The quantity of roughage desired in the head chop material could be altered by varying the quantity of plant material harvested with the grain. Further studies are needed to determine the optimum quantity of plant material, methods of harvesting and storage, and supplementation and feeding procedures. In brief, the results of this study indicate that high moisture milo head chop might appear advantageous in some cases as a means of increasing the quantity of beef produced per acre of harvested milo.

Since the cattle averaged only about 850 pounds and thus were not of acceptable market weight at the time they had to be removed from the experimental rations, carcass data are not presented.

Additional studies on high moisture milo head chop are currently in progress.