Effect Of Physical Form Of Reconstituted Wheat During Storage On The Nutritive Value Of Wheat For Feedlot Cattle

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Story in Brief

Four methods of processing wheat—dry rolled, ground-reconstituted, rolled-reconstituted and whole-reconstituted—were compared with dry rolled mile in 90 percent concentrate rations for finishing beef cattle. The wheat for the ground-reconstituted and rolled-reconstituted treatments was ground and rolled, respectively, before reconstituting. The wheat for the whole-reconstituted treatment was reconstituted and stored in the whole form and then rolled just prior to feeding. All reconstituted wheat was reconstituted to 30 percent moisture and then stored in air tight plastic bags for 21 days before feeding. Wheat made up 70 percent of the total ration in all wheat treatments on a 90 percent dry matter basis.

In the 137 day steer feeding trial, average daily feed intakes for the dry rolled milo, dry rolled wheat, ground-reconstituted wheat, rolled-reconstituted wheat and whole-reconstituted wheat treatments were 24.9, 21.7, 21.8, 22.2 and 23.7 lb., respectively, on a 90 percent D.M. basis. Average daily gains were 3.59, 3.28, 3.37, 3.46 and 3.97 lb. per day; the pounds of feed required per pound of gain were 6.94, 6.63, 6.46, 6.45 and 5.97; and the NE_g values of the processed grain were 99.4, 116.8, 108.1, 103.1 and 107.8 Mcal per 100 kg for the same treatments, respectively. The values for average daily feed intakes, gains, feed conversions and NE_g were not significantly ($P>.05$) different among treatments.

Introduction

Wheat prices have usually been too high in most years to permit extensive use of wheat as livestock feed. Therefore, considerably more research has been conducted in the past with corn and to a lesser extent with grain sorghum than with wheat as an energy source in high concentrate finishing rations. In recent years, however, wheat has become very competitively priced with other grains as an energy source in beef cattle feedlot rations.

Since wheat represents a major economic crop in Oklahoma, beef cattle feeders in this area have easy access to wheat for inclusion in cattle finishing rations. As a result, there has been much interest in different methods of processing wheat. This interest has been generated by research results showing that some processing techniques, such as reconstitution, have proven beneficial for substantially increasing the nutritive value of some grains, particularly milo, for feedlot cattle. To date, practically no research has been done to study the influence of reconstituted wheat fed in high concentrate rations to finishing beef cattle. The purpose of this experiment, therefore, was to compare different methods of reconstituting wheat with dry rolled wheat and dry rolled milo.

Materials and Methods

Choice feeder steers averaging 662 pounds were selected for use in this feeding experiment. The steers were gradually adapted to a 90 percent concentrate ration during a three week preliminary period. Following the preliminary period, twelve steers were selected at random as an initial slaughter sample to permit the determination of net energy values for the wheat and milo. The 50 remaining steers were blocked into two groups on the basis of weight and then randomly allotted within blocks to five treatments with five animals per pen, allowing ten animals per treatment. The treatments studied were as follows:

1) Dry rolled milo (DRM)
2) Dry rolled wheat (DRW)
3) Ground-reconstituted wheat (GRW)
4) Rolled-reconstituted wheat (RRW)
5) Whole-reconstituted wheat (WRW)

The steers were implanted with 36mg of stilbestrol at the beginning of the feeding trial.

The milo and wheat for the dry rolled treatments were rolled through a 12 x 18" roller mill with a roller spacing of .003 inch. The wheat for all the reconstituted wheat treatments (GRW, RRW, and WRW) was reconstituted to 30 percent moisture, followed by storage in air tight plastic bags for 21 days prior to feeding. The wheat used was a hard red winter wheat. Temperature during storage of the reconstituted grain was a minimum of 70° F.

The ground-reconstituted wheat was obtained by grinding the wheat through an ⅛ inch hammermill screen prior to reconstitution and storage. The rolled-reconstituted wheat was rolled through the roller mill specified above prior to reconstitution and storage. The whole reconstituted wheat was reconstituted in the whole form and then rolled just prior to being fed. Thus, the physical form of the wheat during

storage of the reconstituted grain was either ground, rolled or whole, respectively.

The compositions of the experimental rations are given in Table 1. The rations were all formulated to contain the composition indicated on a 90 percent D.M. basis with wheat making up 70 percent of the total ration on the wheat treatments. All rations were high concentrate rations containing 5 percent cottonseed hulls and 5 percent pelleted alfalfa meal. The milo included in the wheat rations was dry rolled. Feed was prepared and fed daily in quantities which permitted availability of feed until the next feeding. At two separate times during the feeding period rumen samples were obtained from each animal two hours after feeding. pH values were determined immediately, and a small amount was saved for VFA analyses.

Initial and final weights were taken after a 16 hour shrink off feed and water. Carcass specific gravities were determined on each animal at the conclusion of the feeding period to permit net energy-determinations for the feed using the comparative slaughter technique.

Results and Discussion

The proximate analysis and moisture composition data for the milo and wheat treatments are shown in Table 2. As indicated, the average moisture content of the dry rolled milo, dry rolled wheat, ground-reconstituted wheat, rolled-reconstituted wheat and whole-reconstituted wheat were 87.2, 89.2, 69.0, 69.1 and 69.4 percent respectively. Particle size and densities of the processed grains are shown in Table 3.

The feedlot performance data for feed intake, rate of gain and feed efficiency are given in Table 4. Average daily feed intakes for the dry rolled milo, dry rolled wheat, ground-reconstituted wheat, rolled-reconstituted wheat and whole-reconstituted wheat treatments were 24.9, 21.7, 21.8, 22.2 and 23.7 lb., respectively, on a 90 percent D.M. basis. Average daily gains were 3.59, 3.28, 3.37, 3.46 and 3.97 lb., and the pounds of

Table 1. Ration Composition[1]

Ingredient	Dry Rolled Milo Treatment	Wheat Treatments
	%	%
Wheat	--	70.0
Milo	84.0	14.0
Premix[2]	16.0	16.0

[1] Formulated on a 90% D.M. basis.
[2] Contained cottonseed hulls, ground alfalfa hay, soybean meal, urea, minerals, antibiotics and Vitamin A.

Table 2. Proximate Analysis of Milo and Wheat

Feed	Dry Matter	Crude Protein[1]	Ash[1]	Ether Extract[1]	CHO[1,2]
	percent				
Dry Rolled Milo	87.2	10.20[3]	1.40	2.90	85.00
Wheat		14.15[4]	2.08	1.33	82.45
Dry Rolled	89.2				
Ground Recon.	69.0				
Rolled Recon.	69.1				
Whole Recon.	69.4				

[1] Values expressed on 100% D.M. basis.
[2] 100 − (Sum of figures for crude protein, ash and ether extract).
[3] 6.25 x percent Nitrogen = percent crude protein.
[4] 5.71 x percent Nitrogen = percent crude protein.

Table 3. Particle Size and Density of Milo and Processed Wheat

	Screen Size							
	4mm	2mm	1mm	500 micron	250 micron	125 micron	Through 125 micron	Wt. per Bu.
	% Retained						Through	lb.
DRM	0.0	6.4	67.1	12.9	7.8	1.8	4.0	38.0
DRW	0.1	39.9	45.0	8.6	2.6	1.5	2.4	35.5
GRW	0.8	59.6	36.6	1.9	0.9	0.2	0.1	28.5
RRW	7.6	79.0	12.6	0.5	0.2	0.1	0.0	26.4
WRW	25.0	69.1	4.1	1.6	0.2	0.0	0.0	25.7

feed required per pound of gain were 6.94, 6.63, 6.46, 6.45 and 5.97 for the same treatments respectively. Although mean values for rate of gain and feed efficiency appeared to favor the whole-reconstituted wheat treatment, the differences were not significant ($P>.05$). The slightly better feed conversions obtained on the whole-reconstituted wheat treatment can likely be explained by somewhat greater intakes and gains in that increased intakes on any given ration and/or increased gains are usually reflected in improved feed conversions in feedlot cattle due to dilution of the maintenance requirement.

The net energy values for NE_{m+g} of the total ration and for NE_{m+g}, NE_m and NE_g of the grain are shown in Table 5. The NE_{m+g}, NE_m and NE_g of the grain in the wheat treatments refers only to the wheat, which made up 70 percent of the total ration. There were no significant differences ($P>.05$) between treatments for any of the net energy values. Reconstitution did not appear to measurably increase the nutritive value of the wheat for feedlot cattle in this experiment as is normally true for sorghum grain. However, palatability of the whole reconstituted wheat

Table 4. Feedlot Performance (137 Days)

	Dry Rolled Milo	Dry Rolled Wheat	Ground Reconstituted Wheat	Rolled Reconstituted Wheat	Whole Reconstituted Wheat
No. of Steers	10	10	10	10	10
Initial weight, lb.	658	665	657	668	663
Final weight, lb.	1149	1113	1119	1142	1206
Daily feed, lb.[1,2]	24.9	21.7	21.8	22.2	23.72
Daily gain, lb.[2]	3.59	3.28	3.37	3.46	3.97
Feed/lb. gain, lb.[1,2]	6.94	6.63	6.46	6.45	5.97

[1] Expressed on a 90% D.M. basis.
[2] None of the values for feed intake, gain or feed per lb. of gain were significantly different at .05 level of probability.

Table 5. Net Energy Values

	Dry Rolled Milo	Dry Rolled Wheat	Ground Reconstituted Wheat	Rolled Reconstituted Wheat	Whole Reconstituted Wheat
			Mcal/100 kg		
NE_{m+g} of Total Ration	129.0	144.9	139.6	135.9	137.5
NE_{m+g} of Grain	135.0	156.7	149.0	143.8	146.1
NE_m of Grain	149.1	175.2	162.1	154.6	161.7
NE_g of Grain	99.4	116.8	108.1	103.1	107.8

may have been slightly better as indicated by the somewhat higher feed intakes. In general the relatively low net energy values observed in this experiment supports previous research at Oklahoma State suggesting that heavy, fast gaining cattle may show relatively lower net energy values for the feed they are consuming than lighter, slower gaining cattle.

Carcass characteristics, percent cutability and dressing percentage for the animals in the experiment are shown in Table 6. There were no significant differences ($P>.05$) between treatments for any of the carcass traits measured.

Mean pH values for the dry rolled milo, dry rolled wheat, ground-reconstituted wheat, rolled-reconstituted wheat and the whole-reconstituted wheat were 5.7, 5.4, 5.3, 5.5 and 5.9 for the first collection and 5.6, 5.4, 5.8, 5.6 and 5.6 for the second collection, respectively. Although it is known that high levels of wheat may be prone to inducing a lower rumen pH under some circumstances, no significant differences ($P>.05$) existed between treatments in this experiment. VFA productions are also being determined on the rations.

In brief, this experiment would suggest that wheat can be successfully fed in high concentrate rations and that reconstitution does not

produce the same degree of increase in the nutritive value of wheat for feedlot cattle as does reconstitution of sorghum grain.

Table 6. Slaughter and Carcass Information

	Dry Rolled Milo	Dry Rolled Wheat	Ground Reconstituted Wheat	Rolled Reconstituted Wheat	Whole Reconstituted Wheat
Dressing%[1]	59.2	60.0	59.3	59.8	58.7
Carcass grade[2]	9.4	9.4	10.5	9.1	9.7
Ribeye area, sq. in.	12.19	12.26	12.06	12.30	12.09
Fat thickness, in.[3]	0.85	0.78	0.78	0.76	0.82
Marbling[4]	14.8	14.3	14.0	13.7	15.4
Cutability, %	47.9	48.3	48.3	48.53	47.74

[1] Calculated on basis of 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, average choice-11, low choice-10, high good-9, average good-8, low good-7.
[3] Average of three measurements determined on tracing at the 12th rib.
[4] Marbling scores: 1 to 30, 11 – slight, 14 = small, 17 = modest.

Influence Of Reconstitution On The Feeding Value Of Wheat For Finishing Cattle

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Wheat reconstituted by two different methods was compared to dry rolled wheat and dry rolled milo in high concentrate rations fed to finishing heifers in a 136 day feeding period. The treatments investigated in 90 percent concentrate rations were: 1) dry rolled milo, 2) dry rolled wheat, 3) whole-reconstituted wheat and 4) rolled-reconstituted wheat. In the reconstituted treatments the wheat was reconstituted to 30 percent moisture and stored for 21 days prior to feeding. The whole-reconstituted wheat was stored in the whole form and rolled just prior to feeding, while the rolled reconstituted wheat was rolled prior to reconstitution and storage. The wheat made up 70 percent of the total ration on a 90 percent D.M. basis.