Dry Processing Of Wheat For Finishing Beef Cattle

Donald G. Wagner, Ryan Christiansen and D. F. Stephens

Story in Brief

Four methods of dry processing wheat were compared with dry rolled milo in 90 percent concentrate rations for finishing beef cattle. The treatments investigated were 1) dry rolled milo, 2) dry rolled wheat, 3) coarsely ground wheat, 4) finely ground wheat and 5) whole wheat. The wheat treatments contained 70 percent wheat in the total ration. The rations were self fed.

In a 122 day steer feeding experiment, average daily feed intakes on a 90 percent D.M. basis were 20.8, 18.6, 20.7, 17.5 and 23.5 lb. for the dry rolled milo, dry rolled wheat, coarsely ground wheat, finely ground wheat and whole wheat treatments, respectively. The treatment differences in feed intake were significant ($P<.05$). Average daily gains were 3.01, 2.70, 2.86, 2.54 and 2.87 on these same treatments, respectively. Although not significant, the differences in gain closely approached the .05 level of probability. The pounds of feed required per pound of gain were 6.90, 6.93, 7.28, 6.89 and 8.19 for the above treatments, respectively. The cattle on the whole wheat consumed significantly more feed ($P<.05$) than on the other treatments.

Introduction

Wheat represents a major economic crop in Oklahoma with production approaching 100 million bushels annually in normal crop years. This is nearly four times the quantity of milo produced in Oklahoma. Due to the low wheat prices during the past few years and the readily available supply of wheat, considerable quantities of wheat have been and are being fed to feedlot cattle, especially during certain months of the year. Furthermore, high yielding varieties of wheat have been developed. Some of these varieties have poor milling and baking properties, but they might possibly be used as livestock feed.

Numerous processing methods have proven useful for improving the nutritive value of milo and some other grains for feedlot cattle. Little research is available, however, concerning the best method of processing wheat when fed in high concentrate rations to finishing cattle. It

In cooperation with Agricultural Research Service, Animal Science Division, USDA.

is true that some grains are now being processed in more sophisticated ways than ever. Nevertheless, considerable interest exists on the part of many cattle feeders in processing grain in a manner which eliminates the need for elaborate, expensive equipment and in which self-feeding programs can be successfully used.

The recent interest in and widespread use of whole corn feeding programs is a case in point. Furthermore, research indicates that not all grains respond the same to processing. The objective of this experiment, therefore, was to determine the effect of various methods of dry processing wheat, including the use of whole wheat, when wheat is fed at a high level in a high concentrate ration to finishing cattle.

Materials and Methods

Equal numbers of choice Angus and Hereford feeder steers weighing approximately 680 lb. were selected for use in this experiment. The animals were gradually adapted to a 90 percent concentrate ration during the preliminary period.

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

1) Dry rolled milo
2) Dry rolled wheat
3) Coarse ground wheat
4) Fine ground wheat
5) Whole wheat

Dry rolled milo was included as one of the treatments to serve as a bench mark or basis of comparison for the high wheat rations in that considerable research has been conducted with dry rolled milo rations.

The milo and wheat for the dry rolled treatments were prepared by rolling through a heavy duty 18 x 24" roller mill with a roller spacing of .003 inch. The wheat for the coarsely ground wheat treatment was obtained by grinding the wheat through a ½" hammermill screen. The wheat for the finely ground wheat treatment was produced by grinding the wheat through a ⅛" hammermill screen. The wheat in the whole wheat treatment was fed in the whole form. The wheat was of the Triumph variety, a hard winter wheat commonly grown in Oklahoma.

The compositions of the experimental rations are given in Table 1. The rations were formulated to contain the compositions indicated on a 90 percent D.M. basis; wheat represented 70 percent of the total ration

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 80% D.M. basis.
[2] Contained cottonseed hulls, ground alfalfa hay, soybean meal, urea, ground milo, minerals, antibiotics, Vitamin A and stilbestrol.

for all wheat treatment. All rations contained five percent cottonseed hulls and five percent coarsely ground alfalfa hay to produce a 90 percent concentrate—10 percent roughage ration. Dry rolled milo was included in all wheat treatment rations at a level of 14 percent of the total ration. Diethylstilbestrol was fed at a level of 10 mg per head per day. The rations were self fed; feeders were filled at approximately weekly intervals.

At two different times during the feeding period, approximately midway and near the end, rumen samples were obtained from each animal; pH values were determined immediately, and a small amount of rumen fluid was saved for VFA analyses.

Initial and final weights were taken full with a 4 percent pencil shrink. Animals in the heavy weight block were fed 112 days; animals in the light weight block were on feed 132 days, for an overall average of 122 days. Carcass specific gravities were determined on each animal at the end of the experiment to permit net energy estimations for the feed using the comparative slaughter technique.

Results and Discussion

The proximate analyses data for the milo and wheat are presented in Table 2. Particle size and densities of the processed grains are given in Table 3. As noted, substantial differences existed in the particle size distribution among the differently processed wheats. The dry rolled wheat and coarsely ground wheat had a rather similar particle size distribution, but the dry rolled wheat had a much lighter density than the coarsely ground wheat, with mean values of 33.1 and 44.6 lb. per bushel, respectively. The finely ground wheat, on the other hand, had a much smaller particle size, as measured in this experiment, than either the dry rolled or coarsely ground wheat. While the dry rolled and coarsely ground wheat had a similar particle size distribution, as measured in this study, it should be pointed out that particle size, as measured here, may

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[3]	88.3	13.05	1.81	2.62	82.88
Wheat[4]	88.8	12.98	2.31	1.82	82.89

[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 Wheat Treatments

	Screen Size							
	4mm	2mm	1mm	500 micron	250 micron	125 micron	Through 125 micron	Wt. per Bu.
Dry Rolled Milo	0.0	1.9	60.5	22.7	5.9	3.6	5.4	39.9
Dry Rolled Wheat	0.0	31.3	42.8	10.9	4.1	2.8	8.1	33.1
Coarse Ground Wheat	0.0	30.1	43.6	14.7	5.6	2.2	4.0	44.6
Fine Ground Wheat	0.0	0.2	12.0	24.1	21.5	15.4	26.8	46.4

[1] Expressed on a 90% D.M. basis.

not necessarily be a direct indicator of total surface area in the grain if rolling, for example, causes multifracturing of a particle. It is a commonly held opinion in the field that the particle size of wheat is not influenced measurably by the grinding or hammermilling conditions (screen size, etc.) due to the hard, flinty nature of wheat which tends to cause considerable shattering of the wheat kernel when subjected to force. This would be at variance with the particle size distributions reported in this study.

The feedlot performance data are shown in Table 4. The levels of daily feed intake (90 percent D.M. basis) were 20.8, 18.6, 20.7, 17.5 and 23.5 lb. per head on the dry rolled milo, dry rolled wheat, coarsely ground wheat, finely ground wheat and whole wheat treatments, respectively. Significant treatment differences ($P<.05$) existed in feed intake.

The average daily gains tended to be the highest on the dry rolled milo and lowest on the finely ground wheat, being 3.01, 2.70, 2.86, 2.54 and 2.87 lb. on the dry rolled milo, dry rolled wheat, coarsely ground wheat, finely ground wheat and whole wheat treatments, respectively. Although not significant, these differences in gain approached the .05

Table 4. Feedlot Permormance[1]

	Dry Rolled Milo	Dry Rolled Wheat	Coarse Ground Wheat	Fine Ground Wheat	Whole Wheat
No. of steers	12	12	12	12	12
Initial weight, lb.	693	693	688	688	685
Final weight, lb.	1058	1024	1033	1003	1038
Daily feed, lb.[2]	20.8[b]	18.6[a,b]	20.8[b]	17.5[a]	23.[c]
Daily gain, lb.	3.01	2.70	2.86	2.54	2.87
Feed/lb. gain, lb.[2]	6.90[a]	6.93[a]	7.28[a]	6.89[a]	8.19[b]

[1] 122 days.
[2] Uncommon letters differ at .05 level.

level of probability. The lowered feed intakes, gains and feed conversions observed on the finely ground wheat treatment may have been related to the fine, powdery nature of the ration resulting in reduced animal acceptance and palatability. Perhaps the inclusion of fat or molasses in such a ration to reduce dustiness and separation may improve performance when wheat is finely ground. The average rate of gain for the animals on all four wheat treatments (70 percent wheat in the total ration) was .26 lb. less than on the milo treatment. This observation is consistent with similar trends noted in other wheat feeding experiments at Oklahoma State; namely, rations containing 70 percent hard red wheat in the total ration usually reduced daily gains approximately .10-.25 lb. per head compared with milo rations.

Although not significantly different, the pounds of feed required per pound of gain appeared to be slightly in favor of dry rolling or fine grinding of wheat as compared with coarse grinding. This would agree with previous experimental observations on rolling and grinding of milo. Since the animals on whole wheat consumed significantly more feed ($P<.05$) and gained at approximately the same rate, the animals on whole wheat displayed a significantly poorer ($P<.05$) feed conversion than those on the remaining wheat and milo treatments. Approximately 1.2 lb. more feed were required per pound of gain on the whole wheat treatment. These data would suggest that wheat cannot be satisfactorily and economically fed in the whole form as can corn.

Mean pH values for the dry rolled milo, dry rolled wheat, coarsely ground wheat, finely ground wheat and whole wheat were 5.96, 5.79, 6.88, 5.66 and 6.75, respectively, for the first rumen sample collection period and 5.79, 6.11, 5.82, 5.80 and 6.69, respectively, for the second collection period.

Carcass characteristics are shown in Table 5. No significant differences ($P<.05$) existed among treatments.

Table 5. Slaughter and Carcass Information

	Dry Rolled Milo	Dry Rolled Wheat	Coarse Ground Wheat	Fine Ground Wheat	Whole Wheat
Dressing, %[1]	62.2	60.8	61.2	60.7	61.6
Carcass grade[2]	9.9	9.8	10.0	9.3	10.2
Ribeye area, sq. in.	12.2	11.4	11.8	12.2	12.1
Fat thickness, in.[3]	0.89	0.89	0.90	0.80	0.93
Marbling[4]	16.6	16.1	16.8	14.9	17.6
Cutability, %	47.65	47.70	47.62	49.18	47.55

[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, 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 Dietary Potassium Levels on Net K^{40} Count in Beef Steers

R. K. Johnson, L. E. Walters and J. V. Whiteman

Story in Brief

Thirty-six Angus-Hereford crossbred steers were used to study the influence of three levels of dietary potassium on net K^{40} count and blood serum and muscle tissue potassium concentrations. The experiment was balanced so that the carryover effect of each diet (the influence of a ration fed in one period on the measurements taken in the following period while steers were on another ration) as well as the direct effect of a diet could be evaluated.

Essentially no carry-over effect of diets was observed. Dietary potassium levels significantly affected K^{40} count of the steers, although they did not have a significant effect on blood serum or muscle tissue potassium levels. These data also indicated animal to animal variation in