The Effect of Feed Grain Preparation Upon Feedlot Performance and Carcass Characteristics of Steers

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The mechanization of beef production has opened new areas for investigation. Foremost of these new areas is that of feed preparation. The older methods of grinding, rolling, and/or steam rolling of feed grains are now being challenged by prolonged steaming, flaking, cooking, and tempering. Tempering, a water soaking, can be done at less expense and with much less complicated machinery than the other new preparations. As each new method is tried, impressive claims for its superiority are reported. Many of these claims are not based upon valid comparisons with proven methods.

The objectives of this experiment were: (1) to compare the effects of tempering, dry rolling, and steam rolling of grains on average daily gain, feed efficiency, and carcass characteristics; and (2) to determine if certain interactions between grain and preparation exist.

Methods

The feeder cattle used in this trial were from a wintering experiment, so they were stratified as to previous treatment and weight and randomly allotted to 12 pens of 11 steers per pen. The experimental design used was a 2 x 3 factorial with two replicates.

Total digestible nutrient (TDN) values were estimated from Morrison's Feeds and Feeding.

The grain preparations consisted of dry rolling (dry grain through a roller), steam rolling (commercial type), and water tempering. The tempering process consisted of soaking grain for approximately 12 hours and then running it through a roller. The moisture content of the tempered grain was about 20%, and the flatness of the flake was intermediate between steam rolling and dry rolling.

The grains used were soft white wheat and barley. The concentrate portion of the ration consisted of 75% grain, either wheat or barley, 15% beet pulp, 5% molasses, and 5% OSU supplement. The total ration consisted of 82% concentrate mixture and 18% chopped alfalfa hay. Because of urinary calculi problems in other cattle in the lots at that time, ammonium chloride (1.25 ounces per head daily) was added to the OSU supplement (Appendix, Table 1). The cattle were fed twice daily at a level calculated so that a small amount of uneaten feed remained prior to each feeding.

The steers were implanted with 12 mg. of stilbestrol at the beginning of the trial. The steers weighed 640 pounds initially and finished at 1,010 pounds in approximately 167 days. Equal numbers from each pen were slaughtered at each slaughter date (140, 154, and 174 days after the start of the trial) so that comparisons of carcass characteristics would be valid.

Results and Discussion

The real advantage to any treatment of grain where heat and moisture are involved is not realized in most experimental work because the feed is usually stored for some time prior to feeding. The freshness of the product consumed is usually related to the animal's intake, and this in turn controls average daily gain, feed efficiency, and subsequent carcass characteristics. However, in this trial the use of steam rolled grain, either wheat or barley, resulted in significantly greater gains ($P < .01$) than the dry rolling of these grains (Table 1). The animals fed tempered grain were intermediate in growth response but not significantly different. There were no significant differences in gains due to either grains used or replicate effect. The effect of the interaction of grain and treatment was significant ($P < .05$). This indicates that the response of all grains to a particular treatment may not be the same.

The physical properties of the grain play an important role in determining the characteristics of the finished manufactured product. The crude fiber content or the type of outside covering on one grain may hold it together during dry rolling, whereas another grain may pulverize to a much greater extent. Past experience at this feedlot has shown there are even varietal differences within grains. For example, Alpine barley does not flake well in the steam rolling process and tends to resemble ground material. From these data it seems that it may be more important to steam roll or temper wheat than barley. This could be explained by the fact that there are more fines in the dry rolled wheat than in barley.

These differences in animal response to grain x treatment interaction may best be illustrated by considering the utilization of estimated TDN from various sources. In the case of wheat, the efficiency of TDN utilization from dry rolled wheat is less than from steam rolled. On the other hand, the dry rolling of barley resulted in TDN utilization comparable to that of steam rolling. In all cases the tempered grains were less efficient in TDN utilization. This could be the result of some losses in soluble carbohydrates.

Two steers died from bloat on the steam rolled barley, one from each replicate. Corrections in feed consumed were made by average daily consumption per animal. (This approach may be subject to bias.)

Although significant differences in average daily gains resulted from different treatments of grain, the carcass characteristics measured were very similar. In fact, pens of animals on identical treatments would be expected to show greater variations than were found. It was also interesting to note that although gains were not as high as usual, the carcasses graded low choice. This was no doubt due to the extra time on the finishing ration.

The extra time on finishing rations of considerable roughage usually produces "barky" carcasses. This was not the case, as only the cattle that were fed steam rolled barley produced over .5 inches of backfat.

Summary

One hundred and thirty-two steers of known background were fed wheat or barley prepared by steam rolling, dry rolling, or tempering. The use of steam rolled grains produced significantly greater gains than dry rolled grain ($P < .01$). Tempered grain was intermediate in gains produced but was less efficient in pounds of beef produced per pound of feed consumed. There was a significant grain x treatment interaction ($P < .05$) in gains produced. This was more apparent when the total digestible nutrient utilization was compared. The steam rolling or tempering of wheat was of greater value than identical treatments of barley.

Table 1. Summary of Performance and Carcass Characteristics of Steers When Fed Steam Rolled, Dry Rolled, or Tempered Wheat or Barley

Treatment		ADG[1] (lbs.)	TDN/ cwt of gain[2]	Marbling score[3]	Backfat (in.)	Ribeye area (sq. in)	USDA grade[4]
Wheat: Steam rolled	Rep. 1	2.52^{ab}	583	14	.44	11.2	16
	Rep. 2	2.57^{a}	582	15	.46	11.5	17
Dry rolled	Rep. 1	2.18^{c}	618	13	.39	11.7	16
	Rep. 2	2.32^{bc}	600	14	.41	11.6	16
Tempered	Rep. 1	2.39^{abc}	631	14	.42	11.7	16
	Rep. 2	2.45^{abc}	613	15	.47	11.1	17
Wheat average		2.41	605	14	.43	11.5	16
Barley:Steam rolled	Rep. 1	2.57^{a}	594	15	.52	11.7	17
	Rep. 2	2.40^{abc}	589	14	.54	11.0	17
Dry rolled	Rep. 1	2.27^{bc}	592	14	.41	11.5	16
	Rep. 2	2.24^{bc}	582	15	.43	10.8	16
Tempered	Rep. 1	2.34^{abc}	620	12	.42	11.3	15
	Rep. 2	2.39^{abc}	626	14	.41	11.2	17
Barley average		2.37	601	14	.46	11.4	16
Steam rolled average		2.52^{a}	587	15	.49	11.4	17
Dry rolled average		2.26^{b}	598	14	.41	11.4	16
Tempered average		2.39^{ab}	623	14	.44	11.4	16

1 ADG = average daily gain. Gains with different superscripts are significantly different ($P < .05$).

2 TDN = total digestible nutrients.

3 Marbling score: 12 = small; 15 = modest.

4 USDA grade: 14 = good; 17 = choice.

Appendix

Table 1. OSU Protein Supplement

	Pounds per ton
Cottonseed meal (41-43%)	100
Alfalfa meal	150
Urea	130
Peas	1,520
Limestone	50
Steamed bonemeal	40
Vitamin A (10,000 IU/gram or equivalent)	10
Ammonium chloride 1.25 oz./lb. of supplement	