

Table 1. Effect of Steam Processing Milo and Barley on Performance of Feedlot Steers (1964 Study)^a

	Milo		Barley	
	DR ^b	SP ^b	DR ^b	SP ^b
Number of steers	15	16	16	16
Average initial weight, lb.	531	523	539	539
Average daily gain, lb.	2.76	3.04	2.75	2.95
Average daily feed, lb.	23.4	24.7	20.6	22.0
Feed/100 lb. gain, lb.	847	814	749	744
Feed cost/100 lb. gain, \$	20.71	19.92	21.09	20.91

^a All values reported with a 5% shrink on initial and final weights.

^b Dry rolled or steam processed.

Table 2. Experimental Rations

	Milo ^a	Barley ^a
Ground alfalfa ^b	5.00	5.00
Cottonseed hulls	15.00	10.00
Milo	68.35	—
Barley	—	74.85
Cottonseed pellets	4.50	3.00
Molasses	5.00	5.00
Dicalcium phosphate	0.50	0.60
Urea	0.60	0.50
Salt	0.50	0.50
Ground limestone	0.50	0.50
Trace minerals	0.05	0.05
	100.00	100.00

Vitamin A, 10,000

I.U./lb. 10 gm. 10 gm.

^a Dry rolled or steam processed.

^b Alfalfa was ground with 1% fat to control dust.

MILO, BARLEY IMPROVED BY STEAM PROCESSING

By W. H. Hale and Bruce Taylor

Performance and feed efficiency in feedlot cattle have shown marked improvement during the last 20 years. Several things have contributed to the improvement. Among these are additives such as stilbestrol, antibiotics, trace minerals, fat and the use of higher concentrate rations.

Recently the processing of grains has been receiving attention as a possibility for additional improvement in performance and feed efficiency. One of the most promising methods of grain processing appears to be a moist heat treatment prior to rolling. The present authors reported in *Progressive Agriculture*, May-June 1964 the results of the first experiment with steam processing milo and barley. The current report includes additional studies with milo, as well as experiments with steam processing barley.

This research at The University of Arizona has attempted to define the conditions of steam treatment of grains as contrasted to reports of studies elsewhere which do not specify the steam treatment.

Raises Moisture Content

The steam-processed grains used in the experiments reported in this paper were treated as follows: The grains

were held in a tempering chamber and subjected to low pressure, high moisture steam until the moisture content of the grains was raised to 18 to 20%. This usually required approximately 20 minutes with temperatures ranging between 205° and 210° F. — the temperature at which steam will condense at the Tucson altitude.

The grain was then rolled and the moisture content and temperature of the grain coming from the rollers were similar to those of the grain in the chamber once the rollers became warm. The high moisture, low pressure steam was produced by an inexpensive steam generator similar to those used in dry cleaning plants.

Results of a feedlot trial conducted during the summer of 1964 at Tucson, comparing steam-processed to dry-rolled milo and barley are presented in Table 1.

Feed Efficiency Up 4 Percent

The rations used in this study are given in Table 2. All rations contained about 11% protein. Slightly different levels of milo and barley were used to equate the crude fiber level in the two rations. Steam-processed milo improved feed efficiency by 4% and performance by 0.28 pounds per day over the dry-rolled milo ration. This was a 10% increase in gain. While steam processing improved the feed efficiency of milo it did not make it equivalent to that of barley.

Steam processing the barley improved gains by 0.20 lb. per day but had no effect on feed efficiency. It appears that steam processing barley improves the physical property of the grain, which results in a higher feed intake by fattening steers. There may be no effect upon the nutritional quality of barley, as indicated by similar

Table 3. Digestibilities of Steam Processed and Dry Rolled Milo

	Milo	
	SP ^a	DR ^a
Dry matter	69.7	61.6
Protein	51.4	49.6
Ether extract	59.0	67.3
Crude fiber	13.6	22.5
Nitrogen free extract	78.5	69.2
Gross energy	69.5	60.0
Total digestible nutrients	69.8	63.4

^a Steam processed or dry rolled.

feed efficiency between the methods of processing. This is in contrast to milo, in which both an increased feed intake and an improvement in feed efficiency occurred due to steam processing. This method reduced the feed cost of gains by 79¢ per hundred pounds of gain as compared to dry-rolled milo.

A digestion trial was conducted with dry-rolled and steam-processed milo to determine if digestibility of some component of the grain was improved by steam processing. The rations used were similar to those in the feedlot study. The results are presented in Table 3. It is apparent from the digestion coefficients that steam processing of milo improves digestion of the nitrogen-free extract fraction. This is the fraction that includes the starch of the grain.

This improvement in digestibility of the nitrogen-free extract of the ration was 13%, which was equivalent to a 17% improvement in the digestibility of the nitrogen-free extract of the milo. Steam processing the milo apparently alters the starch to such an extent that it is more digestible to ruminants.

Protein digestibility was not affected by the steam processing. Earlier

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Dr. Hale is a professor of Animal Science and Dr. Taylor head of that department. A complete discussion of the steam rolling trials was given at the annual Feeders' Day early in May. Readers who wish additional information may write to Dr. Hale and obtain the complete printed report on this work and other research in livestock feeding.

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studies indicated that a more drastic heat treatment than steam processing adversely affected digestibility of milo protein.

Digestibility Higher

The total digestible nutrients and gross energy digestibility were higher in the steam-processed milo than in the dry-rolled ration. While there was a decrease in the digestibility of ether extract and crude fiber of milo due to steam processing, these components make up such a small portion of a high grain ration that they do not materially influence the overall improvement of digestibility due to steam processing.

Additional studies are needed to determine the effect of varying moisture and temperature treatment of the grains while in the tempering chamber.

Freeman Medal Awarded To Sue Alexander

We really don't intend to have an item about Sue Alexander in every issue of this magazine, but if Sue keeps on getting honors and additional honors, what can we do?

Just before classes at The University of Arizona closed in May, announcement was made of the Merrill P. Freeman awards. The medals are given annually by the U of A administration to "the outstanding man and woman of the graduating class."

Our Sue — she has been a parttime student helper in this office — was named to receive the Freeman award in the distaff category. Male recipient was Warren Rustand, president of Associated Students and a basketball star.

The beautiful gold medals were presented to Miss Alexander and Mr. Rustand by President Richard A. Harvill.

Sue Alexander, a home economics major who won the Pillsbury awards contest last spring, began her year of on-the-job training with that company in June. She also attended, and addressed, the college club section of the American Home Economics Assn. national convention in Atlantic City.

Sue is the daughter of Mr. and Mrs. Karl F. Alexander of Tucson.

Arizona Maid of Cotton



The 1965-66 Arizona Maid of Cotton is Miss Pamela Arle, Phoenix, picked from a group of 15 finalists, to represent this state's rich cotton industry in national competition.

Pamela will represent the cotton industry in various events throughout the state, at fashion shows, before agricultural and civic groups, and then next December in the National Maid of Cotton contests at Memphis.

Of particular interest to this college, of course, is the fact that Pamela is the daughter of Mr. and Mrs. H. F. Arle, her father a USDA plant scientist working at the U of A Cotton Research Center in Tempe.

Pamela is a 19-year-old freshman at ASU, majoring in biology. She has been active in a variety of extracurricular activities in high school and college, and is a member of Kappa Kappa Gamma sorority.