The Performance of Beef Steers Fed Iso-Nitrogenous, Iso-Mineral All-Concentrate Rations

M. M. McCartor and Allen D. Tillman[1]

The grain sorghums are deficient in several minerals as well as protein. The protein deficiency can be corrected by the addition of an oil seed meal and/or urea while mineral deficiencies are often corrected by the addition of a high quality roughage, such as alfalfa hay or dehydrated alfalfa meal, to the ration.

It would appear from a consideration of the chemical analyses that high- or all-concentrate rations based on milo and supplemented with cottonseed meal and dehydrated alfalfa would supply most minerals needed by fattening steers. However, if no cottonseed meal or alfalfa meal were included in the ration, it could be deficient not only in several major mineral elements, but also in several trace minerals.

The purpose of this trial was to determine whether the nutrients supplied by cottonseed meal and dehydrated alfalfa would improve the performance of fattening steers.

Experimental Procedure

The experiment was conducted in the beef cattle feeding facilities at the Panhandle A&M College, Goodwell, Oklahoma. One hundred and ten choice Hereford steers with an average initial weight of 720 lb. were randomly divided into five treatment groups. Rations 1, 2, 3 and 4 were each fed to 23 animals while ration 5 was fed to 18 animals. The groups were further subdivided into three subgroups and group-fed their respective diets for 143 days. All animals were hand-fed twice daily with feed records being kept on each subgroup. Water was available at all times.

The animals were weighed intially and at 28-day intervals during the trial. Compositions of the diets are shown in Table 1. Samples of milo were analyzed for nitrogen by the Kjeldahl procedure and for minerals by atomic absorption spectrophotometry. Chemical analysis of the dehydrated alfalfa meal and cottonseed meal were supplied by the American Dehydrators Association and the National Cottonseed Products Association, respectively. A separate premix was formulated for each treatment group in accord with ingredient analyses in an attempt to make the diets contain the same levels of crude protein and all minerals. Vitamin A, chlortetracycline and diethylstilbestrol were also added to the premix (see footnote 2, Table 1).

[1] Professor of Nutrition and Physiology, Panhandle A&M College, Goodwell, Oklahoma and Professor of Animal Science, Oklahoma Agriculture Experiment Station, Stillwater, respectively.

Table 1. Percentage Composition of the Diets

Ingredients	Diets 1	2	3	4	5
Ground milo	87.50	84.75	96.25	91.50	87.75
Dehydrated alfalfa	-- --	5.00	-- --	5.00	5.00
Cottonseed meal[1]	8.10	7.00	-- --	-- --	3.20
Urea[1]	-- --	-- --	0.98	0.84	0.46
Premix[2,3]	4.40	3.25	2.77	2.66	3.59
Total	100.00	100.00	100.00	100.00	100.00

[1] All diets contained 12% crude protein.

[2] The amount of premix varied with each treatment to give the following levels of minerals in each diet: calcium, 0.35%; phosphorus, 0.30%; magnesium, 0.20%; sulfur, 0.13%; potassium, 0.70%; sodium, 0.20%; copper, 10 ppm; manganese, 30 ppm; iron, 80 ppm; cobalt, 0.1 ppm; iodine, 0.1 ppm; and zinc, 80 ppm.

[3] One pound of each ration contained 1500 I.U. vitamin A, 3.5 mg. chlorotetracycline and 0.5 mg. diethylstilbestrol; the concentration of each of these ingredients differed in each premix.

Table 2 shows the percentage of the total crude protein contributed by each ingredient. Feed grade urea containing 45 percent nitrogen was used in the appropriate diets. Technical grade minerals were used and the purity recorded by the suppliers were used in all calculations. The milo was dry-rolled before being mixed with the other ingredients. All diets were mixed in 2,000 lb. batches using a horizontal, double ribbon mixer.

Results and Discussion

Table 3 exhibits the feedlot performance data of the cattle. Feed consumption, gains, and feed efficiency were similar on all rations and were not different statistically. However, in agreement with results of other workers, cattle receiving cottonseed meal tended to eat more feed, gain faster, and make more efficient gains than those containing urea. The addition of dehydrated alfalfa meal did not improve the cottonseed meal- or urea-containing rations. As cottonseed meal is a rich

Table 2. Percentage of the Total Crude Protein Supplied by Each Ingredient

Ingredients	Diets 1	2	3	4	5
Ground milo	66.8	64.2	72.4	69.4	66.6
Cottonseed meal	33.2	28.7	----	----	13.2
Urea	----	----	27.6	23.5	13.1
Dehydrated alfalfa	----	7.1	----	7.1	7.1
Total	100.0	100.0	100.0	100.0	100.0

Table 3. Feedlot Performance of Steers (143-Day Test)

Item	Diets				
	1 CSM[1]	2 CSM+D[2]	3 Urea(u)[3]	4 U+D	5 CSM+U+D
Animals, Nos.	23	21[4]	23	22[4]	18
Final weight, lb.	1070	1050	1055	1066	1056
Initial weight, lb.	716	714	714	722	721
Daily gain, lb.	2.48	2.35	2.38	2.40	2.34
Daily feed, lb.	19.99	19.72	19.77	19.83	19.53
Feed/lb. gain, lb.	8.06	8.39	8.31	8.23	8.35

[1] CSM = Cottonseed meal
[2] D = Dehydrated alfalfa.
[3] U = Urea.
[4] Two animals were removed from diet 2 and one from diet 4 because of urinary calculi.

source of phosphorus and essential trace minerals, it was expected that the replacement of it by dehydrated alfalfa meal, which is also an excellent source of certain minerals, could dilute the diet as regards energy and result in slower gains. The results tend to support the idea, but it must be emphasized that the differences were not significant, statistically.

Since urea contains no essential minerals, one would expect that the addition of dehydrated alfalfa meal could improve animal performance; however, there was no improvement. As many workers have reported that the addition of dehydrated alfalfa meal improved cattle performance when highly-concentrated rations were fed, the results of the present trial indicate that their rations were deficient in one or more essential minerals and that these were corrected by the addition of dehydrated alfalfa meal. It thus appears that when all minerals are present in sufficient levels, no beneficial effects from the addition of dehydrated alfalfa meal are obtained.

Table 4 exhibits a financial statement on the trial. Feed costs are based upon feed prices at the time the trial was initiated. As the price of cottonseed meal was out of line in comparison to the price of urea, milo and mineral supplements to make these combinations equal in nitrogen and certain minerals, the urea-containing diet was more profitable than the one containing cottonseed meal. It thus appears that urea can serve as the sole source of supplemental nitrogen in all-concentrate diets containing milo if adequate minerals and vitamins are added and that such a substitution is desirable as regards profitable feeding of cattle.

Summary and Conclusions

One hundred and ten Hereford steers were used to compare urea and cottonseed meal as supplemental nitrogen sources in all-concentrate diets containing milo. In addition, dehydrated alfalfa meal was added to both the urea- and cottonseed meal- containing diets. A fifth ration contained urea, cottonseed meal, and dehydrated alfalfa meal. All rations contained the same levels of nitrogen and essential minerals.

Table 4. Financial Statement

Item	Rations				
	1 CSM[1]	2 CSM+D[2]	3 Urea(u)[3]	4 U+D	5 CSM+U+D
Final value—dollars[4]	273.00	268.00	269.00	272.00	269.00
Initial value—dollars[4]	200.00	199.50	199.50	202.00	202.00
Increase—dollars	73.00	68.50	69.50	70.00	67.00
Feed cost—dollars[5]	66.92	60.06	55.99	55.02	55.50
Return over feed—dollars	6.08	8.44	13.51	14.98	11.60

[1] CSM = Cottonseed meal.
[2] D = Dehydrated alfalfa.
[3] U = Urea.
[4] Appraisal values by experienced appraisers used for initial and final values.
[5] Actual cost of the feeds and no processing or mixing charges were assessed to any treatment.

Differences in feed consumptions, daily gains and feed efficiencies were not significant, indicating that urea can serve as the sole supplemental nitrogen source in all-concentrate diets containing milo if the diet is properly supplemented with minerals and vitamins. Neither the cottonseed meal- nor the urea-containing diets improved by the addition of dehydrated alfalfa meal.

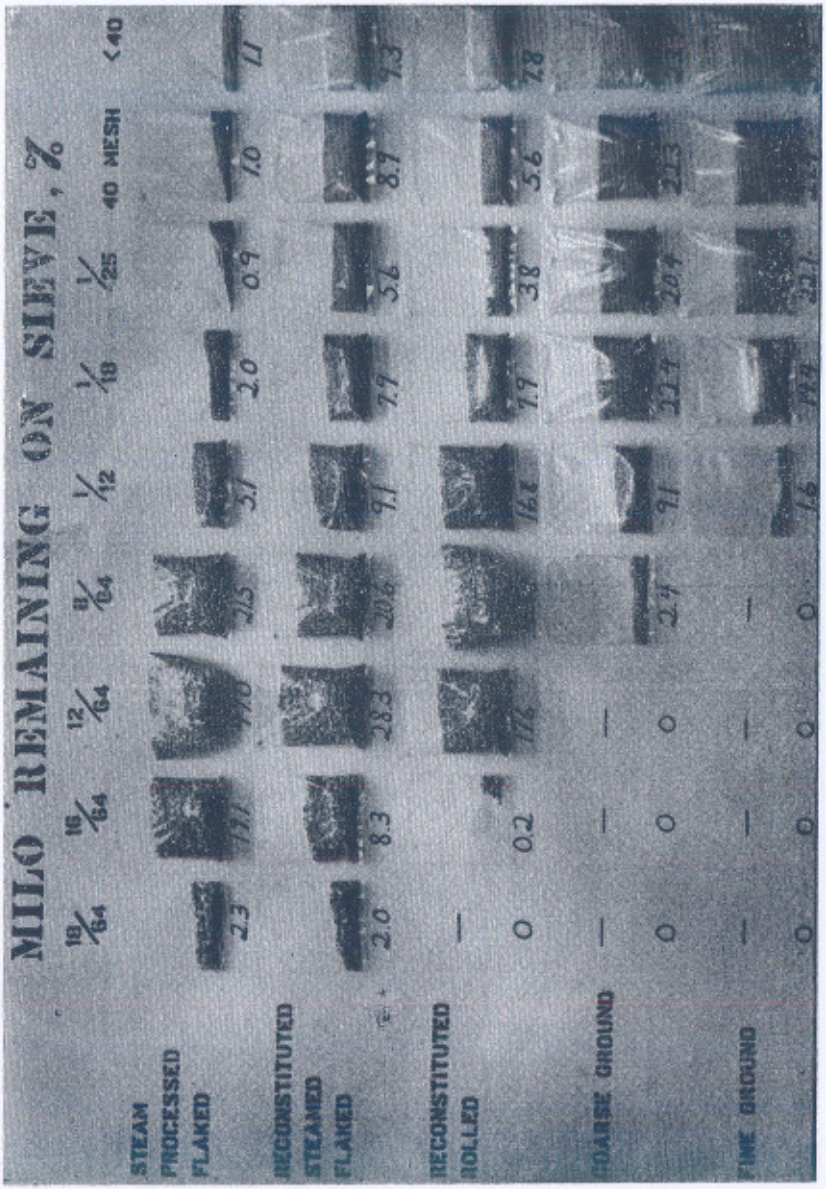

Figure 1. Particle size of milo as affected by processing method. (See Methods of Processing Milo for Fattening Cattle, p. 70) The first seven columns show the percentage of milo remaining on each sieve of the indicated size (in inches). The eighth column shows the percentage of milo remaining on a 40-mesh sieve (about 1/100 inch), and the ninth column shows the percentage of milo passing through a 40-mesh sieve.