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L. B. Embry  
*South Dakota State University*

R. M. Luther

J. F. Fredrikson

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Sulfur Supplementation With Urea as the Supplemental Protein  
With Corn Silage or Ear Corn Diets for Beef Steers

L. B. Embry, R. M. Luther and J. F. Fredrikson

This experiment was conducted to determine the need for a sulfur supplement with urea used as the primary supplemental protein in corn silage or ear corn diets for growing and finishing steers. Supplements which contained one part of sulfur to 10 or 20 parts nitrogen from the urea were compared to a urea supplement without added sulfur and to a low-protein corn supplement fed at the same level. The experiment consisted of a corn silage feeding phase of about 4 months and a ground ear corn phase of about 6 months.

Procedure

Corn Silage Phase

Eight pens with 15 steers were used in the experiment. Four diet treatments were replicated with inside and outside feeding which will be combined in presenting results of the diet treatments.

The cattle were full-fed corn silage once daily and 2 lb. of a supplement. The four experimental treatments were as follows:

1. Corn supplement (control).
2. Urea supplement (40% protein).
3. Urea supplement with 1 part sulfur to 20 parts nitrogen in the urea.
4. Urea supplement with 1 part sulfur to 10 parts nitrogen in the urea.

The corn (control) supplement was composed of 87.65% ground corn grain, 6.0% dicalcium phosphate, 6.0% trace mineral salt and 0.35% aureomycin premix to furnish 35 mg. aureomycin per pound of supplement. Vitamin A was added to furnish 10,000 I.U. per pound of supplement and the cattle were implanted with diethylstilbestrol. Urea was used to replace an equal weight of corn in this supplement (11.80, 11.85 or 11.90%) to obtain 40% protein supplements with no added sulfur and at 1 part sulfur to 20 or 10 parts of nitrogen in the urea.

Ground Ear Corn Phase

The corn silage phase of the experiment was terminated after 124 days. Diets were then changed to ground ear corn with the corn silage being eliminated over a 5-day period. Ground ear corn was increased to a full feed at a rate of 2 lb. per head daily. This rate of increase apparently was too rapid and some death losses resulted as indicated from numbers of cattle per treatment group in table 2. Results presented are for animals completing the experiment with an average feed being deducted per animal up to the time each loss occurred.

The experimental treatments for the supplements were the same as during the corn silage phase except diethylstilbestrol was added at 5 mg. per pound of supplement. The cattle remained in the same pens for this phase of the experiment as

during the previous phase. The experiment was terminated after 189 days on this ground ear corn phase. The cattle were marketed at a central stockyards and carcass data were not obtained.

## Results

### Corn Silage Phase

Results of this phase of the experiment are shown in table 1. It is evident that corn silage and the 2 lb. of corn supplement with added minerals, vitamin A and aureomycin did not supply adequate protein and that supplementing with urea resulted in marked improvement in rate of gain. The average improvement in rate of gain for all the urea supplemented groups amounted to 43% in comparison to the corn control. The cattle fed urea also consumed more feed but required 15.1% less feed per 100 lb. of gain than did the low-protein groups.

Rate of gain was lower and feed requirements higher when feeding supplements with added sulfur. However, these differences were quite small and more likely indicate no effect from sulfur supplementation rather than a reduction in feedlot performance.

Water analysis showed a sulfate ( $SO_4$ ) content of 1865 ppm. Sulfur requirements of cattle appear to be about 0.1% of the air-dry diet. On this basis, the maximum daily sulfur requirement would be about 7 to 8 gm. during this phase of the experiment. Each gallon of the water contained about 2.3 gm. of sulfur. Normal intakes of the water by the cattle should supply total sulfur needs from the water without a need from other diet sources.

### Ground Ear Corn Phase

Results of this phase of the experiment are shown in table 2. Rate of gain and feed efficiency for cattle fed the corn (control) supplement were improved somewhat more than for those fed the high urea supplement over the corn silage phase. This would be in support of a lower protein requirement of cattle with advancing age and finish.

Gains and feed requirements also favored the cattle fed the urea supplement without added sulfur during this phase of the experiment. The difference in gain between urea supplements with and without added sulfur was greater during this phase of the experiment than during the corn silage phase, especially in case of the higher level of sulfur supplementation (1 part sulfur to 10 parts nitrogen from urea). However, data from this one experiment are not enough to conclude these levels of added sulfur were detrimental to cattle feedlot performance.

## Summary

Diets composed of corn silage or ground ear corn were improved by urea supplementation with the improvement in gain and feed efficiency being more pronounced during early stages of growing and finishing when fed corn silage than during later stages of finishing when fed ground ear corn. Adding sulfur at 1 part to 20 or 10 parts of nitrogen from the urea did not show any beneficial effect during either phase. Sulfur content of the water was quite high and would furnish in excess of sulfur requirements at normal water consumption.

Table 1. Sulfur Levels in Urea Supplements Fed With Corn Silage To Growing and Finishing Beef Steers (January 22 to May 26, 1970 - 124 Days)

	Type of Supplement			
	Corn	Corn-urea	Corn-urea 1 pt. S to 20 pt. N <sup>a</sup>	Corn-urea 1 pt. S to 10 pt. N <sup>a</sup>
Number of steers	30	30	30	30
Avg. init. wt., lb.	416	416	416	416
Ave. final wt., lb.	592	671	663	687
Avg. daily gain, lb.	1.41	2.07	1.99	1.99
Avg. daily feed, lb.				
Corn silage	30.28	37.35	36.70	36.84
Supplement	1.98	1.98	1.98	1.95
Feed/100 lb. gain, lb.				
Corn silage	2148	1804	1844	1851
Supplement	140	96	99	98
Total	2288	1900	1943	1949

<sup>a</sup> 1 part of sulfur to 20 or 10 parts nitrogen from urea in supplement.

Table 2. Sulfur Levels in Urea Supplements Fed With Ground Ear Corn to Growing and Finishing Beef Steers (May 25 to December 1, 1970 - 189 Days)

	Type of Supplement			
	Corn	Corn-urea	Corn-urea 1 pt. S to 20 pt. N <sup>a</sup>	Corn-urea 1 pt. S to 10 pt. N <sup>a</sup>
Number of steers	26	30	28	30
Avg. init. wt., lb.	590	671	664	687
Avg. final wt., lb.	959	1106	1080	1067
Avg. daily gain, lb.	1.95	2.30	2.20	2.13
Avg. daily feed, lb.				
Ground ear corn	14.69	16.50	16.59	16.16
Supplement	1.95	1.95	1.96	1.97
Feed/100 lb. gain, lb.				
Ground ear corn	753	717	754	759
Supplement	100	85	89	92

<sup>a</sup> 1 part of sulfur to 20 or 10 parts nitrogen from urea in supplement.