

Soybean Meal vs. Urea Supplement, With and Without Trace Minerals, For Fattening Yearling Steers*

L. S. Pope, Kenneth Urban, L. E. Walters, and George Waller

Although it was observed over 70 years ago that ruminants can utilize urea to meet part of their protein requirements, due to synthesis of bacterial protein in the paunch, current feeding recommendations specify that urea should supply no more than 1/3 of the protein. Most trials have shown that supplements having nearly all of their nitrogen as urea are not as efficiently used as oil meal proteins. In addition, a toxicity problem exists where supplements high in urea are fed.

This prevents the feeder from obtaining full advantage from urea when oil meals are high in price and grains are relatively cheap. Recent research with range supplements has shown that trace minerals may improve the utilization of urea. In the study reported here, a supplement was designed in which nearly 80 percent of the crude protein equivalent was supplied by urea. Comparisons were made of this supplement vs. soybean meal, as well as a study of the effect of adding trace minerals to each supplement.

Procedure

Sixty-four yearling Hereford steers were selected in September from the Experiment Station herd at Lake Carl Blackwell. These cattle were from an experiment designed to test the effect of different levels of stilbestrol implants (0, 12, 24 and 36 milligrams) during the summer grazing season.

The cattle were placed on feed at Fort Reno. They were divided into eight pens of 8 steers each, with 2 steers in each lot from each of the four summer implant treatments. Further, the steers were allotted on the basis of shrunk weight, feeder grade, and previous summer gain. One-half of the steers from each summer treatment were implanted with 24 milligrams of stilbestrol at the base of the ear at the start of the feeding trial.

Results of summer implantation on feedlot performance are given elsewhere in this publication. The lots were assigned at random to the rations to be tested. Duplicate pens of 8 steers each constituted a lot and were full-fed ground milo, with limited amounts of sorghum silage and the following protein supplements (1.5 pounds per steer daily):

* The urea feed compound used in these trials was generously supplied by Deere and Company, Pryor, Oklahoma, and the trace mineral mixture by Calcium Carbonate Company, Chicago, Illinois.

- Lot 1—Soybean meal (solvent processed).
- Lot 2—Soybean meal plus trace minerals.
- Lot 3—Urea-milo-bone meal supplement.
- Lot 4—Same as Lot 3 plus trace minerals.

The urea supplement supplied approximately the same crude protein and phosphorus as the soybean meal and contained 82.5 percent ground milo, 14.5 percent urea feed compound, and 3 percent steamed bone meal. To avoid possible toxic effects with cattle not accustomed to the urea supplement, it was gradually substituted for soybean meal in rations of Lot 3 and 4 steers over a 3-week period at the start of the feeding trial.

The trace minerals fed Lot 2 steers were pre-mixed with a small amount of soybean meal and then mixed with the desired amount of oil meal. A similar procedure was used in incorporating urea, bone meal, and trace minerals in the ground milo, which formed the base of the urea supplement for Lots 3 and 4. The commercial trace mineral mixture fed at the rate of 4 grams per steer daily to Lots 2 and 4 supplied (milligrams per head daily): iron, 384; copper, 29.2; manganese, 488; zinc, 26.8; iodine, 15.2; and cobalt, 10.4.

The steers were fed in dirt pens with an adjacent open shed for shelter. Ration ingredients were fed once daily in large bunks beneath the shed. A mineral mix containing two parts salt and one part steamed bone meal was available to the cattle in all lots. Initial and final weights were taken after a 16-hour period off feed and water. At the completion of the trial, the steers were shipped to Oklahoma City for slaughter. An "on foot" value was calculated using the actual market value of the carcass, based on grade and yield, divided by the final weight off test at Fort Reno.

Results

The average results obtained are shown in Table 1. Each lot shown in Table 1 represents average results from two pens of steers. Essential data based on average comparisons of all lots fed soybean meal vs. urea, or trace minerals vs. no trace minerals, are shown in Table 2. It was necessary to remove several steers from the data due to a rather high incidence of founder and sickness (see footnote to Table 1).

Substituting a special urea supplement composed of ground milo, urea, and steamed bone meal for an equal amount of soybean meal in Lots 3 and 4 resulted in a slight depression in gain and a decrease in feed efficiency with a higher feed cost per cwt. gain.

On-foot value was slightly reduced for the urea-fed lots, resulting in \$5.98 less return per head over costs of steer and feed as compared to cattle receiving soybean meal. Although soybean meal cost \$6 more per ton than the urea supplement, net returns indicate that soybean meal was worth about \$44 more per ton, based on the difference in feed cost per cwt. gain and on-foot value of the two groups of cattle.

This is often the case when comparing two protein supplements since the small amounts fed exert a great influence on rate and efficiency of gain, as well as on final value of the carcass produced. Hence, the feeding value of a protein supplement may be greatly magnified when expressed in terms of cost of gain and value of the final product, and related back to the small amount fed.

There was no apparent distaste for the urea supplement under the conditions of this trial. Average consumption of milo and sorghum silage were very similar among the lots. Cattle gradually accustomed to

TABLE 1. Soybean meal vs. a urea supplement, with and without trace minerals, for fattening yearling steers (157 days on feed, average of 2 pens per treatment).

Lot number	1	2	3	4
Supplement	Soybean Meal	S. B. Meal Plus Trace Minerals	Urea Supplement	Urea Supplement Plus Trace Min.
No. steers per lot ¹	15	13	16	15
Ave. weights (lb.)				
Initial, 10/17/58	758	761	754	754
Final 3/23/59	1179	1177	1166	1151
Total gain	421	416	412	397
Ave. daily gain	2.68	2.65	2.62	2.53
Ave. daily ration (lbs.)				
Ground milo	20.6	20.5	20.6	20.6
Soybean meal	1.5	1.5		
Urea supplement ²			1.5	1.5
Trace minerals (gm.)		4		4
Sorghum silage	25.0	24.7	24.7	25.0
2-1 mineral mix	.06	.06	.06	.06
Feed per cwt. gain (lb.)				
Milo	766	778	787	814
Supplement	56	57	57	59
Silage	932	945	944	988
Feed cost per cwt. gain (\$)	21.56	21.93	21.91	22.73
Slaughter data ³				
Yield, %	60.7	61.1	60.4	60.5
Marbling score	7.2	7.6	7.6	7.6
Carcass grade score	6.1	6.4	6.4	6.4
On-foot value/cwt. (\$) ⁴	26.63	26.64	26.32	26.46
Net return/head over steer plus feed cost (\$) ⁵	41.29	39.68	35.66	33.35

¹ One steer removed from each of Lots 1, 2 and 4 for founder, and 2 steers from Lot 2 for sickness of unknown cause.

² Urea supplement substituted for soybean meal by stepwise replacement over the first 3 weeks of the trial. Small amount of soybean meal fed Lots 3 and 4 included in 1.5 lb. average daily urea supplement fed.

³ Hot carcass weights shrunk 2½%. Marbling score: 2=abundant, 8=moderate, 14=slight or trace. Carcass grade score: 2=prime, 5=choice and 8=good.

⁴ Value per cwt. computed from carcass grade and weight x current value, based on final live weight off test.

⁵ Initial feed cost=\$24.00 per cwt. Cost of urea supplement fed Lots 3 and 4=\$56.00/ton.

TABLE 2. Average lot comparisons of soybean meal vs. urea, and trace minerals vs. no trace minerals.

Comparisons	Lots 1 & 2 vs. 3 & 4		Lots 1 & 3 vs. 2 & 4	
	S. B. Meal	Urea Supple.	No. Trace Min.	Trace Min.
Number of steers per treatment	28	31	31	28
Ave. daily gain (lb.)	2.67	2.58	2.65	2.59
Feed required/cwt. gain (lb.)				
Milo	772	801	777	796
Supplement	57	58	57	58
Silage	939	966	938	967
Feed cost/cwt. gain (\$)	21.75	22.32	21.74	22.33
On-foot value/cwt. (\$)	26.64	26.39	26.48	26.55
Net return/steer (\$)	40.49	34.51	38.48	36.52

the urea supplement over a 3-week period showed no disturbance or evidence of urea toxicity. Performance of the urea-supplemented group early in the trial was less favorable than for those fed soybean meal; this difference tended to become less toward the end of the 157-day test. This may have been an indication of adaptation to the high-urea supplement.

The results indicate that when gradually accustomed to urea in fattening-type rations, cattle may ingest large quantities of urea safely, although the 0.22 pound per day of urea consumed in these trials is less than that shown to be toxic when ingested during a short interval.

Adding trace minerals, either to the soybean meal or urea supplement fed to Lots 2 and 4 appeared to slightly depress gains. This is in contrast to results of several range tests at Lake Carl Blackwell where trace minerals appeared to be beneficial in urea supplements for wintering calves on weathered grass. This difference is probably due to the trace mineral content of the forage, which in the case of sorghum silage should be more advantageous to rumen bacteria.

When both lots fed either trace minerals or no trace minerals are compared, the 4 grams of commercial trace minerals fed daily reduced gains slightly, increased feed costs per cwt. gain by \$0.59, and reduced net return per steer by \$1.96 per head. Thus, the inclusion of trace minerals in steer fattening rations in this experiment as "insurance" against a deficiency was not profitable. With the exception of urea supplements fed cattle on weathered range grass, extensive research at this station has failed to show an advantage from adding trace minerals to cattle rations. There are no known areas of trace mineral deficiency in this state according to present information.

Summary

Fattening trials were conducted with yearling steers to study the value of a high-urea supplement (containing ground milo, urea, and bone meal) vs. soybean meal in rations based on milo and sorghum silage. Further comparisons were made of the effect of adding trace minerals to each supplement.

Results show little difference in rate of gain among treatments, although there was a tendency for the soybean meal fed cattle to gain faster than those receiving urea. Although the urea supplement cost less per ton than soybean meal, net returns per steer favored the steers fed soybean meal by \$5.98 per head.

Trace minerals failed to increase performance when added to either supplement, with a tendency for reduction in gain when added to the urea supplement.

Rolled vs. Pelleted Milo and Certain Feed Additives For Fattening Steer Calves

L. S. Pope, L. E. Walters, George Waller, and W. D. Campbell

Cattle feeders must constantly seek new ways of cutting feed costs in the face of strong competition between beef and other meats. Even small differences in rate of gain and feed efficiency may mean the difference between profit and loss. New methods of preparing grain, such as pelleting, have shown promise in previous tests. With the use of new growth stimulants, such as stilbestrol, the protein requirements of fattening steer calves needs research.

Additional information is needed on the effect of new antibiotics and tranquilizers. Accordingly, a series of steer fattening trials have been conducted at this station since 1956*. This report gives results of the third test.

Procedure

Seventy choice, fall-dropped steer calves were purchased in September from the Lazy S Ranch at Springer. These calves were selected for uniformity from a large group. Upon arrival at Stillwater, they were given 3 weeks to recover from the effects of weaning and shipment, and to become accustomed to the feeds to be used during the trial. The calves were divided into 7 groups of 10 calves each on the basis of shrunk weight and feeder grade; the groups were then assigned to treatment at random.