Self-Fed Liquid and Dry Supplements for Wintering Range Cows

Robert Totusek, J. W. Holloway and W. E. Sharp

Story In Brief

Liquid self-fed supplements, and dry self-fed supplements containing urea or feed grade biuret to furnish one-half of the protein equivalent, were compared to supplements containing only natural protein for range cows.

In one trial during which some prairie hay was fed, weight loss of cows on liquid supplement was similar to that of cows on natural protein. In another trial when only dry grass was available, weight loss was greater on liquid supplement. In both trials, condition of cows and weaning weight of calves tended to favor the natural protein supplements.

The dry self-fed supplements containing urea or feed grade biuret produced results almost as good as a natural protein supplement, and suggest excellent potential for increasing the utilization of non-protein-nitrogen sources for range cattle.

Introduction

There is much interest today in the self-feeding of supplements to range cows. One of the primary reasons for this current interest is the decreasing availability, and increasing cost, of labor.

Much research at the Oklahoma Experiment Station the past 20 years conclusively showed that the intake of cottonseed meal and other protein supplements could be restricted to a desired level by combining with salt, with no deterimental effects on cattle.

There is also renewed interest in self-feeding as a possibility to improve the utilization of non-protein-nitrogen sources (protein replacers) such as urea. Urea is rapidly converted to ammonia in the rumen of cattle, and much of the ammonia is lost before it can be converted to protein. It is possible that the frequent consumption of a urea supplement will result in less loss than when the supplement is consumed daily or every other day.

Liquid supplements are being fed in increasing quantity, primarily because of convenience in feeding. They can be delivered to the self-feeding tank in the pasture with no handling required on the part of the cat-

tleman, and as with any self-fed supplement little labor is required for feeding.

The use of liquid supplements is facilitated by the fact that certain feed ingredients such as urea, phosphorus sources, trace minerals and vitamins are soluble and can be satisfactorily combined with liquid feeds such as molasses. Some ingredients such as urea and phosphoric acid (a source of phosphorus) help to limit the intake.

Most liquid supplements contain urea as the principal source of nitrogen, rather than sources of natural protein such as cottonseed meal or soybean meal. Urea is efficiently utilized as a partial protein replacer in feedlot rations, but its utilization has been less satisfactory under range conditions.

Biuret is another non-protein-nitrogen compound which has potential as a protein replacer for range cattle. It is of interest particularly because it is broken down less rapidly and is less toxic than urea.

The object of the experiments reported here was to compare liquid self-fed supplements and dry self-fed supplements containing urea and biuret to dry supplements containing only natural protein.

Procedure

The trials were conducted at the Lake Carl Blackwell Experimental Range near Stillwater. Experimental cows were Angus and Herefords. Treatment groups were equalized with respect to age and/or breed when more than one breed and/or age was involved in a trial. Calves were born during February, March and April and weaned in early October. Cows grazed native tall grass pastures and were rotated among pastures in each trial. A mineral mix of equal parts salt and dicalcium phosphate was fed free choice.

Trial 1

Trial 1 was conducted during the winter of 1968-69, from December 6 to April 25, a period of 140 days. Angus and Hereford cows five years of age were divided into two groups within each breed. One of each of the breed groups received a dry pelleted supplement containing 25 percent crude protein; all of the protein was natural protein. Major ingredients were cottonseed meal and milo, with 5 percent alfalfa and 5 percent liquid molasses. The supplement was fortified to contain 1.25 percent phosphorus and vitamin A at a level of 10,000 I.U. per pound. This supplement was fed three times each week at an equivalent rate of 3 pounds per cow daily.

The second of each of the breed groups was self-fed a liquid supplement with a protein equivalent of 30 percent, 28.1 percent of which was

contributed by urea (45 percent nitrogen) at a level of 10 percent of the supplement. The liquid supplement was fortified with trace minerals, phosphoric acid to furnish 1.25 percent phosphorus, and vitamin A at a level of 10,000 I.U. per pound.

Prairie hay was fed at a rate of 10 lb. per cow daily beginning when calving started February 1.

Trial 2

Trials 2 and 3 were conducted during the winter of 1969-70, from November 21 to April 9, a period of 139 days. Angus and Hereford cows, four and five years of age in Trial 2 and six years of age in Trial 3, were divided into three and four similar groups for Trials 2 and 3, respectively. Three dry supplements were self-fed in both trials, and a liquid supplement was also self-fed in Trial 3; all supplements contained 30 percent protein equivalent. One dry supplement contained only natural protein, a second contained urea to furnish one-half of the protein equivalent, and a third contained a feedgrade biuret[1] to furnish one-half of the protein equivalent. All three supplements were formulated to contain 1.5 percent phosphorus, 0.5 percent calcium, 0.5 percent sulfur, 5 percent alfalfa meal and 5 percent liquid molasses. Major ingredients were wheat and soybean meal. Consumption of the dry supplements was regulated at desired levels by the inclusion of salt.

The liquid supplement[2] was similar to the one fed in Trial 1. Consumption was limited when necessary with aluminum sulfate at levels of 10 to 20 lb. per ton of supplement.

Prairie hay was fed in Trials 2 and 3 only when snow covered the grass.

Results

Trial 1

Consumption of the self-fed liquid supplement averaged 4.2 lb. per cow daily, compared to 3.0 lb. of the natural protein supplement which was hand-fed. Results are summarized in Table 1.

Total winter weight losses were similar and not significantly affected by type of supplement. However, the patterns of weight loss were considerably different. During the first 28 days of the trial, cows fed the natural protein supplement gained 9 lb. per cow while those fed the liquid supplement lost 48 pounds. This period included two weeks of severely cold weather during which the intake of liquid supplement was very low. Subsequently, the cows on the natural protein supplement lost

[1]Kedlor, furnished by Farmland Industries Kansas City, Missouri.
[2]Supplied courtesy of National Molasses Company, Willow Grove, Pennsylvania, and Lyle Perry, Waskomis.

Table 1. Trial 1: A Comparison of a Liquid-Urea Supplement With a Natural Protein Supplement

Breed	Angus		Hereford		Breeds combined	
Type of supplement	Control[1]	Liquid[2]	Control	Liquid	Control	Liquid
No. cows	14	13	10	10	24	23
Initial wt., 12-6-68, lb.	914	906	987	990	945	943
Final wt., 4-25-69, lb.	770	778	854	862	805	815
Wt. change lb.	—144	—128	—133	—128	—139	—128
Birth wt. of calves, lb.	54	53	63	62	58	57
Weaning wt. of calves, lb.	462	445	442	422	455	436

[1] A dry supplement containing 25% protein equivalent, all natural protein.
[2] A molasses-base supplement containing 30% protein equivalent, including 28.1% from urea.

more weight than cows on liquid supplement. The improved performance of the liquid supplement during late winter may have been associated with the feeding of prairie hay beginning February 1, since previous research has shown that urea is utilized more satisfactorily with hay than with dry grass. The cows fed liquid supplement appeared to be in poorer condition at the end of winter, but this difference was not reflected in body weight.

Birth weight of calves was not affected by type of supplement. Although weaning weights favored the natural protein groups, by 17, 20, and 19 lb. for the comparisons involving Angus, Herefords, and combined breeds, respectively, the differences were not satistically significant.

The type of supplement fed was without apparent affect on the rebreeding performance of the cows.

Trial 2

Results are shown in Table 2. The average daily intake of supplements was regulated rather effectively with salt; there was only 0.09 lb. difference between the low and high consuming groups. Although differences in average winter weight change were not large, weight changes within groups were consistent and consequently the differences were statistically significant. Cows on natural protein gained 32 lb. more than cows on the urea supplement, which in turn had an advantage in weight change of 16 lb. over the cows on the biuret supplement. Condition scores at the end of the wintering period followed the same trend as weight changes, but differences were not statistically significant.

Cows were pasture exposed to bulls for a 45-day period. Most of the cows conceived. With the short breeding season and limited numbers of cows involved it is not possible to make meaningful conclusions regarding treatment effects on conception.

Table 2. Trials 2 and 3. A Comparison of Self-fed Liquid and Dry Supplements for Range Cows

	Supplement[1] (all self-fed)			
	Natural protein (dry)	Urea[2] (dry)	Kedlor[3] (dry)	Liquid supplement[3]
Trial 2: Open cows				
No. cows	10	11	10	
Daily supplement, lb.	2.93	2.87	2.96	
Daily salt, lb.	1.03	.79	.81	
Av. % salt	26.0	21.6	21.5	
Initial wt., 11-21-69, lb.	852	885	862	
Final wt., 4-9-70, lb.	889	890	851	
Wt. change, lb.[4]	+37	+5	−11	
Condition score, 4-9-70[5]	4.4	4.0	3.6	
No. cows bred	8	11	9	
Trial 3: Bred-lactating cows				
No. cows	9	10	9	10
Daily supplement, lb.	3.26	3.25	3.19	3.20
Daily salt, lb.	1.28	.90	1.17	
Av. % salt	28.3	21.7	26.8	
Initial wt., 11-21-69, lbs.	1038	1031	1050	1015
Final wt., 4-9-70, lb.	927	980	955	860
Wt. change, lb.[4]	—111	—51	—95	—155
Condition score,[4] 4-9-70[5 6]	4.2	4.0	3.9	3.2
Birth wt. of calves, lb.	65	69	77	70
Weaning wt. of calves, lb.	413	401	397	380
No. cows rebred	8	10	6	7

[1] All supplements contained 30% protein equivalent.
[2] To supply 50% of protein equivalent.
[3] Approximately 90% of protein equivalent from urea.
[4] Weight damage of cows was significantly affected by treatment ($P<.01$).
[5] On a 1-9 basis, with 1 the poorest condition and 9 the highest.
[6] Significantly affected by treatment ($P<.05$).

Trial 3

As in Trial 2, the average daily intake of all supplements, including liquid supplement, was very similar, with a range of only 0.07 pound. The intake of liquid supplement was very high, approximately 9 lb. per cow daily, at the beginning of the trial. Aluminum sulfate was effective in limiting intake. During the latter part of the trial, in late March and April, intake of the liquid supplement was very low, even without aluminum sulfate. In both Trials 2 and 3, considerable variation in intake of dry supplements was noted as cows were rotated among pastures.

Type of supplement had a significant influence on total winter weight loss. Cows on liquid supplement lost the most weight, followed by those on natural protein, biuret, and urea. However, condition score was also significantly affected, and the cows ranked in the order of natural protein, urea, biuret and liquid supplement, from best to poorest.

Differences in birth weight and weaning weight were not statistically significant. However, it is interesting to note that weaning weights follow-

ed the same trend as condition scores. The biggest difference in weaning weight, 33 lb., was observed between cows fed the natural protein supplement and liquid supplement.

Conclusions

Results with self-fed supplements were encouraging. Although liquid supplement was not totally comparable to natural protein supplements, it is significant that performance on a product containing such a high proportion of its total protein equivalent from urea was as good as it was. The liquid protein seemed to be less satisfactory than natural protein supplements in two trials in terms of condition of the cows and weaning weight of the calves; as well as in body weight loss of cows in one trial when dry grass served as the only roughage.

The dry self-fed supplements containing either urea or feed grade biuret to furnish one-half of the total protein equivalent produced very satisfactory results. The average performance of cows on these products was not as good as that of cows fed natural protein supplements, but was much better than performance of range cattle fed supplements containing non-protein-nitrogen in past research at the Oklahoma Experiment Station. The improved performance may be due to self-feeding, or improved supplement formulation, or both.