Value Of Range Cow Supplements Containing Urea, Biuret and Kedlor and Effects Of Methionine-Hydroxy-Analogue And High Levels Of Dehydrated Alfalfa In Urea And Biuret Supplements

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Story in Brief

Two groups of cows wintered on dry range grass were individually fed winter supplements to evaluate the supplemental value of non-protein-nitrogen (NPN) from Kedlor, biruet and urea. Two supplements containing 15 and 30 percent natural protein served as negative and positive controls.

The other supplements were formulated to contain 30 percent crude protein equivalent with the NPN (Kedlor, biuret or urea) contributing one-half of the crude protein equivalent. The effects of methionine-hydroxy-analogue (MHA) and high levels of dehydrated alfalfa (40 percent of supplement) when added to supplements containing urea and biuret were also determined.

No consistent pattern was apparent in winter weight loss of cows to indicate a considerable utilization of NPN from Kedlor, biuret or urea. In one group, weight loss of cows on NPN supplements was generally intermediate between that observed for negative and positive controls. In the other group, weight loss observed on NPN supplements was similar to that of the negative control.

The addition of MHA to urea or biruet did not improve the performance of the cows. The MHA decreased the palatability of both supplements, and especially with urea where intake was markedly decreased.

The addition of high levels of dehyrated alfalfa meal did not greatly decrease winter weight loss of cows fed urea and biruet supplements.

Calf gains and weaning weights did not appear to be affected by the winter treatments imposed on the cows.

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Introduction

Increases in the cost of the plant proteins have caused a considerable increase in the costs of supplemental feed which is the major expense in a cow-calf operation. Due to the increase in the cost of natural protein, interest in and use of urea and other NPN sources continue to increase. Urea has been used extensively in feedlot rations to lower the protein feed costs, and when urea is fed with concentrates it can be effectively used by the rumen micro-organisms to synthesize microbial protein.

Results have also been somewhat promising when urea is used with wintering rations that contain a considerable amount of hay or silage. To date, however, research has shown that utilization of urea by range beef cows grazing low quality dried winter grass is disappointingly poor. Some of the reasons for poor performance when urea is fed are: (1) It is converted to ammonia in the rumen more rapidly than the ammonia can be utilized by the rumen microbial population and is consequently lost. (2) Dry weathered grass is low in readily available energy (soluble carbohydrates) which is needed for the conversion of ammonia to microbial protein. (3) High levels of urea can result in toxicity problems.

The use of NPN can lower the cost of range supplements. In view of the increasing human demand for natural plant proteins, their price will undoubtedly increase in the future. Since the ruminant is unique in being able to convert NPN into edible protein, methods of utilizing relatively high levels of urea and other NPN products must be developed.

Considerable research effort is being exerted to alleviate the disadvantages of feeding urea and to develop other desirable NPN sources. One which appears to be the most promising is biuret, a product of joining two molecules of urea. Biuret has the reported advantage of being broken down in the rumen at a slower rate which should result in a more effective utilization by the rumen microorganisms. Because of the slower release of ammonia there does not appear to be a problem with toxicity.

One disadvantage of biuret is that a period of time is necessary for the rumen microorganisms to become adapted to biuret so that it can be broken down to ammonia. The length of time needed for adaption varies with the level of energy supplied plus other possible factors, but in high roughage rations it may be as much as 30 days. Another current but perhaps temporary disadvantage of biuret is that it is more expensive than urea. A commercially available source of biuret is Kedlor[1].

[1] Kdlor, a product of Dow Chemical Company, Midland, Michigan, contains approximately 60% biuret, 15% urea and 21% cyanuric acid and triuret.

In earlier research, a low level (5 percent of the supplement) ot alfalfa has increased the utilization of urea and biuret. More recent reports suggest that relatively high levels of alfalfa or dehydrated alfalfa (40 percent or more of the supplement) may further enhance the utilization of NPN and also reduce the time required for adaption to biuret.

Limited research has indicated that when cattle are under stress, especially in the case of high producing dairy cows, methionine (an essential amino acid) may be deficient. The feeding of methionine directly to a ruminant is of little value because it is broken down in the rumen and thus is not present as methionine in the intestines where amino acids are absorbed. Methionine-hydroxy-analogue (MHA) is a product that is reportedly not broken down in the rumen but passes to the lower gut where it is absorbed. Therefore, it may be a dietary source of a methionine precursor to the ruminant. If lactating range cows under stress are deficient in methionine, then supplementation with MHA may fulfill the deficiency, particularly with supplements containing NPN.

The purpose of this trial was to compare the utilization of NPN from Kedlor, biuret and urea in range supplements and to determine the effects of adding MHA and high levels of dehydrated alfalfa to range supplements containing high levels of urea or biuret.

Procedure

The trial was conducted at the Lake Carl Blackwell Range located 10 miles west of Stillwater. The predominant forage is of the tallgrass prairie type with climax species consisting of little bluestem, big bluestem, Indian and switch grass. Since the grasses were dormant during the wintering trial, the major portion of the cows' diet consisted of dry weathered grass. Prairie hay was fed only on a few occasions when snow covered the range forage.

The experimental cattle were 82 mature Hereford and Angus cows 6 to 8 years of age which were maintained in one pasture and 58 Hereford heifers calving for the first time which were maintained in a different pasture. The calving dates were November 22, 1971 to March 2, 1972 for the mature Angus and Hereford cows and October 6, 1971 to January 25, 1972 for the Hereford heifers. The experiment was conducted during an 88-day period from December 28, 1971 to March 25, 1972.

The ingredient makeup of the supplement is shown in Table 1. Two of the supplements (1 and 2) contained all natural protein; supplement 1 contained 15 percent crude protein and supplement 2 contained 30 percent protein. The remaining nine supplements contained 30 per-

Table 1. Ingredient Make-up of Supplements (Percent)

Ingredient	Supplement										
	1	2	3	4	5	6H[1]	7H[1]	6C[2]	7C[2]	8	9
	Negative Control Natural	Positive Control Natural	Kedlor	Biuret	Urea	Biuret +MHA	Urea +MHA	Biuret +MHA	Urea +MHA	Biuret + Alfalfa	Urea + Alfalfa
	15	30	30	30	30	30	30	30	30	30	30
Alfalfa, dehydrated	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	40.0	40.0
Milo	64.3	23.8	53.5	53.2	55.1	53.3	55.1	52.8	54.7	27.5	29.4
Molasses, blackstrap	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Soybean meal (44%)	16.9	57.5	19.3	19.3	18.8	19.2	18.8	19.3	18.9	10.5	10.1
Wheat middlings	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
Kedlor	---	---	6.46	---	---	---	---	---	---	---	---
Biuret	---	---	---	6.73	---	6.73	---	6.73	---	6.73	---
Urea	---	---	---	---	5.31	---	5.31	---	5.31	---	5.31
Dicalcium phosphate	1.13	0.73	1.12	1.12	1.12	1.12	1.12	1.12	1.12	---	---
Monosodium phosphate	2.58	2.36	2.67	2.67	2.66	2.67	2.65	2.67	2.66	3.67	3.66
Sodium sulfate	---	0.63	1.97	1.97	1.97	0.75	0.75	0.75	0.75	1.59	1.59
Trace minerals	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
MHA[3]	---	---	---	---	---	1.185	1.185	1.58	1.58	---	---

[1] Fed to Hereford heifers.
[2] Fed to mature Hereford and Angus cows.
[3] Methionine-hydroxy-analogue provided 10 gm/head/day before calving and 20 gm/head/day after calving.

cent crude protein equivalent; one-half of the total protein, or 15 percent, consisted of natural protein whereas urea, biuret or Kedlor furnished the remaining 15 percent (one-half of the protein equivalent).

Supplement 1, the negative control, served two purposes. First, the difference in performance between cows receiving supplement 2 (30 percent protein) and supplement 1 (15 percent protein) would indicate if additional protein were needed beyond that provided by supplement 1. Second, the performance of cows fed supplements 3 through 11, in comparison to cows on supplements 1 and 2, would provide some indication of the degree of utilization of the NPN sources. The supplements were formulated to contain 1.25 percent phosphorus, 0.5 percent calcium and a nitrogen: sulphur ratio of 14:1. The MHA was added to provide 10 grams per head per day before calving and 20 grams per head per day after calving. The supplements were processed into ¼ inch pellets and were fed 6 days per week. Supplement was not fed on Sundays or on a few days when snow or ice covered the ground in which case only prairie hay was fed. The supplements were fed individually which allowed all of the cows in each group to occupy the same pasture thereby eliminating the effects of different pastures. The amount of supplement fed per cow per feeding was as follows:

	Before Calving	After Calving
Hereford heifers, lb	2.33	4.67
Mature Hereford and Angus cows, lb.	1.75	3.50

Some of the supplements were not palatable and the cows did not consume the entire amount offered. The amount of feed refused was weighed each day and discounted from feed intake.

At the initiation and conclusion of the experiment the cows were scored for condition on a scale of 1 to 9 with 1 being the thinnest and 9 the fattest.

The calves from the mature Hereford and Angus cows were sired by Charolais bulls and the calves out of the Hereford heifers were sired by Hereford bulls. Both the mature cows and Hereford heifers were artificially inseminated starting January 12, 1972 and January 8, 1972, respectively. After approximately 42 days of artificial inseminating, clean-up bulls were turned with the cows for the remainder of the breeding season. The calves from the Hereford heifers were weaned July 10, 1972 and the calves from the mature cows were weaned August 15, 1972. Weaning weights were adjusted to a 205-day basis and to a steer equivalent by multiplying the 205-day weight of the heifers by 1.05. The calves were

Table 2. Winter Weight and Condition Score of Cows

Item	Supplement								
	1 Negative Control Natural 15	2 Positive Control Natural 30	3 Kedlor 30	4 Biuret 30	5 Urea 30	6 Biuret +MHA 30	7 Urea +MHA 30	8 Biuret+ Alfalfa 30	9 Urea+ Alfalfa 30
Hereford and Angus Cows									
Number cows	10	10	10	8	10	7	9	9	9
Weight per cow, lb.									
Initial[1] (12-28-71)	1060	1051	999	1061	1096	1099	1057	1114	1046
Final (3-25-72)	782	810	777	801	828	826	776	843	798
Weight loss	278	241	222	260	268	272	281	270	248
Percent loss	26.2	22.9	22.2	24.5	24.5	24.7	26.5	24.2	23.7
No. cows calved before experiment	3	3	3	3	3	3	2	5	4
Condition score									
Initial	4.8	5.0	4.4	4.5	5.0	5.1	4.9	5.2	4.9
Final	2.4	3.3	2.6	2.4	2.8	3.1	2.6	3.1	3.1
Loss	2.4	1.7	1.8	2.1	2.2	2.0	2.3	2.1	1.8
Hereford Heifers									
Number heifers	7	6	7	7	6	7	6	6	6
Weight per cow, lb.									
Initial (12-28-72)	852	916	834	874	875	904	909	845	863
Final (3-25-72)	730	822	716	753	741	784	756	733	740
Weight loss	122	94	119	121	134	119	153	113	123
Percent loss	14.3	10.3	14.3	13.8	15.3	13.2	16.8	13.4	14.3
Condition score									
Initial	5.3	5.7	4.7	5.3	5.3	5.4	5.2	5.3	5.2
Final	3.3	3.8	2.5	3.1	2.8	3.1	2.7	3.2	2.8
Loss	2.0	1.9	2.2	2.2	2.5	2.3	2.5	2.1	2.4

[1] Initial weights of cows that calved before treatment started were adjusted to pregnant cow basis by dividing calf birth weight by .589 for bull calves and .568 for heifer calves and adding this correction factor for calving loss to the actual initial weight of the cow.

creep-fed with dehydrated alfalfa pellets in late winter (January, February and March).

Results and Discussion

Cow weight and condition score changes are shown in Table 1. The percent weight loss (which included calving loss) for the mature Angus and Hereford cows was relatively high in all treatments. The 15 percent natural-protein supplement resulted in 3.3 percent more weight loss than the 30 percent natural-protein supplement. The cows receiving the Kedlor supplement lost about the same percent of weight as the positive control cows. The percent weight loss of mature cows on other NPN treatments (except urea plus MHA) was intermediate between negative and positive controls (15 percent and 30 percent natural), suggesting a partial utilization of the NPN in the supplements. Trends in weight loss in the Hereford heifers were similar to those observed in the mature cows. The heifers consuming the natural 30 percent protein supplement lost less weight than heifers on all other treatments. In general, percent weight loss on NPN treatment was similar to that of heifers on the negative control, indicating little utilization of the NPN in the supplements.

The condition scores of the mature cows at the end of the trial were not significantly different, although the cows on the natural 30 percent protein supplement appeared to be in the best condition and the cows on the natural 15 percent protein supplement in the poorest condition. The change in condition of the Hereford heifers followed a similar pattern for the positive control and NPN treatments. However, the loss in condition of the heifers on the negative control was relatively smaller.

This trial did not indicate any benefit from the addition of MHA to urea or biuret supplements. The supplement intake data (Table 4) indicated that MHA lowered the palatability of the supplement when added to both urea and biuret. The intake of the urea supplement was especially reduced by MHA.

High levels (40 percent of the supplement) of dehydrated alfalfa meal did not appear to increase urea or biuret utilization; the advantage in winter weight change of cows on the urea supplement with alfalfa over those on urea without alfalfa was small.

The performance of the calves and the fertility of the cows are shown in Table 3. It is doubtful that the treatments had any effect on the performance of the calves. The average daily gain of the calves while on treatment and adjusted weaning weights did not follow any pattern. For example, the performance of the calves from the cows on the natural 15 percent protein was the highest of all treatments for the mature cows and the lowest for the Hereford heifers. It is doubtful that creep-feeding

Table 3. Performance of Calves Born During Winter and Rebreeding Performance of Cows

Item	Supplement								
	1 Negative Control Natural 15	2 Positive Control Natural 30	3 Kedlor 30	4 Biuret 30	5 Urea 30	6 Biuret +MHA 30	7 Urea +MHA 30	8 Biuret+ Alfalfa 30	9 Urea+ Alfalfa 30
					Hereford and Angus Cows				
No. cows calved[1]	10	10	10	8	10	7	8	9	9
Calving date	Jan 13	Jan 17	Jan 2	Jan 2	Jan 4	Dec 31	Dec 31	Jan 1	Jan 1
Birth weight[2], lb.	84	76	74	84	81	86	80	78	78
Daily gain									
Birth to 4-7-72, lb.	1.43	1.33	1.26	1.47	1.34	1.28	1.25	1.35	1.22
Weaning weight[3]	524	512	489	543	522	524	508	502	488
No. cows open 8-15-72	1	2	0	0	2	2	1	0	1
					Hereford Heifers				
No. cows calved[1]	7	6	7	7	6	7	6	6	6
Calving date	Nov 9	Nov 6	Nov 21	Nov. 2	Nov. 4	Nov 15	Nov 12	Nov 7	Oct 30
Birth weight, lb.[2]	65	71	63	72	69	66	72	68	63
Daily gain									
Birth to 4-7-72, lb.	0.80	0.91	0.87	0.79	0.99	0.92	0.79	0.89	1.03
Weaning weight	331	360	353	329	373	361	338	356	362
No. cows open 7-10-72	1	1	2	2	2	2	1	0	0

[1] Includes cows that raised calves to weaning.
[2] Heifer calves adjusted to bull equivalent by multiplying actual birth weight by 1.048.
[3] Weaning weight adjusted to 205 days of age and to steer basis (heifer weight x 1.05).

Table 4. Supplement Intake

Item	1 Negative Control 15	2 Positive Control 30	3 Kedlor 30	4 Biuret 30	5 Urea 30	6 Biuret +MHA 30	7 Urea +MHA 30	8 Biuret+ Alfalfa 30	9 Urea+ Alfalfa 30
				Hereford and Angus Cows					
Number cows	10	10	10	8	10	7	8	9	9
Supplement									
Offered, lb./hd/d	2.63	2.58	2.78	2.79	2.76	2.72	2.74	2.74	2.74
Consumed, lb/hd/d	2.63	2.58	2.78	2.79	2.46	2.64	1.93	2.74	2.53
Percent refused	0	0	0	0	11.0	2.9	29.8	0	7.6
No. of cows refusing supplement	0	0	0	0	8	3	8	0	6
				Hereford Heifers					
Number cows	7	6	7	7	6	7	6	6	6
Supplement									
Offered, lb.	3.93	3.93	3.92	3.93	3.93	3.89	3.93	3.93	3.93
Consumed, lb.	3.93	3.93	3.11	3.87	3.71	3.57	3.04	3.93	3.64
Percent refused	0	0	0.2	15.4	5.5	8.2	22.5	0	7.2
No. cows refusing supplement	0	0	2	2	5	6	6	0	6

masked treatment effects, since the average consumption of dehydrated alfalfa pellets was only 22 and 62 pounds per calf from the mature cows and Hereford heifers, respectively.

With the limited number of cows per treatment, it was difficult to make definite conclusions regarding rebreeding performance.

As previously mentioned, urea lowered palatability. Also, MHA decreased the palatability of both urea and biuret supplements. Part of the palatability problem was apparently due to lack of competition among the individually fed cows. Supplement 5 (the urea supplement) was group-fed to crossbred Angus x Holstein cows at higher levels than fed in this trial and was commonly consumed in 12 minutes. The same supplement was not completely consumed by all individually fed cows when allowed 20 minutes to eat. There also appeared to be differences in preference among cows.

Conclusions

This trial indicated poor utilization of the NPN in winter supplements for range cows. The addition of MHA or high levels of dehydrated alfalfa meal to urea and biuret supplements did not result in improved cow performance. The MHA decreased the palatability of biuret supplements slightly and urea supplements considerably.