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Types of Urea Supplement for Wintering Beef Calves

A. L. Slyter, L. B. Embry and J. Herndon

Previous research at the Cottonwood Station showed that calves fed low levels of urea during an adaptation period made faster gains than unadapted calves when fed higher levels of urea during the wintering period. Calves fed a corn-base urea supplement in pellet form gained faster than those fed a commercial, molasses-base urea supplement in liquid form. The following two experiments were conducted as replications of those reported previously under this title (A.S. Series 70-26).

Experiment 1 - Levels of Urea

Procedure

Sixty-four steer calves purchased from a rancher in western South Dakota were used in this trial. The calves were separated from their dams, trucked to the feedlot from a nearby ranch, ear tagged, weighed and allotted to 8 pens of 8 steers each.

The experiment consisted of two phases, an adaptation phase of 28 days and a wintering phase of 158 days. Supplements fed during the adaptation and wintering phases are shown in table 1.

Table 1. Experimental Design

Adaptation phase			Wintering phase		
Treatment	No. head	Supplement	Treatment	No. head	Supplement
1	16	Soybean meal	1	8	Soybean meal
			2	8	Corn-8% urea
2	16	Corn-2% urea	3	8	Corn-2% urea
			4	8	Corn-8% urea
3	16	Corn-4% urea	5	8	Corn-4% urea
			6	8	Corn-8% urea
4	16	Corn-8% urea	7	8	Corn-8% urea
			8	8	Corn-12% urea

In the adaptation phase, four replicated treatments of 2 pens of 8 steers each were used. The calves were fed supplement ad libitum up to a maximum of 2 lb. per head per day and a full feed of prairie hay. The composition of the supplements was the same as for the wintering supplements shown in table 2 except that a combination of chlortetracycline and sulfamethazine to furnish 175 mg. of each drug per pound of supplement replaced chlortetracycline. The supplements, formulated to contain 40% protein, were fed in outside bunks. Baled prairie hay

was fed indoors. The calves were weighed with an overnight shrink without feed and water after the adaptation phase and wintering phase. For the wintering phase, the calves were reallocated within each adaptation treatment group on the basis of shrunk weights to 2 pens of 8 steers each. Feeding and management procedures were the same as used during the adaptation phase using the wintering treatments shown in the preceding experimental design.

Results

Table 3 shows the results of the adaptation phase. Average daily gains for calves fed the corn-2% urea or corn-4% urea supplements were 0.04 lb. and 0.08 lb. higher, respectively, than for those on the control soybean meal supplement. Supplement consumption and average daily gains were reduced when the supplement contained 8% urea. Average daily consumption of hay was similar for all four adaptation treatments.

Results of the wintering phase are shown in table 4. Average daily gains ranged from 1.00 to 1.18 lb. for all treatment combinations with the exception of those previously on corn-8% urea during the adaptation phase. Gains were depressed in both groups that received corn-8% urea during the adaptation phase. Calves maintained on corn-8% urea for both phases gained 0.11 lb. per day more than those on the corn-8% urea for adaptation and then changed to corn-12% urea for the wintering phase. Average daily hay consumption was similar for all groups. Supplement consumption during the wintering phase was greater in those groups on the same supplement for both phases of the experiment. Consumption of the corn-12% urea supplement was approximately 50% less than the average of all other groups.

Experiment 2 - Liquid vs. Dry Supplement

Procedure

Sixty-four steer calves were purchased from one rancher for this experiment. They were received and handled as outlined in experiment 1. Allotment was to 2 pens of 32 steers each.

The feeds used in this experiment consisted of baled prairie hay and either a corn-urea based supplement or a commercial liquid protein supplement fed ad libitum. The composition of the corn-urea supplement was ground corn, 77.79%; urea (281% protein equivalent), 11.5%; dicalcium phosphate, 4%; trace mineral salt; 4%, sodium sulfate, 2.29%; aureomycin-10 (35 mg. aureomycin/lb.), 0.35% and vitamin A premix (10,000 I.U. vitamin A/lb.), 0.07%. This supplement was fed in meal form. A commercial liquid protein was fed in two 50-gallon barrel, plastic wheel self-feeders. The dry and liquid supplements contained about the same amount of urea but about 40% protein for the dry and 33% protein for the liquid.

During the first 3 weeks, both pens were fed 2 lb. per head daily of a soybean meal supplement (40% protein) fortified to furnish 350 mg. daily each of chlortetracycline and sulfamethazine. This was fed in addition to ad libitum feeding of their respective urea supplements. Consumption of the corn-urea meal supplement was extremely low during the first 3 weeks. Soybean meal was provided both groups for the following 28 days at an approximate rate of 0.5 lb. per head per day in an attempt to get better consumption of the urea supplements. The soybean meal was mixed with the urea meal supplement or fed alone to the group on the liquid supplement. Thereafter it was concluded that the urea-meal supplement

was unpalatable at the 11.5% urea level and ground corn was mixed with the supplement at 1 part ground corn to 3 parts corn-urea supplement. This resulted in a mixture with about the same level of total protein as in the liquid supplement. No ground corn was supplied to the liquid-fed group. The cattle were weighed before feeding after 21 days and at 28-day intervals thereafter. Final weights were taken after an overnight stand without feed and water.

Results

The results of this experiment are presented in table 5. Consumption for the first 21 days averaged 0.94 lb. per head per day for the liquid supplement and 0.11 lb. for the meal group. Calves refused the urea meal supplement more noticeably on extremely cold, wet days. Consumption of the liquid supplement appeared to be lower on extremely cold days although it was not measured daily.

Consumption over the entire period favored the liquid form (0.92 vs. 0.81 lb. daily) over the dry form. However, average daily gains were higher for the meal group (0.89 vs. 0.76 lb.). Feed conversion was superior for the meal form for both prairie hay and supplements on a combined basis. Two steers were lost in the meal lot and one in the liquid lot, apparently from bloat.

Conclusion

Results of this experiment indicate that with prairie hay up to 4% urea in a corn-based supplement can be fed during a 28-day adaptation phase with no depression in average daily gains when compared to a soybean meal supplement. During the subsequent wintering phase the urea level can be increased to 8% with no resulting loss in average daily gains. However, a corn-12% urea supplement during the wintering phase appears to depress both supplement consumption and average daily gains. These results differ from those obtained in an experiment the previous year in that some depression in rate of gain was encountered during the initial 4-week period from the supplement with 4% urea. Increasing the level of urea in the supplements from 0, 2 or 4% to 8% after the 4-week period did not result in any depression in later rate of gain as in the previous experiment.

Average daily gains appear to be better for calves fed a urea-corn supplement than for a urea-molasses supplement when both furnish about the same amount of protein with full-fed prairie hay. Palatability of the commercial liquid supplement at the same level of urea appeared superior to the corn-urea supplement. Adequate nitrogen intake was difficult to maintain when the level of urea exceeded approximately 8% of the supplement or supplement plus grain.

Table 2. Percentage Composition of Wintering Phase Supplements

Ingredient	Type of Supplement				
	Soybean meal	Corn-2% urea	Corn-4% urea	Corn-8% urea	Corn-12% urea
Ground corn	0.94	13.98	27.02	53.08	77.43
Soybean meal (44%)	90.64	75.20	59.76	28.90	--
Urea (281%)	--	2.00	4.00	8.00	11.80
Dicalcium phosphate	4.00	4.00	4.00	4.00	4.00
Trace mineral salt	4.00	4.00	4.00	4.00	4.00
Antibiotic premix ^a	0.35	0.35	0.35	0.35	0.35
Vitamin A premix ^b	0.07	0.07	0.07	0.07	0.07
Sodium sulfate ^c	--	0.40	0.80	1.60	2.35

^a 35 mg. chlortetracycline per pound of supplement.

^b 10,000 I.U. vitamin A per pound of supplement.

^c Added to furnish 1 part sulfur to 10 parts nitrogen from the urea.

Table 3. Results of Adaptation Phase, Experiment 1
(November 16 to December 14, 1970 - 28 Days)

	Type of Supplement			
	Soybean meal	Corn-2% urea	Corn-4% urea	Corn-8% urea
Number of steers	16	16	16	16
Avg. initial wt., lb.	417.0	417.8	415.5	415.7
Avg. final wt., lb.	441.2	442.9	441.7	432.9
Avg. daily gain, lb.	0.86	0.90	0.94	0.61
Avg. daily feed, lb.				
Prairie hay	12.55	12.51	12.44	12.63
Supplement	1.85	1.83	1.82	0.99
Feed/100 lb. gain, lb.				
Prairie hay	1459	1390	1323	2070
Supplement	215	203	194	162

Table 4. Results of Wintering Phase, Experiment 1
(December 14, 1970 to April 23, 1971 - 130 Days)

Adaptation Supplement	Type of Supplement							
	Soybean meal	Corn-8% urea	Corn-2% urea	Corn-8% urea	Corn-4% urea	Corn-8% urea	Corn-8% urea	Corn-12% urea
Wintering Supplement	Soybean meal	Corn-8% urea	Corn-2% urea	Corn-8% urea	Corn-4% urea	Corn-8% urea	Corn-8% urea	Corn-12% urea
Number of steers	8	8	8	8	8	8	8	8
Avg. initial wt., lb.	440	442	441	445	439	444	433	433
Avg. final wt., lb.	575	574	585	586	576	572	550	543
Avg. daily gain, lb.	1.01	1.09	1.02	1.18	1.00	1.08	0.89	0.78
Avg. daily feed, lb.								
Prairie hay	15.19	15.31	15.38	15.33	15.41	15.27	15.20	15.20
Supplement	2.00	1.77	2.00	1.82	2.00	1.65	1.52	0.85
Feed/100 lb. gain, lb.								
Prairie hay	1508	1403	1508	1296	1547	1420	1711	1941
Supplement	197	162	196	154	201	153	171	109

Table 5. Results of Experiment 2
(November 16, 1970 to April 23, 1971 - 158 Days)

	Corn-urea supplement	Liquid protein supplement ^a
Number of steers	30	31
Avg. initial wt., lb.	431	429
Avg. 21 day wt., lb.	460	454
Avg. final wt., lb.	582	568
Avg. daily gain, lb.	0.89	0.76
Avg. daily feed, lb.		
Prairie hay	15.32	14.84
Urea supplement	0.81	0.92
Soybean meal	0.08	0.09
Ground corn	0.22	0.00
Adaptation supplement	0.23	0.24
Feed/100 lb. gain, lb.		
Prairie hay	1727	1958
Supplement (all combined)	151	164

^a Rum-Liq. 33 furnished by Farmers Union Grain Terminal Association, Ellis, South Dakota.