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Urea vs. Soybean Meal During Feedlot
Adaptation and Later Growing and Finishing

J. D. Burkhardt and L. B. Embry

Urea is a common ingredient in cattle diets. While this nonprotein nitrogen compound is a satisfactory source of supplemental protein in many cattle diets, there are limitations as to levels in the diet and conditions of use. The primary basis for the use of urea as a substitute for conventional high-protein ingredients is the lower cost for protein supplementation.

One problem associated with the use of high levels of urea in cattle diets is that a period of adaptation to urea is involved during which weight gains are reduced. It has frequently been shown to be beneficial to include protein, minerals, vitamin A and antibiotics at higher levels during a period of feedlot adaptation (3 to 4 weeks) than commonly fed during later growing and finishing periods. Since type and perhaps level of supplementation would be changed following a period of feedlot adaptation under this system of feeding, it would appear that adaptation to urea supplementation might be accomplished during this time by use of low levels of urea with conventional high-protein ingredients or by higher levels of total protein supplementation.

The objectives of this experiment were to compare urea and soybean meal as supplemental protein to a diet of corn silage and corn grain, dry or high-moisture, during feedlot adaptation and later growing and finishing. A high urea supplement was fed alone and in combination with soybean meal giving two sources and two levels of protein during the initial 4-week feedlot adaptation period. There appeared to be no interactions between type of protein supplementation and high-moisture or dry grain fed whole or rolled. Therefore, the part of the experiment pertaining to moisture content of the corn and processing method is reported elsewhere (A.S. Series 71-21).

Procedures

One hundred twenty-eight steers were used initially in this experiment. They were fed alfalfa-brome hay for a period of 10 days after arrival before initiating the experiment. They were allotted into 16 pens of 8 each on the basis of weight.

Experimental diets consisted of dry or high-moisture corn grain fed whole or rolled making up four grain treatments. Four protein supplement treatments as follows were used with each of the grain treatments:

1. 2 lb. 32% soybean meal (SBOM) supplement during feedlot adaptation and later growing and finishing.
2. Same as 1 except 2 lb. SBOM-corn mix (32% protein) also fed during feedlot adaptation (4 weeks).

3. 1 lb. 64% urea supplement during feedlot adaptation and later growing and finishing.
4. Same as 3 except 2 lb. SBOM-corn mix (32% protein) also fed during feedlot adaptation (4 weeks).

Ingredient composition of the protein supplements is shown in table 1. The diets were composed of 20 lb. corn silage initially, the appropriate amount and kind of protein supplement and corn grain fed to appetite. The cattle were started on feed with the full allowance of corn silage and 2 lb. daily of protein supplement or protein supplement and corn. The concentrate portion of the diets was increased 1 lb. per head daily to a full feed with the appropriate level of protein supplementation being reached before including corn.

After 29 days, the 2 lb. of SBOM-corn mix was discontinued in supplementation treatments 2 and 4. Good quality corn silage stored at harvest in a concrete stave silo was fed at 20 lb. daily for 147 days. Thereafter, corn silage stored in a pile over winter and then blown into a concrete stave silo was fed at 10 lb. daily until the end of the experiment. This silage had undergone considerable fermentation and heating, but it was consumed at the 10 lb. level without any apparent problems.

The experiment was terminated after a total of 230 days. Only the parts of the experiment pertaining to the level and type of protein supplementation are presented in this report.

Results

Feedlot Adaptation

Results of the 29-day feedlot adaptation phase and accumulated daily gains on a filled basis by weigh periods during the 230-day experiment are shown in table 2. The lowest rate of gain (2.59 lb.) was obtained when feeding the urea supplement (64% protein) at 1 lb. per head daily. Steers fed 2 lb. of the soybean meal-corn mix (32% protein) in addition to 1 lb. of the urea supplement gained 0.25 lb. more daily than steers fed only 1 lb. of the urea supplement. Rate of gain for this group was about the same as for those fed 2 lb. of 32% protein soybean meal supplement. This would indicate no added advantage of the urea supplement in addition to 2 lb. of the soybean meal supplement. On the other hand, an additional 2 lb. of the SBOM-corn mix resulted in 0.23 lb. more daily gain than for 2 lb. of the 32% all-vegetable protein supplement. Apparently, the higher level of protein (14.7 vs. 10.9%) was beneficial during this time. Feed efficiency data reflect the higher rates of gain since total feed intake was largely controlled during this 4-week period.

Accumulative gains to date, shown in table 2, show that rate of gain was improved more for cattle fed 1 lb. of the urea supplement than for the other groups during the second period of the experiment. Apparently adaptation to the high level of urea (16% of the supplement) had occurred by the end of the second weigh period (29 to 57 days). Rate of gain was not much different at 85 days for the various supplement groups except for the group fed 4 lb. of the 32% all-vegetable supplement for the first 4 weeks which was still gaining at a faster rate.

Growing and Finishing

Feedlot performance of cattle fed the various supplements for the 230-day experiment is shown in table 3. These results show no advantage over the total experiment from feeding 2 lb. of the SBOM-corn mix during the first 4 weeks of the experiment in addition to the 1 lb. of 64% protein urea supplement. However, it would seem reasonable to assume that calves gaining 0.25 lb. more daily during this feedlot adaptation period were suffering less from stress and would be less susceptible to disease problems during this time.

Calves fed 2 lb. of the 32% SBOM supplement throughout the experiment gained only slightly more than those fed the urea supplement. Differences in feed requirements for these groups were also small. It would appear therefore that urea, as the major supplemental protein to finishing diets composed of corn grain with a limited amount of corn silage, is as satisfactory as soybean meal after the initial adaptation to urea has been accomplished.

Steers fed an additional 2 lb. of 32% protein supplement from soybean meal and corn during the first 4 weeks of the experiment gained only slightly more than those fed 2 lb. of the soybean meal supplement throughout the experiment. Feed requirements were also only slightly less for the steers fed the larger amount of protein supplement. However, these small differences show that the advantage after 4 weeks was retained throughout the experiment. This would indicate a beneficial effect of higher levels of protein supplementation during the first few weeks in the feedlot for calves than what is now commonly used.

Summary

Levels of urea fed in this experiment (1 lb. supplement with 16% urea fed with or without 2 lb. of 32% protein soybean meal-corn supplement) did not appear to be efficiently utilized under conditions of the experiment in comparison to soybean meal by calves during the first 4 weeks in the feedlot.

Following the initial adaptation to urea, there were only small differences between urea and soybean meal as the supplemental protein to the finishing diets of corn grain with limited corn silage.

Results indicated that a higher level of protein supplementation during the first few weeks in the feedlot than commonly used may be beneficial from the standpoint of early weight gains and feed efficiency. These advantages appeared to be retained during later growing and finishing.

Table 1. Protein Supplement Composition

Ingredient	32% SBOM supplement	64% urea supplement	32% SBOM-corn mix
Corn	20.00	20.00	34.30
Soybean meal	69.25	40.50	65.70
Urea	--	16.00	--
Ground limestone	4.00	8.00	--
Trace mineral salt	4.00	8.00	--
Potassium chloride	2.00	4.00	--
Sodium sulfate ^a	--	3.20	--
Additives ^b	0.75	0.30	--

^a Added to supply 1 part sulfur to 10 parts nitrogen from urea.

^b Includes vitamin A and diethylstilbestrol to furnish 20,000 I.U. and 10 mg. per head per day, respectively. Chlortetracycline-sulfamethazine premix was included at 350 mg. per head per day for the first 29 days and then deleted from supplement and replaced by 70 mg.* chlortetracycline per head per day.

Table 2. Feedlot Adaptation of Steers Fed Urea or Soybean Meal Protein Supplements (January 6, 1971-February 4, 1971 - 29 days)

	Type and Level of Protein Supplement			
	1 lb. 64% urea	2 lb. 32% SBOM	2 lb. 32% SBOM	4 lb. 32% SBOM
Number of animals	32	32	32	31 ^a
Init. filled wt., lb.	509	504	509	505
Weight, Feb. 4, lb.	584	586	593	595
Avg. daily gain, lb.	2.59	2.84	2.89	3.11
Avg. daily feed, lb.				
Corn silage	19.31	19.31	19.31	19.33
Corn grain	6.46	4.55	6.03	3.15
Supplement	0.97	0.97	1.93	1.93
Special supplement (32% SBOM)	--	1.90	--	1.90
Total	26.74	26.73	27.27	26.31
Feed/100 lb. gain, lb.				
Corn silage	750	695	678	626
Corn grain	249	160	210	100
Supplement	37	34	68	62
Special supplement (32% SBOM)	--	67	--	61
Total	1036	956	956	849
Protein in dry diet during feedlot adaptation, %	11.60	15.15	10.90	14.70
Accumulated gain to date during growing and finishing (filled wt. basis)				
March 4 (57 days)	2.79	2.87	2.96	3.16
April 1 (85 days)	2.79	2.71	2.79	2.92
April 29 (113 days)	2.98	2.94	2.90	2.96
May 27 (141 days)	2.97	2.94	2.97	3.00
June 24 (169 days)	2.85	2.73	2.72	2.88
July 22 (197 days)	2.82	2.76	2.86	2.98
August 19 (225 days)	2.77	2.69	2.77	2.85
August 24 (230 days)	2.80	2.77	2.83	2.87

^a One steer died from pneumonia.

Table 3. Urea or Soybean Meal Supplements in Growing-Finishing Cattle Diets (January 7, 1971-August 25, 1971 - 230 days)

	Type and Level of Protein Supplement			
	1 lb. 64% urea	2 lb. 32% urea and SBOM	2 lb. 32% SBOM	4 lb. 32% SBOM
Feedlot Adaptation	1 lb. 64% urea	2 lb. 32% urea and SBOM	2 lb. 32% SBOM	4 lb. 32% SBOM
Growing-Finishing	1 lb. 64% urea	1 lb. 64% urea	2 lb. 32% SBOM	2 lb. 32% SBOM
Number of animals	32	31 ^a	32	31 ^a
Initial shrunk wt., lb.	509	502	507	508
Final shrunk wt., lb.	1124	1111	1135	1143
Avg. daily gain, lb.	2.67	2.64	2.73	2.76
Avg. daily feed, lb.				
Corn silage	16.51	16.82	16.51	16.51
Corn grain	14.16	13.77	13.73	13.36
Supplement	0.99	0.99	1.98	1.98
Total	31.66	31.58	32.22	31.85
Feed/100 lb. gain, lb.				
Corn silage	618	636	605	598
Corn grain	529	522	502	483
Supplement	37	37	73	72
Total	1184	1195	1180	1153
Dressing percent	64.0	63.9	63.6	64.0
Conformation ^b	22.7	22.5	22.6	22.7
Marbling ^c	6.0	6.3	6.3	6.8
Carcass grade ^b	20.0	20.3	20.3	20.8
Kidney fat, %	2.8	2.8	2.8	2.8

^a Two steers died from pneumonia.

^b Good = 17; Choice = 20. Graded to one-third of a grade.

^c Modest, 6; moderate, 7.