1975

Soybean Meal or Urea During Feedlot Adaptation and Growing of Calves

R. N. Gates
South Dakota State University

L. B. Embry

South Dakota State University
Brookings, South Dakota

Department of Animal Science
Agricultural Experiment Station

A.S. Series 75-25

Soybean Meal or Urea During Feedlot Adaptation and Growing of Calves

R. N. Gates and L. B. Embry

Urea and other nonprotein nitrogen (NPN) compounds are frequently used as the supplemental source of protein for feedlot cattle. A period of adaptation appears to be required before the ruminant develops the ability to utilize NPN efficiently as a source of dietary protein. When urea is used as a major source of supplemental protein, cattle may suffer from a period of reduced performance while this adjustment is being made. Protein level in the ration, amount of NPN, energy content of ration, previous treatment, animal size and condition are factors which may affect the degree and time at which performance is reduced. It has been suggested that some improvement in performance may be obtained by feeding preformed protein such as soybean meal during this period of feedlot adaptation before introducing urea in the ration.

This experiment investigated the response by calves to different levels of protein during the first 4 weeks of feedlot adaptation using soybean meal, urea or a combination of the two sources. Following the adaptation period, the calves were continued on experiment for a growing phase to compare soybean meal and urea as supplements to corn silage.

Procedures

The animals used in the experiment were steer calves purchased at a cattle auction. All calves (108 Hereford-Angus and 36 Angus) had been raised on the same ranch and were weaned about 2 weeks prior to time of purchase. During these 2 weeks, they grazed a field of standing forage sorghum without supplemental feeds. All calves had previously received vaccinations commonly associated with preconditioning treatment. No additional vaccinations were given except for blackleg. After the calves arrived at the feedlot, they were offered a ration of 4 lb. of alfalfa-brome hay with a full feed of corn silage for about 1 week.

The calves were allotted into 24 pens of 6 calves each on basis of weight and breed group for the experiment which consisted of a 4-week adaptation phase and a growing phase. The initial weight on experiment was about 360 lb. which was approximately the same as the purchase weight. Each animal was implanted with 36 mg of zeranol near the beginning of the experiment.

Adaptation Phase

The rations during this phase of the experiment were a full feed of corn silage and one of six supplement treatments which were formulated to compare levels and sources of supplemental protein with corn silage fed to calves following weaning and shipping. Soybean meal and urea were used to provide variation in source of supplemental protein with each used at two levels. Ingredient composition of the supplements is shown in table 1.

The soybean meal and urea supplements were formulated to contain about 32% protein. The corn supplement was fortified to supply the same supplemental levels of vitamin A, vitamin E and the combination of chlortetracycline and sulfamethazine as the soybean meal and urea supplements. All supplements were formulated to contain approximately the same amounts of calcium and phosphorus and to contain adequate amounts of trace minerals with sulfur added to those with urea. All supplements were fed at 4 lb. daily during the 4-week adaptation phase. The combination supplements were equivalent to 2 lb. of each supplement which were combined.

Four pens of calves received each of the six supplements. An injectable grubicide was used on the calves. Treatment levels were approximately 1, 2 or 3 cc per 100 lb. of body weight with a nontreated control. These four grub control treatments were balanced between supplement treatments.

Weights were obtained at 14 and 28 days to measure effects of supplement treatment on weight gains of the calves following weaning and shipping.

Growing Phase

Following the 4-week adaptation phase, the calves were continued on a growing phase for an additional 110 days (138 days total). Corn silage was fed to appetite as during the first 4 weeks. Ingredient composition of the supplements was the same as for the adaptation phase of the experiment except chlortetracycline at 35 mg/lb. of supplement was substituted for the chlortetracycline-sulfamethazine combination.

Only three supplements--corn, soybean meal or urea--were fed during this phase. Levels of supplements were reduced to 2 lb. per head daily. Calves previously fed the corn-soybean meal and the soybean meal supplements were fed the soybean meal supplement. Those previously fed the corn-urea, soybean meal-urea and urea supplements were fed the urea supplement. The corn supplement was reduced to the 2-lb. level for this group.

The corn silage fed for the first 80 days of the experiment was low yielding with a small amount of grain (estimated 20 to 30 bushels per acre) because of dry weather during the growing season. It was harvested in a dry condition because of an early frost. Samples for determinations of dry matter taken at approximately weekly intervals during the experiment averaged 44.8% with a protein content of 9.63% on a dry basis. That fed for the remainder of the 138 days was from irrigated corn. While it was well-eared, yield was reduced by the early frost. Average dry matter content was 51.7% with 8.67% protein on a dry basis.

Feeding was once daily during both phases of the experiment in outside, paved pens without access to shade or shelter. The experiment was terminated after 138 days when available corn silage was used up.

Results

Results of feedlot performance presented as the accumulative performance to date by weigh periods are shown in table 2 with performance stated as percent of corn control shown in table 3. There was no evidence that the grub control treatments had any effect on response to dietary treatments. Therefore, feedlot performance for supplement treatments has been averaged across grub control treatments.

Adaptation Phase

Problems were encountered in getting the calves to eat the supplement with 8.44% urea. It was found necessary to dilute this supplement with the corn supplement. Therefore, this treatment was similar to that for the urea-corn group especially during the first 2 weeks. In view of the problems encountered, it would not appear advisable to offer supplements with as much as 8.44% urea along with corn silage to calves during feedlot adaptation following weaning and shipping.

Results during the first 4 weeks of the experiment show an advantage for protein supplementation in comparison to the corn control (tables 2 and 3). The soybean meal-corn and the soybean meal-urea supplements appeared to offer a small advantage over the urea-corn supplement during this time. The higher level of protein supplementation from soybean meal (SBOM-SBOM) did not improve performance over the lower level (SBOM-corn).

Other than for the high-urea supplement, there appeared to be no important effects of type of supplementation on feed consumption. Thus, calves making faster rates of gain had lower feed requirements.

Growing Phase

Average daily gains were lower at termination of the growing experiment than after 4 weeks except for the initial high-urea treatment. This resulted from the lower initial performance by this group of calves. Otherwise, there was essentially no difference in rate of gain between type of protein supplements. However, all types of supplements, with the exception mentioned, resulted in daily rates of gain about 0.30 lb. (17.5%) more than for no supplemental protein.

Calves fed the higher level of soybean meal (SBOM-SBOM) during the first 4 weeks had a lower rate of gain during the first month following the reduction in level of supplementation. There appears to be no satisfactory explanation for this temporary reduction in performance. At other times during the growing experiment, relatively uniform performance was obtained from soybean meal and urea supplements with essentially no effect of the adaptation treatment.

Feed consumption was improved by protein supplementation. Calves fed urea supplements consumed slightly more feed than those supplemented with soybean meal. This resulted in slightly higher feed requirements for calves fed urea supplements. Improvement over the corn control amounted to 11.4% for soybean meal and 8.7% for urea, excluding the initial high-level urea group.

Summary

Results of the experiment show a need for supplemental protein with corn silage rations for calves to obtain optimum weight gains and feed efficiency following weaning and shipping (corn silage 8.7 to 9.6% protein, dry basis).

Calves fed 4 lb. daily of a urea-corn supplement with 4.22% urea (about 16% protein) had a slightly lower rate of gain after 4 weeks than calves fed a soybean meal-corn supplement with a similar level of protein. After this initial 4-week period of adaptation, weight gain, feed consumption and feed efficiency differed only slightly between these two groups of calves when fed 2 lb. daily of supplements with about 32% protein using soybean meal or urea (8.44% urea) as the supplemental protein to corn silage.

Problems were encountered in getting calves to eat a urea-corn supplement with 8.44% urea upon arrival at the feedlot following weaning. It would appear that this level of urea is too high in a supplement offered with corn silage to calves following weaning and shipping. After the initial 4 weeks, these calves performed about the same when fed 2 lb. of a 32% protein supplement containing 8.44% urea as did calves offered a supplement with a lower level of urea during feedlot adaptation.

Supplementing the calves with the higher level of protein (4 lb. of 32% protein) either from soybean meal (SBOM-SBOM) or urea (SBOM-urea) offered essentially no improvement in performance over the SBOM-corn supplement (4 lb. of 16% protein) after 4 weeks or at various stages of the growing phase of the experiment.

Table 1. Ingredient Composition of Protein Supplements (Adaptation Phase)

	Corn supplement	Urea-corn	SBOM-corn	Urea-SBOM	SBOM	Urea
	%	%	%	%	%	%
Corn	91.39	86.61	58.50	53.72	25.62	81.84
SBOM	---	---	33.59	33.59	67.18	---
Urea (45% N)	---	4.22	---	4.22	---	8.44
Calcium-phosphorus supplement[a]	4.76	4.83	4.14	4.21	3.52	4.90
Limestone	1.57	0.91	1.59	0.93	1.60	0.25
TM salt (regular)	2.08	2.08	2.08	2.08	2.08	2.08
TM premix	0.20	0.20	0.10	0.10	---	0.20
Ca sulfate	---	1.15	---	1.15	---	2.29
Vitamin A (30,000 IU/g), 10,000 IU/lb. of supplement	33.33 g	33.33 g	33.33 g	33.33 g	33.33 g	33.33 g
Vitamin E (100,000 IU/lb.), 100 IU/lb. supplement	45.45 g	45.45 g	45.45 g	45.45 g	45.45 g	45.45 g
Aureo-S 700 (350 mg each CTC and SMZ/4 lb. supplement)	8.75 g	8.75 g	8.75 g	8.75 g	8.75 g	8.75 g

[a]Ca, 18 to 21.5%; P, 18.5%.

Table 2. Soybean Meal or Urea During Feedlot Adaptation and Growing of Calves--Weight Gain and Feed Data November 13, 1974, to April 2, 1975--138 days

Adaptation phase	Corn-control	SBOM-SBOM	SBOM-corn	Urea-SBOM	Urea-corn	Urea-urea
Growing phase	Corn	SBOM	SBOM	Urea	Urea	Urea
Number of animals	23	24	24	24	24	24
Avg. init. shrunk wt., lb.	347	347	348	347	348	349
Avg. final shrunk wt., lb.	575	614	615	617	621	608
Avg. daily gain, lb.						
14 days	2.07	2.46	2.79	2.54	2.50	2.59
28 days	1.92	2.31	2.23	2.28	2.08	1.83
56 days	1.92	1.56	2.14	2.28	2.15	2.12
82 days	1.88	2.19	2.20	2.21	2.01	2.05
110 days	1.82	2.18	2.14	2.15	2.11	2.05
138 days (filled)	1.69	1.98	1.98	1.96	1.91	1.85
138 days (shrunk)	1.66	1.94	1.94	1.95	1.97	1.88
Avg. daily ration, lb.						
14 days	18.33	17.46	18.54	18.15	18.24	15.62
28 days	21.61	21.31	21.06	21.54	21.57	19.94
56 days	23.45	23.90	23.50	24.16	24.40	23.78
82 days	24.65	25.37	24.90	26.24	25.92	26.04
110 days	23.58	24.71	24.51	25.66	25.33	25.39
138 days	23.48	24.45	24.34	25.70	25.31	25.33
Feed/100 lb. gain, lb.						
14 days	892	714	668	721	735	606
28 days	1134	925	948	953	1038	1108
56 days	1226	1542	1138	1060	1134	1128
82 days	1312	1160	1132	1188	1288	1278
110 days	1306	1136	1146	1194	1203	1212
138 days (filled)	1396	1235	1232	1314	1325	1368
138 days (shrunk)	1424	1264	1258	1317	1284	1350

Table 3. Soybean Meal or Urea During Feedlot Adaptation and Growing of Calves--Percent of Corn Control November 13, 1974, to April 2, 1975--138 days

	Percent of corn control					
Adaptation phase	Corn control	SBOM-SBOM	SBOM-corn	Urea-SBOM	Urea-corn	Urea-urea
Growing phase	Corn	SBOM	SBOM	Urea	Urea	Urea
	lb.	%	%	%	%	%
Number of animals	23	24	24	24	24	24
Avg. init. shrunk wt., lb.	347	100	100	100	101	101
Avg. final shrunk wt., lb.	575	107	107	107	108	106
Avg. weight gain, lb.						
14 days	29	121	134	124	121	128
28 days	54	120	115	119	109	94
56 days	108	81	111	119	112	110
82 days	154	117	118	118	107	109
110 days	200	120	118	120	116	116
138 days (filled)	233	118	117	116	113	110
138 days (shrunk)	229	117	117	118	119	113
Avg. daily ration, lb.						
14 days	18.33	95	101	99	100	85
28 days	21.61	99	97	100	100	92
56 days	23.45	102	100	103	104	101
82 days	24.65	103	101	106	105	106
110 days	23.58	105	104	109	107	108
138 days	23.48	104	104	109	108	108
Feed/100 lb. gain, lb.						
14 days	892	80	75	81	82	68
28 days	1134	82	84	84	92	98
56 days	1226	126	93	86	93	92
82 days	1312	88	86	91	98	97
110 days	1306	87	88	91	92	93
138 days (filled)	1396	88	88	94	95	98
138 days (shrunk)	1424	89	88	92	90	95