

## NITROGEN AND ENERGY RELATIONSHIPS IN WINTERING STEER CALVES

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Wintering weaner calves on native meadow hay generally requires some kind of supplementation. The two nutrients of most concern are protein and energy. Opinions vary as to which is most important and what kind is best. Trace minerals are sometimes of concern in specific areas.

Natural protein can be replaced with some nonprotein nitrogen compounds. Biuret and urea are the most common. Due to toxicity, palatability and utilization problems associated with urea, it has not been a consistently effective source of nitrogen for growing calves. Biuret has had no problems of toxicity or palatability, therefore making it an ideal source of N for supplementing low quality roughage, provided adequate energy is in the ration.

Supplemental energy, generally supplied by grains, is often necessary in obtaining economical gains from wintering calves on meadow hay. Protein has traditionally been supplied via a plant meal such as cottonseed meal. Which nutrient (nitrogen or energy) is needed first for most economical growth is not always clear cut. Supplements on the market range from high protein-no energy supplement to one of high energy low protein (straight grain).

Trace minerals are often considered important in a balanced nutritional program. Previous work at this Experiment Station has indicated that cattle eating the available forage of the area and on a relatively low plane of nutrition seldom show response to any mineral supplements other than phosphorus. Trace minerals were included in the first trial to determine if weaner steer calves would show a response to trace minerals, particularly in view of the fact that nonprotein nitrogen was being used rather than natural protein sources, and these calves would be growing at above maintenance levels.

This study was designed to determine the relative necessity of energy, nitrogen and trace minerals for supplementing weaner calves on native meadow hay. Biuret and barley were fed alone and in combination with each other to provide a comparison of these supplemental systems. Trace minerals were included the first year of the study.

### EXPERIMENTAL PROCEDURE

The trials were conducted on two sets of cattle for two consecutive years at Section five winter headquarters. The cattle were fed in 12 adjacent lots. The supplement was fed in wooden bunks and long meadow hay in mangers under open sheds. The hay portion of the ration was fed as long hay free choice, weighed in daily with refusals weighed out weekly. Fresh water, salt and salt-bonemeal mix were supplied free choice at all times. Hay samples were taken with a bale core sampler and composited for analysis. The animals were weighed at 28 day intervals after overnight restriction from water. All supplements containing barley were pelleted in a 3/4 inch cube.

Trial 1. One hundred twenty weaner steer calves were stratified by weight and assigned randomly to one of 12 pens with 10 steers per pen (Table 1). Eight pens were assigned a treatment of mineral mix, feed grade biuret or energy, alone and in combination with each other. Twelve treatments were fed with six nitrogen-energy treatments and two trace mineral treatments (none or added trace minerals). Experimental design in Table 1.

Table 1. Experimental Design - Trial 1

Mineral	Nitrogen level <sup>2/</sup>	Energy <sup>3/</sup>	
		0	+
0	0	1 <sup>4/</sup>	2
	1	3	4
	2	-	9
	3	-	11
+	0	5	6
	1	7	8
	2		10
	3		12

1/ Mineral was either none (0) or fed at 2.27 gm/head/day (+). Table 2.

2/ Nitrogen levels calculated as follows:

0. No supplemental Biuret added.
1. All supplemental nitrogen (considering all N supplied by free choice hay intake) being supplied by biuret.
2. All supplemental N being supplied with biuret and barley.
3. All of the calculated N requirement of the animal being supplied by biuret (ignoring the N in the hay and barley).

3/ Energy was either 0 (no added barley) or + (2 lb. added barley).

All + treatments were isocaloric.

4/ Number represents treatment.

Treatment explanations were as follows: (\* denotes added trace mineral)

- 1 and 5.\* No supplemental nitrogen or energy.
- 2 and 6.\* No supplemental nitrogen but with added energy from barley (some nitrogen was in barley).
- 3 and 7.\* No supplemental energy. Biuret added to supply the nitrogen needed to balance the ration for N
- 4 and 8.\* Added energy supplied by barley plus the same amount of biuret added as in number 3 and 7.\* Thus, the barley would add N in excess of the animals theoretical requirement.
- 9 and 10.\* Added energy supplied by barley, with biuret supplying the N needed to balance the ration.
- 11 and 12.\* Added energy supplied by barley, with the entire daily requirement for N coming from biuret alone (ignoring N in the hay and barley). This treatment was in excess of the animals' theoretical requirement for N.

Table 2 shows the trace mineral mix, with 2.27 grams per head per day fed in the supplement (or in salt for the treatment number 5 group).

Table 2. Trace mineral Mix <sup>1/</sup>

Mineral	%	Mg/hd/day as fed
Zinc	29.6	670
Iron	9.8	222
Manganese	8.0	182
Copper	3.0	68.1
Sulphur	3.0	68.1
Iodine	1.8	68.1
Cobalt	0.12	2.7

<sup>1/</sup> Fed at a rate of 2.27 grams/head/day.

Table 3 shows the ration composition with the meadow hay being 6% protein.

Table 3. Ration Composition - Trial 1 <sup>1/</sup>

Treatment	Trace mineral	Biuret	Barley <sup>2/</sup>	
			Dry matter	Air dry
	(gm)	(lbs.)	(lbs.)	(lbs.)
1	--	--	--	--
2	--	--	2.0	2.25
3	--	.34	--	--
4	--	.34	2.0	2.25
5	2.27	--	--	--
6	2.27	--	2.0	2.25
7	2.27	.34	--	--
8	2.27	.34	2.0	2.25
9	--	.22	2.0	2.25
10	2.27	.22	2.0	2.25
11	--	.63	2.0	2.25
12	2.27	.63	2.0	2.25

<sup>1/</sup> All animals received native meadow hay free choice. Requirements were determined from 1970 NRC requirements for 1.5 pounds daily gain.

<sup>2/</sup> .04 pounds N.

<sup>3/</sup> Trace mineral supplied gratis by Leslie Salt Co.

<sup>4/</sup> Biuret supplied gratis by Dow Chemical Co.

Trial 2. Trial two was a repeat of trial one without the trace mineral treatment, using two pens of 8 head per pen on each treatment. The 96 weaner steer calves were stratified by weight and assigned randomly to one of 12 pens. Treatment number was randomly assigned to two pens each as seen in Table 4. Nitrogen and energy treatments were the same as in Trial 1 with ration composition shown in Table 5. Differences in amount fed were primarily due to different hay analysis and size of animal. The biuret only treatment was fed daily to the animals by suspending finely pulverized biuret in water and spraying the hay.

## RESULTS AND DISCUSSION

Trial 1. Results from Trial 1 are presented in Table 6 and 7. Hay intake was very similar for all treatments. Trace mineral had no effect on the performance of weaner calves and therefore, was not considered in Trial 2. Nitrogen and energy consideration will be discussed in conjunction with Trial 2.

Table 4. Experimental Design - Trial 2

Nitrogen level <sup>1/</sup>	Energy <sup>2/</sup>	
	0	+
0	1 <sup>3/</sup>	2
1	3	4
2	-	5
3	-	6

<sup>1/</sup> Nitrogen levels calculated as follows: (0) no supplemental N supplied. (1) All supplemental N being supplied by biuret considering only the nitrogen in the hay, ignoring N supplied in the barley. (2) All supplemental N being supplied with biuret and barley (balanced diet). (3) All of calculated N requirement of the animal supplied by biuret (ignoring the N in the hay and the barley).

<sup>2/</sup> Energy is either 0 (no added barley) or + (3 pounds added barley). All (+) treatments are isocaloric.

<sup>3/</sup> Number represents treatment designation, see Table 5. All treatments contain 2 pens of 8 head each.

Table 5. Ration Composition - Trial 2 <sup>1/</sup>

Treatment	Biuret	Barley	
		Dry matter	As fed
	(lb.)	(lbs.)	(lbs.)
1	--	--	--
2	--	2.75	3.25
3	.21	--	--
4	.21	2.75	3.25
5	.08	2.75	3.25
6	.63	2.75	3.25

<sup>1/</sup> Rations 2, 4, 5, and 6 were pelleted in 3/4 inch square pellets. All animals received native meadow hay free choice.

Table 6. Performance Results - Trial 1

Trace mineral	Nitrogen level <sup>1/</sup>	Hay intake		Average daily gain	
		Barley		Barley	
		0	+	0	+
None	0	12.7	11.6	.64	1.07
	1	12.0	11.3	.76	1.08
	2	---	12.2	---	1.09
	3	---	12.5	---	1.20
2.27 gm per day	0	12.3	11.8	.64	1.02
	1	12.4	12.0	.69	1.11
	2	---	12.2	---	1.20
	3	---	12.3	---	1.03

<sup>1/</sup> Levels explained in footnote - Table 1.

Table 7. Trial 1 average daily gains averaged across treatments

Mineral	Barley	
	None	Added
None	.7	1.11
2.27 gm/day	.6	1.09
Nitrogen level <sup>1/</sup>		
	0	.64
	1	.72
	2	1.15
	3	1.12
Barley	.68	1.10

<sup>1/</sup> Nitrogen levels explained in footnote - Table 1.

Trials 1 and 2. Performance results and daily hay intake from Trial 2 are presented in Table 8.

Table 8. Average daily gain and hay intake - Trial 2 <sup>1/</sup>

Nitrogen level	Energy			
	Hay intake		ADG	
	0	+	0	+
0	12.5	11.4	.37	1.04
1	12.4	11.4	.59	1.03
2		12.1		.97
3		12.4		1.21

<sup>1/</sup> Pounds per head per day.

In both trials there was a stimulation in average daily gain by the addition of N alone (12.5% and 59% in Trials 1 and 2, respectively). However, this stimulation in gain was not as great as the addition of barley alone (64.5% and 181%). This would indicate that the first limiting nutrient in these trials was the need for additional energy. There was a trend of a little added gain for additional nitrogen with barley. The apparent increase in gain for the high N level in Trial 2 may indicate a shortage of available N in the hay with a resulting shortage to the animals. This was not apparent in Trial 1 with higher added N.

In looking at this data from a more practical economic viewpoint, we will compare the N only to the barley only treatment using \$60/ton barley, \$312/ton biuret and 40¢ beef.

#### Trial 1.

Nitrogen only	Cost	5.26¢/day
	Return	3.20¢
		2.06¢ loss per head/day
Barley	Cost	6.8¢
	Return	16.8¢
		10.0¢/head/day

Dollars returned for dollars feed cost invested 2.47

Trial 2.

Nitrogen only	Cost	3.3¢
	Return	8.8
		5.5¢/head/day

Dollars returned for dollars feed cost invested 2.66

Barley only	Cost	9.8
	Return	26.8
		17.0¢/head/day

Dollars returned for dollars feed cost invested 2.75

It is quite apparent from these data that feeding barley alone was a better investment than feeding nitrogen alone. This does not mean that one should never feed N alone or barley alone. Probably over most conditions the most economical diet would be one of a balanced ration with both N and energy. Some feed and ranch conditions may dictate using a supplemental program which will be a little less efficient but will be made up for in practicality.

#### COPPER AND MOLYBDENUM NUTRITION IN PASTURE MANAGEMENT

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Cattle grazing irrigated pastures in southeastern and south central Oregon may be receiving deficient amounts of copper or toxic amounts of molybdenum from the pasture forage. Recent work at Squaw Butte Experiment Station shows that animal gains can be increased by copper supplementation when forage from improved pastures is grazed.

The importance of copper as an essential element in the animal's diet has been recognized for many years. Early symptoms of the deficiency are usually observed by bleaching of the hair in colored animals, diarrhea, and lowered animal gains. Prolonged deficiencies of copper cause impaired reproduction, inability to coordinate muscular movements, skeletal abnormalities, and anemia.

Copper deficiencies occur most frequently where forage is grown on soils high in organic matter. Such conditions exist in old lake bed areas as one might find near Klamath Falls and where lands are repeatedly flooded year after year as are the meadows in Harney County near Burns. In these muck and peaty soils the copper ion is attached to the organic humus complex and may not be available to growing plants.