

# PERFORMANCE OF BEEF CALVES SUPPLEMENTED WITH PROTEIN OR ENERGY WITH OR WITHOUT SMARTAMINE-M

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## Story in Brief

Sixty, 7-month-old calves weighing 375 lb were used to compare supplements with 40 or 25% crude protein with or without Smartamine-M (70% methionine), a methionine source that escapes ruminal digestion. Treatments were: Control (no supplement), 40% protein (1 lb/day), or 25% protein (2.5 lb/day). Half the calves from each supplement group were also fed 5 g/day of Smartamine-M at the rate of 5 g per day. From May 25 to June 22, gains were significantly increased for Control and 25% protein calves fed Smartamine-M, suggesting that the protein to energy ratios in the diets of calves fed no supplement or the 25% protein supplement resulted in a postruminal deficiency of methionine. During the second period from June 22 to July 20, gains were not affected by 40% or 25% crude protein supplements. Within supplement treatments, Control and 25% protein-fed calves again tended to gain faster when fed Smartamine-M but responses were less than seen during the first period. During the third period from July 20 to August 17, gains were not affected by Smartamine-M. During the third period, gains were improved by about .5 lb/day for the 40% protein supplement and almost .75 lb/day for the 25% supplement. In conclusion, feeding 5 g per day of Smartamine-M significantly improved the rate of gain of light weight calves grazing native range during late spring and early summer but did not improve gains after cattle reached about 500 lb and (or) forage quality declined during summer. Forage conditions will dictate the optimum starting date for feeding of summer supplements.

(Key Words: Beef Cattle, Methionine, Smartamine, Supplements, Grazing.)

## Introduction

Most supplementation research with summer stockers has been with yearlings. However, the average weight and age of summer stockers have decreased substantially during the past few years. Recent studies suggest that younger calves may respond to supplemental protein earlier in the summer than do yearlings. Because early summer forage provides a higher ratio of total digestible nutrients (TDN) to protein, the opportunity may exist to increase gains with added energy in the supplements. It is also possible that protein

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deficiencies could be alleviated by providing specific amino acids directly to the small intestine of calves with high protein requirements. The objectives of this study were to compare the effects of feeding supplements with 40 or 25% crude protein (CP) with or without Smartamine-M, a methionine source that escapes ruminal digestion, to light weight calves grazing native range during the summer.

### Materials and Methods

Sixty Hereford and Hereford x Angus calves born from September 1 to November 1, 1992 were allotted to six treatment groups in a 3 x 2 factorial arrangement. Allotment was based on sex (steer or heifer) and weight. Treatments were: 1) Control, no supplement, 2) 1 lb/day of 40% CP supplement, 3) 2.5 lb/day of 25% CP supplement (Table 1). Half the calves in each supplementation treatment were fed Smartamine-M (70% methionine) at a daily rate of 5 g. Smartamine-M is a product that provides over 90% escape from ruminal digestion but is 90% available in the small intestine.

**Table 1. Composition of supplements.**

Ingredient	Supplement	
	40% CP	25% CP
Soybean meal	87.1	35.5
Wheat middlings	7.0	59.0
Cane molasses	4.0	4.0
Dicalcium phosphate	1.6	
Calcium carbonate		1.5
Vitamin A (30,000 IU/gm)	.18	.05
Calculated analysis (as fed basis)		
Dry matter, %	89.5	89.0
Crude Protein, %	39.6	25.4
K, %	2.17	1.64
Ca, %	.5	.73
P, %	1.01	.88
Mg, %	.32	.37
Cu, ppm	18	15
Se, ppm	.21	.19
Zn, ppm	62	74

All calves grazed a common pasture with forage consisting of predominantly native tallgrass species and were gathered at 8:00 am on Monday through Friday each week for feeding of supplements in individual covered stalls. Supplement amounts were prorated for the 5-day per week feeding schedule. Smartamine-M was delivered via a carrier consisting of corn (86%), cane molasses (4%) and cottonseed hulls (10%). Smartamine-M was mixed at the rate of 7 g of Smartamine/112.5 g (.25 lb) of the carrier. The carrier was top-dressed on the supplements or fed directly to Control calves and resulted in feeding 5 g of Smartamine per calf on a 7-day basis. Groups not fed Smartamine were fed .25 lb of the carrier without Smartamine each 5-day per week feeding. Supplements were pelleted (3/16 in diameter) but the carrier and Smartamine were fed in meal form. A mineral mix containing phosphorus, copper and zinc was available free-choice in the pasture at all times.

Calves were weighed after overnight withdrawal from feed and water at the initiation of the study (day 0), and on day 28, 56 and 84 (termination). Complete records were maintained of supplement intake, animal weight and health. One calf died in late June of apparent respiratory disease not believed associated with any supplement treatment.

Data were analyzed using the GLM procedures of SAS. The model for weight gains included feed treatment, Smartamine, feed treatment x Smartamine interaction, calf sex and calf breed. Initial weight was included as a covariate.

## Results and Discussion

Calves weighed about 375 lb at the beginning of the study on May 25. The interactions between feed treatments and Smartamine-M approached significance ( $P > .19$ ) for the first 28-day weighing period and means are shown for each supplement and Smartamine-M combination (Table 2). This interaction was not significant for other weighing periods ( $P > .50$ ) and means are shown pooled for supplement and Smartamine-M treatments (Tables 3 and 4).

During the first period from May 25 to June 22, gains were significantly increased for Control calves fed Smartamine-M. Although this is a short period with limited numbers of calves, results suggest that methionine may have been limiting gains of these light calves grazing early summer native range. Gains were not increased by feeding Smartamine-M in addition to the 40% CP supplement but were significantly increased (10 lb) when fed in addition to the 25% CP supplement, suggesting that the protein to energy ratio in the diet of calves fed the 25% CP supplement resulted in a post-ruminal deficiency of methionine. Gain responses to protein and energy supplements during this period were less than observed in mid to late summer when forage protein and digestibility are lower.

**Table 2. Weights and weight gains of calves fed protein or energy supplements with or without 5 g/day of Smartamine-M.**

Supplement Smartamine-M	Control		40% CP		25% CP	
	0	+	0	+	0	+
No. of calves	10	10	10	10	10	9
Initial wt, 5/25 (lb)	380	345	371	358	373	365
Gains (lb)						
5/25 - 6/22	40 <sup>a</sup>	49 <sup>b</sup>	50 <sup>b</sup>	50 <sup>b</sup>	51 <sup>b</sup>	61 <sup>c</sup>
6/22 - 7/20	44	52	46	44	48	53
7/20 - 8/17	40 <sup>a</sup>	40 <sup>a</sup>	51 <sup>b</sup>	55 <sup>bc</sup>	60 <sup>c</sup>	61 <sup>c</sup>
Total	124 <sup>a</sup>	141 <sup>ab</sup>	147 <sup>bc</sup>	149 <sup>bc</sup>	159 <sup>bc</sup>	175 <sup>c</sup>
Daily gains (lb)						
5/25 - 6/22	1.43 <sup>a</sup>	1.75 <sup>b</sup>	1.79 <sup>b</sup>	1.79 <sup>b</sup>	1.82 <sup>b</sup>	2.18 <sup>c</sup>
6/22 - 7/20	1.57	1.86	1.64	1.57	1.71	1.89
7/20 - 8/17	1.43 <sup>a</sup>	1.43 <sup>a</sup>	1.82 <sup>b</sup>	1.96 <sup>bc</sup>	2.14 <sup>c</sup>	2.18 <sup>c</sup>
Total	1.48 <sup>a</sup>	1.68 <sup>ab</sup>	1.75 <sup>bc</sup>	1.77 <sup>bc</sup>	1.89 <sup>bc</sup>	2.08 <sup>c</sup>

a,b,c Means on a line with different superscripts differ ( $P < .05$ ).

**Table 3. Weights and weight gains of calves fed protein or energy supplements (pooled across Smartamine treatments).**

Item	Control	40% CP	25% CP
No. of calves	20	20	19
Initial weight, lb, 5/25	363	365	369
Gains			
5/25 - 6/22	45 <sup>a</sup>	50 <sup>a</sup>	56 <sup>b</sup>
6/22 - 7/20	48	45	51
7/20 - 8/17	40 <sup>a</sup>	53 <sup>b</sup>	61 <sup>c</sup>
Total	133 <sup>a</sup>	148 <sup>b</sup>	168 <sup>c</sup>
Daily gains			
5/25 - 6/22	1.61 <sup>a</sup>	1.79 <sup>b</sup>	2.00 <sup>c</sup>
6/22 - 7/20	1.71	1.61	1.82
7/20 - 8/17	1.43 <sup>a</sup>	1.89 <sup>b</sup>	2.17 <sup>c</sup>
84 days	1.58 <sup>a</sup>	1.76 <sup>b</sup>	2.00 <sup>c</sup>

a,b,c Means on a line with different superscripts differ ( $P < .05$ ).

**Table 4. Weights and weight gains of calves fed 0 or 5 g/day of Smartamine-M (pooled across supplement treatments).**

Item	Control	Smartamine-M
No. of calves	30	29
Initial weight, lb 5/25	375	356
Gains		
5/25 - 6/22	47 <sup>a</sup>	54 <sup>a</sup>
6/22 - 7/20	46	50
7/20 - 8/17	50	52
Total	143 <sup>a</sup>	156 <sup>b</sup>
Daily gains		
5/25 - 6/22	1.68 <sup>a</sup>	1.93 <sup>b</sup>
6/22 - 7/20	1.64	1.79
7/20 - 8/17	1.79	1.86
84 days	1.70 <sup>a</sup>	1.86 <sup>b</sup>

a,b Means on a line with different superscripts differ ( $P < .05$ ).

During the second period from June 22 to July 20, gains were not consistently affected by 40% or 25% CP supplements. Gain responses to Smartamine-M were less than observed during the first period (+.15 lb/day;  $P < .21$ ). Within supplement treatments, Control and 25% protein-fed calves again tended to gain faster when fed Smartamine-M but responses were less than during the first period. The response to supplementation was less than expected for this period. The spring of 1993 was characterized by abnormally cool temperatures and heavy rain. As a result, the native forages in these pastures began growth later than would be typical and forage quality probably remained somewhat higher than normal during the trial. Calves were also moved to a previously ungrazed pasture at the beginning of the second period and had abundant forage for selection. This high-quality forage would not be expected to respond to supplementation.

During the third period from July 20 to August 17, gains of Control calves decreased as expected when forage matures. Gains were not affected by Smartamine-M ( $P = .48$ ). Two factors, heavier, older calves and declining forage quality, may have caused the decline in the response to Smartamine-M. The response to both 40 and 25% CP supplements was greater than during previous weighing periods, suggesting a decline in forage quality. Gains were improved by about .5 lb/day for the 40% CP supplement and almost .75 lb/day for the 25% supplement, consistent with previous results at this station.

In conclusion, feeding 5 g per day of Smartamine-M significantly improved the rate of gain of light weight calves grazing native range during late spring and early summer. Smartamine-M may not improve gains after cattle reach about 500 lb of weight and/or forage quality declines during summer. Feeding 1 lb of high-protein supplement or 2.5 lb of 25% protein supplements after mid-July resulted in .5 to .75 lb/day increased gain, respectively, both of which would be economically attractive. Forage conditions will dictate the optimum starting date for feeding of summer supplements.