Evaluation of Intake Restricted Pea-Based Creep Diets Among Calves Grazing Western North Dakota Native Range
Interim Progress Report

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Summary

Previous creep feeding research has shown that unrestricted consumption during the grazing season can result in costly over consumption. This project evaluated two levels of salt restriction, and two levels of protein and the effect of a pea-based creep diet on range forage and milk intake (Gelvin et al., 2003). Intake was limited by adding either 8 or 16% salt to the complete pelleted creep feed formulations. The high salt creep diet was formulated to contain either 19 or 33.5% crude protein.

Calves receiving the 8% salt creep diet consumed more creep (P=.0001) and were slightly heavier at weaning, whereas calves consuming the 16% salt creep consumed significantly less creep (P=.0001) but gained at a similar rate. Offering grazing nursing calves a high protein creep formulation reduced creep intake (P=.0001) and growth (P=.002) suggesting that protein was not the first limiting nutrient.

Supplementation of nursing calves with a pea-based creep diet (.45% of BW) increased total intake without altering forage or milk consumption.(Gelvin et al., 2003)

Introduction

Utilization of peas in livestock supplements was identified as an important research focus and priority among North Dakota field pea producers in a January 2000 survey. Development of novel uses for both new and existing crops, like field peas, was also identified as a research priority area by the USDA/CSREES Alternative Crops Program. Because of the large number of beef cows relative to other species, the state's cow/calf industry holds particular promise as a market for various field pea uses.

Nutrient requirements for nursing calves grazing native range during late summer and fall may not be met due to advancing forage maturity (Johnson et al., 1996). Creep feeding is commonly practiced by beef cattle producers to alleviate nutrient deficiencies in forages, increase weaning weight, and potentially to increase profit. Stroh et al. (2000) evaluated creep feed restriction and reported calves allowed free choice access to creep feed consumed 2.2 times more creep feed but growth due to supplementation was only slightly improved when compared to calves receiving a salt restricted creep diet. In a subsequent investigation at the DREC, Landblom et al. (2000) evaluated salt restricted creep diets formulated with 33, 67, and 100% peas in pea-wheat midd creep diets. A diet containing two-thirds peas and one-third wheat midds resulted in the most favorable creep to gain efficiency. Data from southeastern North Dakota (Loy et al., 1999) suggests energy to be the first limiting nutrient for nursing calves grazing native range and that small amounts (1.5 Lb./hd/da) of supplement did not affect forage intake. Lardy et al. (2001) found metabolizable protein to be the first limiting nutrient for nursing calves.

The purpose of the present investigation is to evaluate the application of intake restricted high and low protein pea-based creep diets on growth and creep supplement efficiency, and to investigate changes in forage intake and nutrient supply from pea creep supplement as range condition changes over time from mid-summer to late fall.

Project Objectives

1. Using ruminally cannulated nursing calves, measure seasonal changes in nutritive value of native range, the effect of pea creep supplement on forage intake, ruminal digestion, and total tract digestibility.

2. Using cows and calves grazing western North Dakota native range, evaluate supplement protein level and level of salt restriction on pea creep feed intake, and the interrelationship between calf growth, and gain to creep efficiency with respect to advancing forage maturity.

3. valuate the economics of salt-restricted pea creep feed intake under varying ingredient and calf prices, beef price slides, forage maturities, labor availability and cost scenarios.

Materials and Methods

Forty-eight Angus x Hereford cow/calf pairs nursing Angus, Red Angus, and Hereford sired calves were used to evaluate pea/wheat midd and pea/soybean meal creep diets formulated to contain two levels of protein (19 and 33.5%) and two levels of salt restriction (8 and 16%) in a randomized complete block design. Cows and calves were put on replicated native pastures June 25 without creep feed. Three phase pelleted complete creep diets were fed an average 104.5 days in portable creep feeders equipped with creep panels that allowed calves continuous access to creep feed but restricted cows. The creep feeding season was divided into three 35 day periods (Phase 1: July 25-Aug 29; Phase 2: Aug 30-Oct 3; Oct 4-Nov 7) . In the first 35 day period, creep feeds were fed without salt to insure the calves would locate the feeders and begin consuming creep feed aggressively. Salt was added to the creep diet formulations during the second and third phases. A schedule of salt restriction is shown in Table 1. Initially, 8% salt was added to all treatment formulations. At the end of phase two one of the groups continued to receive the 8% salt-limited creep (Pea-LS) and the other two study groups (Pea-HS and Pea-HiPro) received formulations prepared with 16% added salt. Creep diet formulations are shown in Table 2.

Results

Creep feeding protocol applied in this project was designed to supply supplemental nutrients to nursing calves grazing southwestern North Dakota native range in a manner such that forage and milk intake would not be impacted negatively.

The effect on forage intake and digestibility when a pea-based creep feed is introduced into the diet of nursing calves was evaluated by Gelvin et al. (2003). The complete report can be found elsewhere in this annual report. Briefly, supplemental creep feed increased total feed intake of nursing calves, without affecting forage or milk intake. Grazed diets of nursing calves declined in crude protein and digestibility with advancing season.

Growth, feed efficiency and economic efficiency are summarized in Table 3. Unsupplemented control calves gained 2.69 lbs/hd/da. Calves receiving creep grew faster (P=.002) than the unsupplemented control calves gaining 3.20, 3.08, and 2.92 lb/hd/da for the Pea-LS, Pea-HS, and Pea-HiPro, respectively. Calf creep gain/head (P=.002), creep/head/day (P=.0001), and creep to gain efficiency(P=.0001) were 67.7, 6.67, and 10.47; 58.0, 4.10, and 7.99; 41.1, 3.03, and 10.78 for the Pea-LS, Pea-HS, and Pea-HiPro, respectively.

Figures 1 and 2 depict growth and supplemental creep intake within treatment at each phase change. An elevated protein creep improved performance compared to the control group, but was inferior to the high salt creep. Creep intake during the late fall period between October 3 and weaning on November 7, (Fig. 2) when calves normally consume large amounts of creep feed, was maintained at 4.11 pounds/head/day. Based on creep efficiency recorded and shown in Table 3, the data would suggest this is a desirable intake level for nursing calves grazing fall native western North Dakota range. The data also suggests that energy rather than protein is first limiting nutrient, which is in agreement with the findings of Loy et al. (1999).

Economic analysis of creep feeding enterprises do not always yield positive returns. Creep diets in the investigation were priced differentially based on ingredient composition and salt level. Average creep cost for the combined phases within treatment was $131.56, $134.92, and $185.42/Ton for the Pea-LS, Pea-HS, and Pea-HiPro, respectively. Using these values, creep feed cost/head totaled $45.82 for the Pea-LS, $28.92 for the Pea-HS, and $29.35 for the Pea-HiPro. Pricing the additional gain was conducted using actual feeder calf prices for October and November from Stockmen's Livestock Exchange Dickinson, North Dakota. Using the recorded price slide and calf weaning weight, the value of added gain due to creep feeding was $41.84 for the Pea-LS, $42.23 for the Pea-HS, and $30.86 for the Pea-HiPro. Deducting creep feeding returns from the cost of creep feed within each treatment resulted in net returns of -$3.98, $13.31 and $1.51 for the Pea-LS, Pea-HS and Pea-HiPro, respectively.

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Table 1. Salt intake restriction schedule.

	Control	Pea-LS	Pea-HS	Pea-HiPro
Phase 1 (29 da)[a]	---	---	---	---
Phase 2 (35 da)[b]	---	No Salt	No Salt	No Salt
Phase 3 (35 da)	---	8%	8%	8%
Phase 4 (35 da)	---	8%	16%	16%

[a] No creep during the first 29 days on pasture.
[b] Thirty-five day adjustment period. Creep formulation without salt fed initially to allow calves adequate time to locate self feeders and begin consuming the experimental formulations.

Table 2. Experimental As Fed Pea/Wheat Midd Creep Diets (91% dry matter)

	Pea Low Salt			**Pea Hi Salt**			**Pea HI Protein**		
Phase	**1**	**2**	**3**	**1**	**2**	**3**	**1**	**2**	**3**
Salt Level	0	8%	8%	0	8%	16%	0	8%	16%
Peas	61.00	56.27	56.27	61.00	56.2	50.96	37.90	30.59	18.30
Wheat Midds	26.30	24.33	24.33	26.30	24.3	22.03	0	0	0
Molasses	5.88	5.88	5.88	5.88	5.88	5.88	5.87	5.87	5.87
Limestone	1.16	1.16	1.16	1.16	1.16	1.16	1.2	1.2	1.2
Salt	0	7.3	7.3	0	7.3	14.63	0	7.3	14.6
Soybean Meal	5.35	4.894	4.894	5.35	4.89	4.44	54.0	54	59
Dical	.86	.86	.86	.86	.86	.86	1.0	1.0	1.0
Other[a]	.041	.041	.041	.041	.041	.041	.041	.041	.041
	100.6	100.7	100.7	100.6	100.	100	100	100	100

[a] Includes Trace mineral .018%, Vitamin E .018%, and Vitamin A, D .005%.

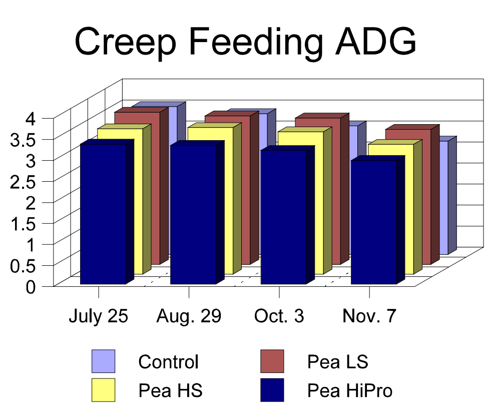

Figure 1.

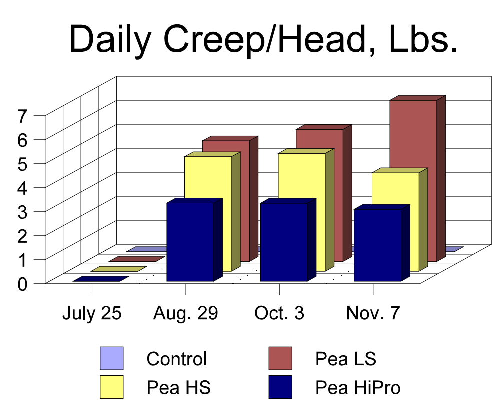

Figure 2.

Table 3. Two year combined creep feeding calf growth, efficiency, and economic analysis (2001, 2002).

	Control	Pea-LS	Pea-HS	Pea-HiPro	P - Value
Creep Growth					
No Calves Fed	20	20	20	20	
Grazing Period, Da.	136.5	136.5	136.5	136.5	
Creep Feeding Period, Da	0	104.5	104.5	104.5	
Calf Initial Wt, lb.	290	280.6	301.8	300.6	.42
Calf Creep Start Wt., lb.	407.3	400.1	414.8	408.6	.81
Calf Weaning Wt., lb.	656.6[b]	717.1[a]	722.1[a]	699.0[b]	.004
Creep Gain/Hd., lb.	0.0	67.7[a]	58.0[a]	41.1[b]	.002
Total Pasture Gain, lb.	366.6[c]	436.5[a]	420.3[ab]	398.4[b]	.002
AD Creep Feeding Gain, lb.	2.38[c]	3.03[a]	2.94[ab]	2.78[b]	.002
ADG, lb.	2.69[b]	3.20[a]	3.08[a]	2.92[b]	.002
Creep Summary					
Creep/Head, lb.	0.0	696.4[a]	428.5[b]	316.7[c]	.0001
Creep/Head/Day, lb.	0.0	6.67[a]	4.10[b]	3.03[b]	.0001
Creep Gain/Head, lb.	0.0	67.7[a]	58.0[a]	41.1[b]	.002
AD Creep Gain, lb.	0.0	.65[a]	.56[a]	.39[b]	.002
Creep:Gain, lb.	0.0	10.47[a]	7.99[b]	10.78[a]	.0001
Creep Economics					
Creep Cost/Cwt, $	0	6.58	6.75	9.27	
Creep Cost/Hd, $	0	45.82	28.92	29.35	
Weaning Wt., lb.	656.6	717.1	722.1	699.0	
Calf Selling Price/Cwt., $[a]	81.00	80.00	79.50	80.50	
Calf Value, $	531.84	573.68	574.07	562.70	
Added Calf Value From	0	41.84	42.23	30.86	
Net Return From Creep, $	0	-3.98	13.31	1.51	

[a] Price slide adopted from Stockmen's Livestock Exchange weekly report on February 24, 2003. The values shown are for illustration purpose only. Reader is encouraged to their own price slide.