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Beef Section

Dickinson Research Extension Center
1089 State Avenue
Dickinson, ND 58601

Application of Salt-Limited Pea/Wheat Midd Creep Diets in Southwestern North Dakota

D.G. Landblom[1], W.W. Poland[1], and G.P. Lardy[2]

[1]NDSU Dickinson Research Extension Center, Dickinson, ND
[2]NDSU Animal & Range Science Dept., Fargo, ND

Summary

Eighty-eight A x H cows nursing Angus, Red Angus, Hereford, Polled Hereford, and Charolais sired calves were assigned to pasture groups and received complete pelleted isonitrogenous and isocaloric creep diets containing 33, 67, and 100% peas with corresponding reciprocal levels of wheat midds in the 33 and 67% pea treatments. Control calves received no creep feed. Experimental creep feeds were prepared at the NDSU Northern Crops Institute feed mill and self-fed in portable steel creep feeders equipped with self-contained creep panels. Calves were initially offered the experimental creep diets without salt restriction for 35 days. Then intake was limited in a step-wise fashion by switching from no salt to 8% salt for 28 days, followed by an additional 8% salt increase to 16% salt for the remaining 49 days of the study. The total creep feeding period was 112 days. Creep intake did not differ between treatments (P=.42), and was in keeping with a preset intake goal of 3.0 pounds/head/day. Daily creep intake was 2.93, 3.19, and 3.03 pounds/day for the 33, 67, and 100% pea diets, respectively. Calves receiving pea treatments gained faster than the untreated control calves (P=.11). Within pea treatments, calves receiving a 67% pea creep grew faster (P=.11), and although not significant, had numerically greater creep gain and consumed numerically less creep/pound of gain. Average daily gains for the 33 and 100% pea treatments were similar. Compared to 100% pea treatment, creep gain for the 33% pea treatment was numerically greater and creep consumed/pound of gain was numerically lower. Creep consumption/pound of gain was 6.80, 4.76, and 12.52 pounds for the 33, 67, and 100% pea treatments, respectively, but the difference observed was not significant. Economic analysis revealed a net return for creep feeding of $13.33, $24.91 and -$4.65 for the 33, 67, and 100% pea test diets, respectively. These data suggest creep diets formulated with peas should not exceed 67% peas and that regulating

creep intake using a step-wise salt-limiting protocol has the potential to effectively deliver nutrients without over consumption.

Introduction

Creep feeding grazing nursing calves is an established practice that in most situations pays a favorable return to the operator. The potential for success can be influenced by precipitation and subsequent effect on range condition, calf genetic potential for growth, delivery costs, and creep ingredient formulation. Most creep feed supplements are formulated with ingredients that are considered to be sources of highly digestible fiber such as wheat midds, soyhulls, and to a lesser extent barley malt sprouts. Supplements prepared with digestible fiber sources containing low levels of starch (20%) present less negative associative effects relative to fiber digestibility, when used in grazing situations, than has been observed with starch or molasses supplements (Anderson et al., 1988; Martin and Hibberd, 1990; Galloway et al., 1991; Ovenell et al., 1991; Grigsby et al., 1992). Field peas are an excellent source of protein and energy for ruminants (Anderson, 1999), and contain more than 50% starch. Robinson and McQueen (1989) evaluated rumen degradability characteristics of starch in wheat, barley, corn, oats and peas, and found starch solubility of peas to be slower than wheat, barley or oats, and comparable to that of corn.

Anderson (1999), at the Carrington R&E Center, evaluated creep diets when suckling drylot calves were offered reciprocal diets of dry rolled peas and pelleted wheat midds (100-0%, 33-67%, 67-33%, and 0-100%). Voluntary intake increased with increasing level of peas, however, feed efficiency declined with each incremental pea increase. Efficiency was maximized when either peas or wheat midds were included at 67% of the diet.

Limiting intake of self-fed supplements to minimize over consumption can be used to reduce supplement and labor costs provided the limiting procedure allows the target animals to grow to their full genetic potential. Recent research suggests that salt is an effective intake limiting agent. Schauer et al. (2000) evaluated salt, ammonium chloride, ammonium sulfate, and 7% calcium hydroxide for their intake limiting potential. Based on supplement intake, ADG, F:G, and variability between years, salt was the most consistent limiting agent for self-fed pasture supplementation.

In a recent study to evaluate fiber-based creep diets, conducted by Stroh et al. (2000) for Cooperative Research Farms at the Dickinson Research Extension Center, intake of a 39% CP diet was restricted with salt and compared to either an all-natural 19% CP diet or a 19% CP diet prepared with the replacement of 2.4% protein equivalents from urea. Salt restriction of the 39% CP creep diet controlled intake to less than 3 pounds/head daily, while supplying sufficient nutrient flow to meet calf growth requirements.

Considering the availability and nutrient quality of field peas and wheat midds, the present investigation was conducted to determine supplement intake, diet acceptability, calf growth and efficiency, and economic return to supplementation when salt-limited pea/wheat midd diets were offered to grazing suckling calves.

Materials and Methods

Eighty-eight AxH cows nursing Angus, Red Angus, Hereford, Polled Hereford, and Charolais sired calves were randomly allotted into 8 pasture groups of 11 cow/calf pairs each based on calf weight, sex, sire, and cow MPPA value (CHAPS 2000). Three pasture groups were assigned to receive one of three experimental complete pelleted pea/wheat midd diets shown in Table 1, and a fourth pasture group served as an unsupplemented control group. Each dietary treatment was replicated twice.

One set of four pastures used were located at the Dickinson Research Extension Center's ranch headquarters located southwest of Manning, North Dakota, and the other set of four pastures were located 17 miles south of Fryburg, North Dakota, at a location historically referred to as "Pyramid Park". Due to the distance between locations, creep feeding began and ended on separate days. Feeding of the experimental creep diets began on July 18 at the Manning location, and July 19 at the Pyramid Park location. Creep feeding was terminated when calves were weaned on November 8 at the Manning location, and November 9 at the Pyramid Park location.

Test diets were formulated on a dry matter basis such that 33, 67 and 100% of the protein/energy component of each creep supplement originated from peas. The diets were also formulated to be isonitrogenous and isocoloric using soybean meal to correct deficiencies. Test creep diets were manufactured at the Northern Crops Institute feed mill on the campus of NDSU, and fed in portable steel creep feeders equipped with self-contained calf creep panels.

An average creep feed intake goal of 3 pounds/head/day was projected as a target level in the study, based on the intake observed by Stroh et al. (2000), using a step-wise salt restriction method. Calves were initially introduced to the experimental creep diets without salt restriction for 35 days, and then intake was limited in a step-wise fashion by switching from no salt to 8% salt for 28 days, followed by an additional 8% salt increase to 16% salt for the remaining 49 days of the study. The total creep feeding period was 112 days.

A limited economic analysis was conducted to determine the added calf value due to creep feeding of each test diet compared to the unsupplemented control calves. A price slide was created for southwestern North Dakota by averaging the selling price/hundredweight for 5 steer and 5 heifer calves in each weight group represented at Stockman's Livestock Exchange on November 16, 2000. The analysis does not account for creep feeder cost, fixed costs, and creep feed delivery cost.

Results and Discussion

Results of calf response to pea/wheat midd creep treatments on pasture using a step-wise intake restriction protocol is shown in Table 2. Creep intake did not differ between treatments, within the projected target level of 3 pounds/head/day, and ranged from 2.93 pounds for the 33% pea treatment to 3.19 pounds for the 67% pea treatment. Calves receiving the 100% pea test diet consumed an average 3.03 pounds/day. Compared to the control calves, treatments receiving the complete pelleted 33, 67, and 100% pea treatments gained at a faster rate (P=.11). Within pea treatments, average daily gain for the 33 and 100% pea creep diets were similar, but numerically less than the 67% pea test diet. Although not significant, creep gain/head, and average daily creep gain were numerically greater for the 67% pea treatment. Creep gain/head, average daily creep gain, and creep pounds/pound of gain were intermediate for the 33% pea treatment. When the protein/energy source was entirely from pea grain in the 100% pea treatment, intake was consistent with the other treatments, but creep gain/head and average daily creep gain were numerically lower resulting in a numerically greater consumption of creep/pound of

gain.

Anderson (1999), reported drylot calves fed reciprocal pea/wheat midd diets increased voluntary creep consumption with each incremental pea increase, and that creep feed efficiency was maximized when 67% of the creep diet was derived from either peas or wheat midds . While a step-wise salt limiting protocol was incorporated into this study to control over consumption, calf response to the 33 and 67% pea diets is in agreement with that of Anderson (1999). An explanation for the numerically poorer feed efficiency in the 100% pea treatment is not available. Previous research has shown that starch in sufficient quantities has the potential to interfere with fiber digestibility, however, whether such an interaction between starch and fiber digestibility occurred in the 100% pea treatment is unknown

Economics for creep feeding the test diets evaluated has also been summarized in Table 2. As previously described, calf value was determined using an average price slide for steer and heifer calves, in southwestern North Dakota, on November 16, 2000. Total creep diet cost/head was $22.93, $24.90, and $23.91 for the 33, 67 and 100% pea test diets, respectively. Deducting the cost for each test creep diet from the added calf value over the control calves resulted in a net return for creep feeding of $13.33, $24.91 and -$4.65 for the 33, 67, and 100% pea treatments, respectively.

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Table 1. As Fed Pea/Wheat Midd Creep Diets (91% dry matter)

	33% Pea			67% Pea			100% Pea		
DM Salt Level	**0**	**8%**	**16%**	**0**	**8%**	**16%**	**0**	**8%**	**16%**
Peas	30.73	28.08	25.42	61.57	56.2	50.96	93.14	85.07	77.0
Wheat Midds	52.84	48.28	43.71	26.62	24.3	22.03	0	0	0
Molasses	5.89	5.87	5.87	5.88	5.87	5.88	5.87	5.90	5.9
Limestone	2.0	2.0	2.0	1.16	1.16	1.16	2.0	.74	.74
Salt	0	7.3	14.6	0	7.32	14.63	0	7.34	14.67
Soybean Meal	10.11	9.24	8.36	5.35	4.89	4.44	0	0	0
Dical	0	0	0	.86	.86	.86	1.65	1.65	1.65
Other[a]	.041	.041	.041	.041	.041	.041	.041	.041	.041

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

Table 2. Creep diet calf growth, efficiency, and economic analysis.

	Control	33% Pea	67% Pea	100% Pea	P-Value

Creep Growth					
No Calves Fed	22	22	22	22	
Days Creep Fed	0	112	112	112	
Calf Initial Wt, lb.	413.5	427.3	427.3	409.6	
Calf Weaning Wt., lb.	597.7	660.2	688.0	630.6	
Gain, lb.	184.2	232.9	260.7	221	.11
ADG, lb.	1.65	2.08	2.33	1.97	.11
Creep Summary					
Creep/Head, lb.	0	328.7	357.5	339.2	.42
Creep/Head/Day, lb.	0	2.93	3.19	3.03	.42
Creep Gain/Head, lb.	0	48.5	76.3	36.6	.34
AD Creep Gain, lb.	0	.43	.68	.33	.34
Creep, lb.:Gain, lb.	0	6.80	4.76	12.52	.48
Creep Economics					
Creep Cost/Cwt, $	0	6.976	6.964	7.048	
Creep Cost/Hd, $	0	22.93	24.90	23.91	.42
Weaning Wt., lb.	597.7	660.2	688.0	630.6	
Calf Selling Price/Cwt.[a], $	93.25	89.90	88.25	91.50	
Calf Value, $	557.35	593.61	607.16	577.00	
Value over Control, $	0	36.26	49.81	19.65	
Net Return from Creep, $	0	13.33	24.91	-4.65	
Net Return/$ of Creep Inv.$		.58	1.00	-.19	

[a] Price slide shown is the average for steer and heifer calves on November 16, 2000 in southwestern ND

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