RESPONSE OF PREGNANT BEEF COWS TO UNDEGRADABLE INTAKE PROTEIN FED IN EXCESS OF THE DEGRADABLE INTAKE PROTEIN REQUIREMENT [1]

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Summary

Two concurrent experiments were conducted to evaluate the effect on performance and forage intake of increasing the supply of undegradable intake protein (UIP) to pregnant beef cows already receiving sufficient degradable intake protein (DIP) to maximize forage intake. Three supplements were fed at .34% BW/day, providing .092% BW/day of DIP (level determined in previous study to maximize forage intake) and .042, .059, and .077% BW/day of UIP (low, moderate, and high UIP, respectively). In study 1, ad libitum tallgrass-prairie forage intake was measured daily from 12/1/93 to 2/10/94 using 18 pregnant Angus × Hereford cows. Forage intake steadily increased throughout the study, but did not vary between supplements for the first 6 weeks. However, forage intake was less during the last 4 weeks for cows offered the moderate and high UIP supplements. In study 2, 117 pregnant Angus × Hereford cows grazing dormant bluestem range were used to determine the impact of the supplements on body weight and body condition changes. Level of UIP in the supplement exerted only minimal effects on cumulative or 28-day interval changes in body weight or condition.

(Key Words: Beef Cows, Intake, Protein Supplementation.)

Introduction

Feeding supplements with a high concentration of degradable intake protein (DIP) to pregnant beef cows grazing dormant rangeland increases forage intake and enhances performance. In addition, some previous research at KSU noted that performance of pregnant cows grazing winter range improved when they were fed supplements that contained more undegradable intake protein (UIP; for example, dehydrated alfalfa) than would generally exist in grain/oilseed meal mixtures. This could indicate that, even in situations where the DIP requirement (to maximize forage intake) is met, the metabolizable protein reaching the small intestine may not fully meet the needs of a pregnant cow. Recent studies at Kansas State have attempted to identify the amount of DIP required to optimize the use of low-quality, tallgrass-prairie forage. The present study was designed to evaluate whether providing UIP in addition to the DIP requirement would improve forage intake and (or) performance.

Experimental Procedures

Angus × Hereford cows from the same herd and in the final 3 to 5 months of pregnancy were used in both studies. Three different supplements that varied in the amount of UIP were provided. The proportion of DIP was the same in all supplements (27% of supplement DM) and provided an amount of DIP (.092 %BW) that was previously determined to maximize forage intake in nonpregnant cows fed a similar forage. Supplements were formulated with soybean meal, sorghum grain, molasses, blood meal, and corn gluten meal and were designated: 1) low UIP (UIP fed at .042 %BW), 2) moderate UIP (UIP fed at .059 %BW), and 3) high UIP (UIP fed at .077 %BW). Daily supplement was fed at .34 %BW (DM basis).

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In study 1, 18 cows (940 lb) were blocked by weight and assigned to treatments. Six steers (650 lb) also were blocked by weight as environmental controls (steers were fed the low UIP supplement). Cattle were individually fed dormant tallgrass-prairie forage ad libitum. Daily forage intake was measured (12/l/93 to 2/10/94) and summarized as means for five 2-week periods. In study 2, 117 cows (1160 lb) grazing in three tallgrass prairie pastures were assigned randomly to supplement treatments. All supplement treatments were present within each pasture. Body weight and body condition were measured at 28-day intervals from 11/22/93 through 2/10/94, at calving (day 103), 2 weeks before the beginning of the breeding season (day 154), and at weaning (day 194).

Results and Discussion

In study 1, a sex × time interaction (P=.07) occurred for forage intake (Figure 1). Forage intake increased and was similar between the cows and steers for the first three periods, suggesting that increased intake was largely due to the environmental conditions. However, forage intake differed between the sexes for periods 4 (P=.07) and 5 (P<.0l), with cow intake increasing with increased gestational length and steer intake plateauing. In addition, a level of UIP level × time interaction (P<.05) occurred for dry matter intake (Figure 2). No differences (P>.10) occurred in the forage intake among supplemented groups in the first three 2-week periods. However, in periods 4 and 5, forage intake tended (P < .10) to be lower for cows fed higher levels of UIP in the supplements. This may imply that amount or composition of nitrogenous constituents arriving at the small intestine has a role in the peripheral control of forage intake. In study 2, amount of UIP in the supplement (Table 1) exhibited only a few sporadic effects on cow body weight or condition scores. Similarly, supplement type did not affect (P>.10) calf birth weight or ADG. Results from this study suggest that for cows in late gestation and fed low-quality, tallgrass prairie forage, the combination of microbial protein and UIP (from supplement and forage) flowing into the small intestine with the low UIP treatment was adequate to meet the metabolizable protein requirement.

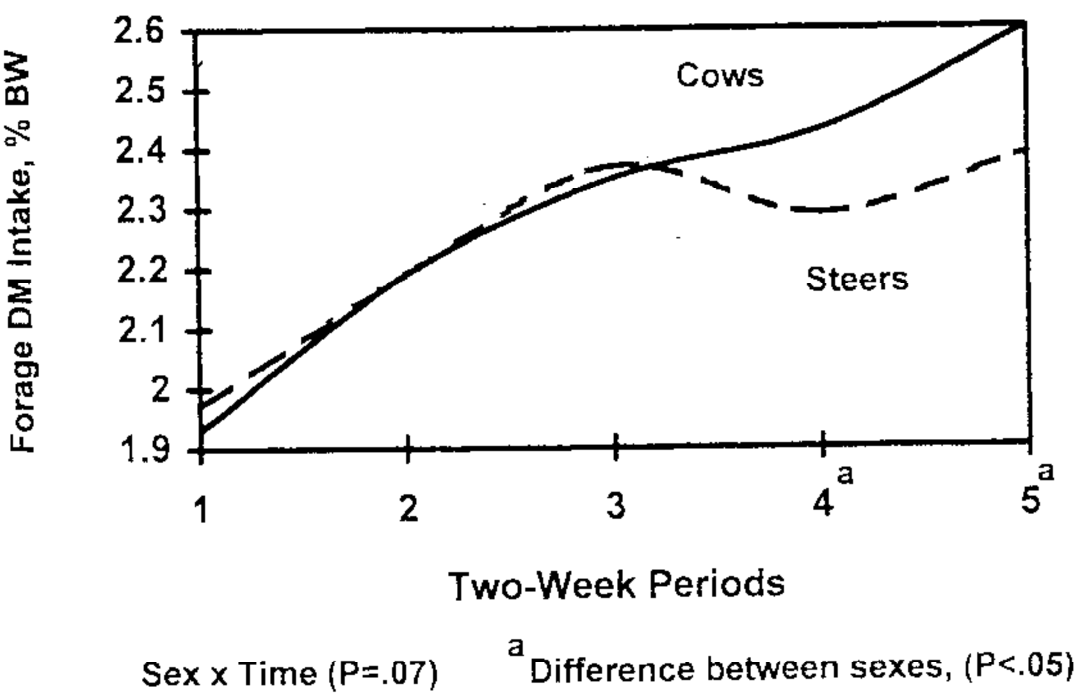

Figure 1. Effect of Sex on Forage Intake

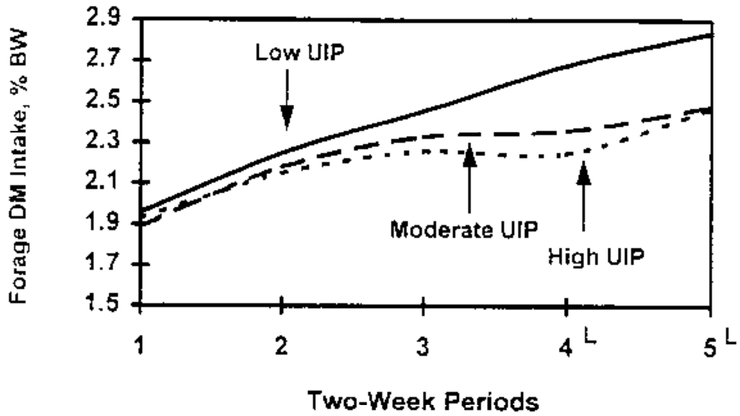

Figure 2. Effect of Undegradable Intake Protein (UIP) Level in Supplements on Forage Intake by Pregnant Cows

Table 1. Effect of Level of UIP[a] in Supplements on Body Weight and Body Condition Score Changes

Item	Supplements			Contrasts[b]	
	Low UIP	Moderate UIP	High UIP	Linear	Quadratic
Initial BW, lb	1158	1158	1169		
Period BW change, lb:					
0 - 28 day	-4.23	-8.2	-4.3	.92	.01
28 - 56 day	9.8	11.1	7.6	.62	.53
56 - 84 day	9.4	9.2	3.8	.19	.44
84 - 103 day	-164.2	-157.4	-151.3	.29	.97
103 - 154 day	-71.4	-85.4	-77.1	.70	.40
154 - 194 day	178.1	190.8	193.9	.24	.66
Accumulative BW change, lb:					
0 - 56 day	5.6	2.9	3.3	.61	.69
0 - 84 day	14.9	12.1	7.1	.22	.82
0 - 103 day	-148.1	-144.6	-148.0	.99	.74
0 - 154 day	-71.4	-85.4	-77.2	.52	.30
0 - 194 day	-42.7	-44.3	-30.7	.40	.58
Initial body condition	5.2	5.2	5.4		
Period BC change:					
0 - 28 day	-.03	-.14	-.08	.55	.31
28 - 56 day	-.07	-.08	-.08	.97	.98
56 - 84 day	-.08	-.02	-.08	.95	.2
84 - 103 day	-.29	-.28	-.35	.27	.36
103 - 154 day	-.21	-.34	-.24	.72	.25
154 - 194 day	.55	.70	.71	.4	.65
Accumulative BC change:					
0 - 56 day	-.11	-.21	-.16	.61	.39
0 - 84 day	-.19	-.23	-.24	.5	.77
0 - 103 day	-.46	-.52	-.59	.09	.77
0 - 154 day	-.67	-.86	-.83	.06	.14
0 - 194 day	-.12	-.16	-.08	.83	.71
Calf data:					
Calf birth weight, lb	88.8	85.3	87.5	.61	.28
Calf ADG, lb/day	2.1	2.2	2.1	.72	.30

[a]UIP = undegradable intake protein. [b]Probability of observing a larger F-value. [c]Day 103 = average calving date, day 154 = 2 weeks before beginning of breeding season, day 194 = weaning.