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Abstract

One hundred thirty two Hereford x Angus cows grazing tallgrass-prairie range during winter were used to evaluate the effects of varying the amount of supplemental degradable intake protein (DIP) derived from urea on cow and calf performance. Treatment groups were: 0, 15, 30, and 45% of the supplemental DIP from urea. Supplements were formulated to contain 30% crude protein (CP), with approximately 70% of the CP being DIP. Palatability was not a significant problem within the range of urea inclusion tested. In general, prepartum weight and condition losses were greater with increasing levels of urea, although the magnitude of condition loss was greater when urea comprised more than 30% of the DIP. Calf performance was not affected by treatment.

Keywords

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EFFECT OF UREA LEVEL IN PROTEIN SUPPLEMENTS ON PERFORMANCE BY BEEF COWS CONSUMING LOW-QUALITY, TALLGRASS-PRAIRIE FORAGE [1]

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Summary

One hundred thirty two Hereford × Angus cows grazing tallgrass-prairie range during winter were used to evaluate the effects of varying the amount of supplemental degradable intake protein (DIP) derived from urea on cow and calf performance. Treatment groups were: 0, 15, 30, and 45% of the supplemental DIP from urea. Supplements were formulated to contain 30% crude protein (CP), with approximately 70% of the CP being DIP. Palatability was not a significant problem within the range of urea inclusion tested. In general, prepartum weight and condition losses were greater with increasing levels of urea, although the magnitude of condition loss was greater when urea comprised more than 30% of the DIP. Calf performance was not affected by treatment.

(Key Words: Cows, Forage, Urea, Performance.)

Introduction

Supplementing cattle consuming low-quality, tallgrass-prairie forage with DIP has been shown to increase forage intake and digestion and subsequently enhance animal performance. True proteins from feedstuffs such as the oilseed meals are rich in DIP and have been used frequently in formulating protein supplements. However, such feedstuffs are typically quite expensive. Previous research at Kansas State University has suggested that urea can replace at least 30% of the DIP in a natural-protein, dry supplement without adversely affecting forage intake and digestion. In contrast, trends have been evident in previous research for a decline in performance when urea exceeded that level. This study was conducted to evaluate supplement palatability and animal performance when urea accounted for up to 45% of the supplemental DIP in dry supplements fed to beef cows consuming low-quality, tallgrass-prairie forage.

Experimental Procedures

Our study was conducted to evaluate the influence of increasing the portion of DIP from urea in dry supplements on cow body weight and body condition changes, pregnancy rate, and calf performance when cows grazed dormant, tallgrass-prairie range. The experiment consisted of four supplement treatments furnishing 1) no urea, 0% of the supplemental DIP (0% of the supplemental CP) or the following amounts of urea 2) 15% of the supplemental DIP (11% of the supplemental CP), 3) 30% of the supplemental DIP (22% of the supplemental CP), and 4) 45% of the supplemental DIP (34% of the supplemental CP).

One hundred thirty two Hereford × Angus cows (BW = 1175 lb, final 3 to 5 months of pregnancy) were assigned randomly to supplement treatments and pastures. Three pastures were used, and all supplements were represented within each pasture. Cows received approximately 4.95 lb per day of supplemental dry matter (DM). Supplements were formulated with rolled sorghum grain, soybean meal; urea (15, 30, 45% treatments only);

[1]The authors express their appreciation to Gary Ritter and Wayne Adolph for their assistance in conducting this experiment.

molasses; and minerals to contain 30% CP and a nitrogen to sulfur ratio of 10:1. Based on previous KSU research, the DIP supplied by this amount of supplement should have been sufficient to maximize the digestible forage intake.

Body weight and condition measurements were taken at approximately 5-wk intervals beginning on November 30 and continuing through calving, with additional measurements taken 48 hours after calving, before breeding (April 26), and at weaning (October 1). After calving, all cows were handled as a group and received 10 lb per day of alfalfa hay (as-fed basis), (89.3% DM, 18.0% CP and 45.7% neutral detergent fiber (NDF) on DM basis) until adequate new grass growth had occurred (end of April).

Calf birth weights were recorded within 48 hours. Calf average daily gain was calculated as weaning weight minus birth weight divided by the number of days from birth. Cows were bred by natural service after a single shot of PGF2$_\alpha$ was administered at the beginning of the breeding season.

Table 1. Effect of Different Proportions of DIP from Urea on Body Weight (BW) and Body Condition (BC)[a] Changes in Beef Cows Grazing Dormant, Tallgrass-Prairie Forage

	% Supplemental DIP from Urea[b]					Contrasts		
Item	0	15	30	45	SEM[d]	L	Q	C
No. of cows	33	33	33	33				
Initial BW, lb	1178	1170	1175	1177	9.35	.97	.61	.71
Period BW change, lb								
30 November - 4 January	38.7	23.2	21.8	-4.1	3.20	<.01	.15	<.04
5 January - 9 February	30.0	24.0	13.5	26.1	6.36	.46	.19	.37
10 February - 8 March (calving)	-172.5	-169.8	-159.8	-162.8	8.80	.36	.76	.62
calving - 26 April (breeding)	-86.3	-77.8	-76.9	-80.3	8.66	.64	.52	.94
26 April - 1 October (weaning)	192.8	209.7	210.0	229.1	8.63	.03	.88	.41
Cumulative BW change, lb								
30 November - 9 February	68.8	47.2	35.3	22.0	8.18	<.01	.63	.77
30 November - 8 March (calving)	-103.7	-122.6	-124.5	-140.9	6.44	<.01	.85	.32
30 November - 26 April (breeding)	-190.0	-200.5	-201.4	-221.2	9.25	.06	.63	.52
30 November - 1 October (weaning)	15.0	20.1	8.6	11.0	8.44	.55	.88	.45
Initial BC	5.33	5.33	5.33	5.34	.01	.21	.37	.66
Period BC change								
30 November - 4 January	-.06	-.06	-.15	-.11	.05	.35	.69	.37
5 January - 9 February	.08	-.03	-.01	-.13	.05	.03	.90	.24
10 February - 8 March (calving)	-.32	-.20	-.19	-.37	.07	.68	.08	.82
calving - 26 April (breeding)	-.23	-.35	-.36	-.23	.07	.96	.13	.89
26 April - 1 October (weaning)	.50	.58	.64	.74	.06	.02	.91	.82
Cumulative BC change								
30 November - 9 February	.02	-.09	-.16	-.24	.05	<.01	.76	.81
30 November - 8 March (calving)	-.30	-.29	-.35	-.62	.05	<.01	.04	.60
30 November - 26 April (breeding)	-.53	-.64	-.71	-.84	.04	<.01	.78	.67
30 November -1 October (weaning)	.02	-.02	-.07	-.06	.07	.41	.71	.83

[a]Body condition scale: 1 = extremely emaciated; 9 = extremely obese.
[b]Percent of the total supplemental N from urea is 0, 11, 22, and 34, respectively.
[c]L = linear, Q = quadratic, C = cubic.
[d]Standard error of the mean.

Results and Discussion

All supplements were consumed readily, which agrees with previous work at K-State suggesting that palatability was not affected by providing up to 45% of the DIP in a dry supplement from urea. Cumulative body weight loss before calving increased (linear; P=.06) with increasing level of urea inclusion. This was primarily due to differences in response noted during the first 5-week period (cubic; P<.04). In contrast, body condition loss during the same time frame was greatest for those cattle receiving 45% of the supplemental DIP from urea (quadratic; P=.04). By weaning, changes in body weight and condition were similar among treatments. Calf birth weight, ADG, and weaning weights were not affected (P≥.40) by the level of urea fed to their dams prior to calving (Table 2). Similarly, pregnancy rate was not affected (P=.44) by treatment in this study and averaged 92%.

Table 2. Effect of Different Proportions of DIP from Urea on Calf Birth Weight and Gain and Pregnancy Rate in Beef Cows Grazing Dormant, Tallgrass-Prairie Forage

	% Supplemental DIP from Urea[a]					Contrasts[b]		
Item	0	15	30	45	SEM[c]	L	Q	C
No. of cows	33	33	33	33				
Calf birth weight, lb	92.5	91.6	91.5	93.0	1.84	.88	.53	.92
Calf ADG, birth-weaning, lb	2.20	2.18	2.21	2.19	.03	.93	.93	.45
Calf weaning weight, lb	543	542	553	552	8.8	.40	.98	.57

[a]Percent of the total supplemental N from urea is 0, 11, 22, and 34, respectively.
[b]L = linear, Q = quadratic, C = cubic.
[c]Standard error of the mean.