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INFLUENCE OF FALL PROTEIN SUPPLEMENTATION WITH A SELF-FED LIQUID SUPPLEMENT ON PERFORMANCE OF BEEF COWS GRAZING TALLGRASS-PRAIRIE RANGE

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Summary

We evaluated the effect of providing a liquid, high-protein supplement during the fall grazing period on beef cow and calf performance. Mature, pregnant, spring-calving cows (n=122) grazing native range were assigned to supplementation treatments. All calves were weaned on October 15. Control cows received no fall supplementation and then were hand-fed a dry supplement (40% crude protein; as-fed basis) from December 17 until calving. Supplemented cows were either allowed access to a liquid protein supplement (40% crude protein; as-fed basis) approximately 2 months before weaning until calving (fall supplementation from August 14 to December 17) or from weaning until calving (fall supplementation from October 15 to December 17). Supplement intake of the control cows from December 17 until calving was adjusted to match the estimated supplement intake of the liquid-fed groups and was prorated and fed 3 days/week. Supplementation was terminated upon calving, at which time all cows were treated similarly. Provision of liquid supplement during the fall increased cow body weight and body condition in the post-weaning period. However, cows not supplemented during the fall phase were able to overcome their lesser previous nutrition when they were suitably supplemented during the winter phase. The pre-weaning rate of gain of calves was not affected by fall supplementation. Calves produced by cows receiving no fall supplementation gained more weight from birth to the start of the summer grazing season. Subsequent pregnancy rate was not affected by fall supplementation.

Introduction

Forage quality in the tallgrass-prairie region of Kansas typically declines during late summer and fall. This is exhibited by the decrease in crude protein and the increase in the fibrous fractions of the forage. Previous research at Kansas State University has demonstrated that providing ruminally degradable protein (protein that is available for use by the ruminal microbes) improves production of grazing beef cows. Moreover, the magnitude of response to supplementation is commonly the greatest with the first increment (i.e., least amount) of degradable protein provided.

Generally, the nutrient requirements of spring-calving cows are least during the fall. The relationship between beef cow body condition at calving and subsequent reproductive performance is well established. Efficiently building mobilizable energy reserves in the fall may result in the maintenance of reproduction during the subsequent breeding season. Previously at Kansas State University, investigations into fall protein supplementa-

[1]Quality Liquid Feeds, Inc., Dodgeville, Wisconsin.

tion focused on supplements in various forms (i.e., self-fed pellet, molasses blocks, and hand-fed meal). Liquid protein supplements have the advantages of continuous accessibility and reduced labor.

The objective of our study was to evaluate the impact of providing supplemental protein via a liquid supplement during the fall. The time at which supplementation was initiated was evaluated to determine if the provision of supplement before or after weaning resulted in performance advantages.

Experimental Procedures

An experiment was conducted from August 14, 2002, through the beginning of the summer grazing season (May 2, 2003). One-hundred twenty-two mature, pregnant, spring calving, Hereford x Angus cow/calf pairs were assigned to treatments. All calves were weaned and weighed on October 15. Treatments were: 1) control, no fall supplementation (a hand-fed high-protein supplement [40% crude protein; as-fed basis] was provided from December 17 until calving); 2) pre-and post-weaning supplementation (liquid; 40% crude protein, as-fed basis) approximately 2 months before weaning until calving; or 3) post-weaning supplementation (same supplement as treatment 2) fed from October 17 until calving. Initial body weights of the cows and calves and body condition scores of the cows were recorded at the initiation of the study (August 14, 2002) and approximately every 60 days thereafter. Cow body weights and birth weights of calves were recorded within 48 hours of calving, and cow and calf body weights were obtained at the start of the summer grazing season (May 2, 2003). The three fall supplementation treatments were randomly assigned to 12 fall pastures (60 to 100 acres/pasture), allowing for four pasture replications per treatment. Stocking rate across all fall pastures was based on the cow/calf pair weights obtained at the beginning of the experiment. A 50:50 mix of salt and dicalcium phosphate was provided during the fall phase, and a commercial mineral mix was provided to all cattle from December 15 until the end of the experiment.

The fall-supplemented cows were provided the self-fed, liquid supplement containing urea (40% crude protein; as-fed basis) throughout their respective supplementation periods. Calves did have access to the supplement during the pre-weaning period. During the winter grazing period, all cows resided in three large pastures (approximately 340 acres/pasture). Each treatment was managed together within one pasture. To ensure that pasture did not become a source of variation in the experiment, cows were rotated every two weeks such that each group resided in each pasture before calving. Throughout the winter grazing period, the liquid-supplemented cows (those cows that received supplement before and after weaning, as well as those that received supplement only after weaning) continued to be provided with free access to the same supplement they received during the fall phase. The control cows were provided with a high-protein (40% crude protein; as-fed basis) hand-fed supplement in meal form fed at a rate to match the approximate intake of the liquid-supplemented cows. The ingredients of the hand-fed supplement were approximately 83.0% soybean meal, 13.7% rolled milo, 3.0% molasses, 0.2% trace mineral mix, and 10,215 IU/lb Vitamin A. The hand-fed supplement was bunk-fed 3 days per week (Monday, Wednesday, and Friday; prorated to deliver the designated daily quantity). Additional bromegrass hay was provided to cows on all treatments from February 10, 2003, to April 4, 2003, because of weather conditions and limited forage availability. The protein supplementation treatments were terminated upon calving, at which time the cows and their calves were removed from their respective supplementation treatments and handled similarly (provided with 12 lbs of alfalfa hay per cow daily). Pregnancy was confirmed by rectal palpation on October 31, 2003.

Result and Discussion

During the pre-weaning period, cows that received supplementation did not exhibit significantly different body weight (P=0.41; Table 1) or body condition (P=0.34; Table 2) changes than the cows that received no supplement. Likewise, the weight gain of the calves nursing fall-supplemented cows during this period was not different (P=0.83; Table 3) from that of calves of unsupplemented cows. During the period after weaning (October 15 to December 17), the cows receiving fall supplement tended (P=0.08) to gain more weight and more (P=0.03) body condition. Cumulative body weight (P=0.13) and body condition (P=0.06) gains tended to be greater for the cows receiving fall supplement during the entire fall period (August 14 to December 17). Before the start of the calving season (February 5), no significant differences in body weight or body condition score changes were observed between those cows that were provided with supplement before and after weaning and those that started receiving their supplement only after weaning. Furthermore, cumulative body weight and body condition changes of the cows were not significantly affected by the time of initiation of supplementation.

During the winter grazing period (December 17 to February 5), the control cows gained more weight and body condition (P<0.01) than the cows that had previously received fall supplementation. At calving, the control cows were heavier (P=0.03) and had greater (P=0.04) body condition scores than the fall-supplemented cows. This implies that the cows that did not have access to fall supplementation had the ability to compensate, at least in part, for their poorer nutritional status during the fall phase.

No effects of fall supplementation (P=0.39) were observed in calf birth weights (2003 calf crop). Calves produced by the control cows gained more weight (P<0.01) from birth until the start of the summer grazing season (May 2) than the cows receiving fall supplementation. In addition, calves produced by the control cows were heavier (P<0.01) at the start of the summer grazing season. The greater gains of calves produced by the control cows, when considered together with the tendency for the control cows to lose more weight (P=0.07) and body condition score (P=0.14) during the same period, suggest that the calves from the control cows may have benefited from increased milk production at the expense of maternal reserves.

No significant differences were observed between the supplementation treatments with regard to pregnancy rate (Table 3).

In conclusion, the provision of a self-fed liquid supplement to beef cows grazing poor-quality forage resulted in body weight and body condition gains during the period from weaning until the start of the winter grazing period. Those cows not receiving supplementation during the fall had the ability to compensate for their earlier nutritive status during the pre-calving period when they were suitably supplemented during the winter.

Table 1. Influence of Fall Liquid-Protein Supplementation on Beef Cow Body Weight (BW) Changes

	Treatment[a]				Statistical Comparisons (P-values[b])		
Item	Control	Pre+post-weaning	Post-weaning	SEM[c]	Pre-wean vs none	Pre+post vs Post	Control vs Pre+post and Post
No. of cows	45	39	38				
Initial BW, lb	1097	1094	1095	11			
Period BW changes, lb							
Aug 14-Oct 15	92	105	80	19	0.41	NA	NA
Oct 15-Dec 17	39	84	67	15	NA	0.47	0.08
Dec 17-Feb 5	89	16	37	13	NA	0.28	< 0.01
Feb 5-Calving	- 138	- 165	- 152	8	NA	0.30	0.07
Calving-May 2	- 97	- 69	- 76	10	NA	0.63	0.07
Cumulative BW changes, lb							
Aug 14-Dec 17	131	189	147	18	NA	0.15	0.13
Aug 14-Feb 5	220	205	184	13	NA	0.29	0.15
Aug 14-Calving	82	40	32	14	NA	0.69	0.03
Dec 17-Calving	- 49	- 149	- 115	18	NA	0.22	< 0.01
Aug 14-May 2	- 16	- 29	- 44	12	NA	0.40	0.18
Calving BW, lb[d]	1179	1134	1127	15	NA	0.75	0.03
May 2 BW, lb	1082	1065	1047	13	NA	0.35	0.11

[a]Treatment: Control = no fall supplementation; Pre + post-weaning = supplementation during the entire fall period; Post-weaning = supplementation beginning after calves were weaned on Oct. 15.

[b]NA = not applicable. Statistical comparison under consideration was not applicable to the designated period.

[c]SEM = standard error of the mean.

[d]Average calving date = mid March.

Table 2. Influence of Fall Liquid-Protein Supplementation on Beef Cow Body Condition Score (BCS[a])

	Treatment[b]				Statistical Comparisons (P-values[c])		
Item	Control	Pre+post-weaning	Post-weaning	SEM[d]	Pre-wean vs none	Pre+post vs Post	Control vs Pre+post and Post
No. of cows	45	39	38				
Initial BCS	4.76	4.80	4.74	0.04			
Period BCS changes							
Aug 14-Oct 15	0.27	0.37	0.16	0.13	0.34	NA	NA
Oct 15-Dec 17	- 0.10	0.18	0.24	0.10	NA	0.70	0.03
Dec 17-Feb 5	0.42	- 0.12	- 0.07	0.05	NA	0.56	< 0.01
Feb 5-Calving	- 0.36	- 0.39	- 0.42	0.07	NA	0.80	0.62
Calving-May 20	- 0.14	- 0.03	- 0.07	0.05	NA	0.59	0.14
Cumulative BCS changes							
Aug 14-Dec 17	0.17	0.55	0.39	0.11	NA	0.36	0.06
Aug 14-Feb 5	0.58	0.43	0.32	0.11	NA	0.48	0.16
Aug 14- Calving	0.22	0.05	- 0.10	0.08	NA	0.23	0.03
Dec 17-Calving	0.06	- 0.50	- 0.49	0.11	NA	0.92	< 0.01
Aug 14-May 2	0.09	0.02	- 0.13	0.09	NA	0.27	0.19
Calving BCS[e]	4.98	4.84	4.64	0.08	NA	0.13	0.04
May 2 BCS	4.85	4.81	4.58	0.08	NA	0.07	0.12

[a]Body condition score: 1 = emaciated; 9 = obese.

[b]Treatment: Control = no fall supplementation; Pre + post-weaning = supplementation during the entire fall period; Post-weaning = supplementation beginning after calves were weaned on Oct. 15.

[c]NA = not applicable. Statistical comparisons under consideration were not applicable to the designated period.

[d]SEM = standard error of the mean.

[e]Average calving date = mid March.

Table 3. Influence of Fall Liquid-Protein Supplementation on Calf Body Weight (BW) and Beef Cow Reproductive Performance

	Treatment[a]				Statistical Comparisons (P-values[b])		
Item	Control	Pre+post-weaning	Post-weaning	SEM[c]	Pre-wean vs none	Pre+post vs Post	Control vs Pre+post and Post
2002 Calf Crop							
No. of calves	45	39	38				
Initial BW, lb	406	393	401	3.7			
Pre-weaning BW gain, lb							
Aug 14-Oct 15	148.6	150.2	149.6	4.2	0.83	NA	NA
2003 Calf Crop							
Calf birth BW, lb	90.8	85.2	92.7	1.9	NA	0.02	0.39
Calf BW on May 2, lb	199.6	173.5	187.6	3.9	NA	0.04	< 0.01
Calf BW gain, birth-May 2, lb	108.2	88.4	94.6	2.3	NA	0.09	< 0.01
Reproductive Performance							
No. of cows	43	38	35				
Cows pregnant on Oct 31[d], %	98	95	100				

[a]Treatment: Control = no fall supplementation; Pre + post-weaning = supplementation during the entire fall period; Post-weaning = supplementation beginning after calves were weaned on Oct. 15.

[b]NA = not applicable. Statistical comparisons under consideration were not applicable to the designated period.

[c]SEM = standard error of the mean.

[d]Chi-Square, P=0.36.