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INFLUENCE OF LOW-LEVEL SUPPLEMENTATION WITH A HIGH-PROTEIN FEED ON PERFORMANCE OF BEEF COWS GRAZING TALLGRASS-PRAIRIE RANGE DURING THE FALL

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Summary

An experiment was conducted to evaluate the effect of hand feeding a limited quantity of a high-protein supplement during the fall grazing period on cow and calf performance. The time of initiation of supplementation was also evaluated. One-hundred thirty-six multiparous, pregnant, spring-calving cows grazing native range were assigned to supplementation treatments. Control cows received no fall supplementation. Supplemented cows received 0.14% of body weight per day (1.5 lbs per day) of a high-protein supplement (40% crude protein, as-fed basis) approximately 2 months before and after weaning (Aug 15 to Dec 14; weaning = Oct 15) or only after weaning (Oct 15 to Dec 14). Supplement was fed 3 days per week (Monday, Wednesday, and Friday) and was prorated to deliver the designated daily amount. All cows received 4 lbs per day of the same supplement during the winter (Dec 14 until calving in early March). Fall and cumulative winter performance (body condition score and body weight) indicated that providing a limited amount of a high-protein supplement during the fall supplementation period can increase cow body condition and body weight, and in some cases, subsequent calf performance. Fall supplementation did not significantly affect the proportion of cows cycling prior to the breeding season or subsequent pregnancy rate.

Introduction

Forage quality in most of the western United States declines during the late summer and fall and is quite low as the plants reach vegetative maturity. This is especially true in the tallgrass-prairie regions that are dominated by C4 grass species. Previous research at Kansas State University has demonstrated that cattle grazing low-quality tallgrass prairie respond very positively to supplementation with ruminally degradable protein (the protein available to rumen microbes) and that the greatest efficiency is achieved from the first increments of supplemental protein. The nutrient requirements of spring-calving cows are typically lowest during the fall and it has been demonstrated that the efficiency of metabolizable energy use to promote body condition gain is greater during late lactation than during the dry period. Together, these factors may provide a unique opportunity to realize efficient range cow weight and body condition gains prior to entering the winter grazing season. This could be important for the maintenance of reproduction in beef cows in poor body condition and also could moderate subsequent winter supplement dependency by building mobilizable reserves during a period when such reserves are established efficiently. Therefore, the objective of our study was to evaluate the impact of delivering limited quantities of a hand-fed, high-protein supplement during the fall grazing period on fall and subsequent winter beef cow performance. The provision of supplement prior to weaning versus after weaning was also evaluated to determine if performance differences existed due to the time of initiation of supplementation.

Experimental Procedures

An experiment was conducted from August 15, 2001 through the beginning of the 2002 summer grazing season that used 136 mature, pregnant, spring calving Hereford x Angus cows. The treatments were as follows: 1) control with no fall supplementation; 2) fall supplementation during the entire fall grazing period, both before and after weaning (August 15 to December 14); 3) fall supplementation beginning after weaning (October 15 to December 14). Initial body weights of the cows and calves and body condition scores of the cows (1 to 9 scale) were recorded on August 14, 2001 and repeated approximately every 60 days and within 48 hours of calving. Additional body weight and condition scores of the cows and calf weights (for the 2002 calf crop) were collected at the beginning of the summer grazing season. Treatments were randomly assigned to 12 fall pastures of tallgrass prairie with 3 replications per treatment. Four groupings of the treatment/fall pasture combinations were then assigned to one of four winter pastures of tallgrass prairie (each fall treatment was represented in each winter pasture). The cattle were stratified by body condition score and pair weight and assigned to one of the three fall supplementation treatments. The pastures varied in size from 60 to 100 acres; therefore, the randomization procedure was designed to allow a consistent number of cows across treatments and a stocking rate of approximately 7.5 acres per cow/calf pair.

All fall-supplemented cows received 0.14% of their average initial body weight per day (as-fed basis) in supplement during their designated supplementation period, and all treatment groups received 4 lbs/day of the same 40% crude protein supplement in meal form during the winter grazing period (December 15 to calving). The supplement used throughout the experiment was comprised of approximately 52% cottonseed meal, 30% soybean meal, 15% sunflower meal, 2.5% molasses, and 0.5% grease. All supplementation occurred 3 days per week (Monday, Wednesday, and Friday) and was prorated to deliver the designated daily amount. To ensure that only cows consumed the supplement fed during the period before weaning, calves were separated from their dams before bunk feeding the supplement. During the entire fall period, all cows were fed as groups in their respective pastures. On supplementation days during the winter period, cows within each of the four pastures were separated into their respective treatment groups and bunk fed their allotment of supplement. Adequate forage was available in all pastures during the course of the study, and the approximate quality of the forage available in those pastures was characterized. Five samples, randomly distributed throughout each of the experimental pastures, were collected in each time period (total samples = 160) utilizing 1.08 square foot frames (Table 1). A commercial mineral mix was provided free choice to all cattle throughout the experiment. To evaluate the effect of fall supplementation on subsequent reproductive performance, two blood samples were collected from the tail vein of each cow prior to the breeding season (May 10, 2002 and May 20, 2002) and assayed for progesterone levels to determine whether cows were cycling prior to the breeding season. Pregnancy was confirmed by rectal palpation on September 12, 2002.

Results and Discussion

Cows receiving supplement prior to weaning tended ($P=0.16$; Table 2) to increase in body condition a bit more than nonsupplemented cows. This observation was corroborated by a higher ($P=0.03$; Table 3) weight gain in that group. However, weight change in calves (Table 4) nursed by these cows during this period was not different ($P=0.33$) from the calves nursed by nonsupplemented cows. All cows lost body condition during the period after weaning (October 15 to December 14) even though weight gain was positive (due to growth in the products of conception).

Cows receiving fall supplementation lost less (P=0.02) body condition and gained more (P=0.02) weight than the control cows. Cumulative weight and body condition scores were affected as well. Weight and body condition change between the two supplemented groups was not significantly different during the period after weaning, which suggests that neither compensation nor adaptation (i.e., adaptation to having been supplemented previously) were important under these circumstances.

In contrast, at calving the cows receiving fall supplementation tended (P=0.12) to be only slightly heavier with no significant differences in body condition score when compared to the control cows. This suggests that the cows that were not supplemented during the fall exhibited some ability to compensate for the earlier nutritional restriction. No significant differences in calf birth weights were observed among the treatments for the 2002 calf crop. However, calves produced by cows that had received supplementation during the previous fall gained faster (P=0.03) than calves from control cows during the period from birth until the start of the summer grazing season (May 20). Likewise, calves from cows that had been supplemented both before and after weaning gained faster (P=0.02) than those calves whose dams only received supplement during the period after weaning. No significant differences were observed among treatments in either the proportion of cows that were cycling prior to the breeding season or in the number of cows that ultimately became pregnant.

In conclusion, feeding beef cattle a limited amount of a high-protein supplement during the fall period can elicit positive changes in body weight and body condition scores, particularly during the period after weaning. Similarly, this practice also may positively affect the performance of calves born to these dams. However, it also appears that cows that do not receive fall supplementation have some potential to compensate during the winter if they are appropriately supplemented during that period. It seems likely that low-level fall supplementation would have greatest applicability in cows that enter the fall grazing season in a compromised state of body condition.

Table 1. Forage Chemical Composition

	Nutrient[a]			
Item	Organic Matter	Crude Protein	Neutral Detergent Fiber	Acid Detergent Fiber
Tallgrass-prairie range	------------------------- % of the Dry Matter -------------------------			
September 25	89.3	5.48	68.4	46.5
December 10	89.7	3.45	74.0	52.4
February 28	90.5	3.33	74.4	53.7

[a]From analysis of hand clipped samples.

Table 2. Influence of Low-Level Fall Supplementation on Beef Cow Body Condition Scores

		Supplementation			Statistical Comparisons (P-values[b])		
Item	Control	Before and After Weaning	After Weaning Only	SEM[c]	Before Weaning vs None	Before and After vs After	Control vs Supplement
No. of cows	46	44	46				
Body condition score[a]							
Initial	4.77	4.76	4.76	0.018			
Change before weaning, Aug 14-Oct 15	0.42	0.51	0.31	0.075	0.16	NA	NA
Change after weaning, Oct 15-Dec 14	-0.44	-0.09	-0.11	0.089	NA	0.86	0.02
Cumulative changes							
Aug 14-Dec 14	-0.02	0.42	0.20	0.108	NA	0.19	0.04
Aug 14-Calving	-0.15	-0.01	-0.05	0.087	NA	0.75	0.30
Dec 15-Cavling	-0.14	-0.43	-0.25	0.103	NA	0.25	0.15
At calving[d]	4.60	4.75	4.70	0.086	NA	0.74	0.28

[a]Body condition score: 1 = emaciated; 9 = obese.
[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 = March 7, 2002.

Table 3. Influence of Low-Level Fall Supplementation on Beef Cow Body Weights

Item	Control	Supplementation: Before and After Weaning	Supplementation: After Weaning Only	SEM[b]	Statistical Comparisons (P-values[a]): Before Weaning vs None	Before and After vs After	Control vs Supplement
No. of cows	46	44	46				
Body weight, lb							
Initial	1078	1083	1083	6.1			
Change before weaning, Aug 14-Oct 15	98	115	86	6.8	0.03	NA	NA
Change after weaning, Oct 15-Dec 14	30	60	67	9.3	NA	0.63	0.02
Cumulative changes							
Aug 14-Dec 14	128	176	153	14.1	NA	0.30	0.08
Aug 14-Calving	7	32	18	6.3	NA	0.16	0.05
Dec 15-Cavling	-122	-143	-135	8.9	NA	0.52	0.16
At calving[d]	1087	1116	1100	8.9	NA	0.29	0.12

[aN]A = not applicable. Statistical comparison under consideration was not applicable to the designated period.
[b]SEM = standard error of the mean.
[c]Average calving date = March 7, 2002.

Table 4. Influence of Low-Level Fall Supplementation on Calf Body Weight and Cow Reproductive Performance

Item	Control	Supplementation: Before and After Weaning	Supplementation: After Weaning Only	SEM[c]	Statistical Comparisons (P-values[b]): Before Weaning vs None	Statistical Comparisons (P-values[b]): Before and After vs After	Statistical Comparisons (P-values[b]): Control vs Supplement
2001 Calf Crop							
No. of calves	46	44	46				
Initial weight, lb	406	405	409	6.8			
Weight gain before weaning, lb, Aug 14-Oct 15	133.0	141.8	137.8	4.9	0.33	NA	NA
2002 Calf Crop							
Calf birth weight, lb	90.4	90.4	88.2	1.3	NA	0.12	0.74
Calf weight on May 20, lb	233.7	247.0	235.9	2.8	NA	0.02	0.09
Calf weight gain, birth-May 20, lb	144.6	155.7	147.1	2.0	NA	0.02	0.03
Reproductive performance							
No. of cows	40	40	42				
Cows in estrous prior to May 20[c], %	85	87	93				
Cows pregnant on Sept 12[d], %	100	95	98				

[a]NA = not applicable. Statistical comparison under consideration was not applicable to the designated period.
[b]SEM = standard error of the mean.
[c]Chi-Square, P = 0.52.
[d]Chi-Square, P = 0.35.