Effect of Level of Cow Winter Nutrition and Calf Creep Feeding on Fall Calving System Productivity

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Story in Brief

A two-year study was conducted to identify effects of level of cow supplementation and creep feeding on cow and calf performance. One hundred and seven fall calving Angus and Hereford x Angus cows calved during September and October and grazed abundant tall grass prairie throughout the experiment. Treatments were initiated in early January, after the breeding season had ended, and continued through April. Pairs were assigned to one of four treatments based on calving date and calf gender. Treatments were: 1) 2 lb of 40% crude protein supplement with no creep feed; 2) 6 lb of 20% crude protein supplement with no creep feed; 3) 2 lb of 40% crude protein supplement with calves having ad libitum access to creep feed; and 4) 6 lb of 20% crude protein supplement with creep feed. Creep feeding calves did not influence cow weight or body condition score change during winter or spring. Cows fed the higher level of winter supplement lost slightly less weight during winter and gained slightly more weight during spring and early summer grazing. Creep feeding resulted in increased calf weight gain from January to April (91 and 69 pounds for calves nursing cows receiving the restricted and high level of winter supplement, respectively). Seventy nine percent of the additional weight gain from winter creep feeding was retained through weaning.

Key Words: Beef, Creep Feeding, Cow Performance, Fall Calving

Introduction

Fall calving beef production systems are frequently thought to be expensive from a winter supplementation standpoint. In Oklahoma, it is common for producers to provide hay and 5 to 7 pounds per day of 18 to 25% protein supplement to fall calving cows during winter. Considerable research suggests that feeding supplemental energy, beyond that provided by 3 to 4 lb of protein supplement, may slightly increase calf weight gains but does little to improve nutritional status and body condition of lactating cows (Lusby and Wettemann, 1988; Cox et al., 1989; Ovenell et al., 1989; 1990). This response suggests that milk production may be improved, although cow nutritional status is not. Furthermore, it may be more beneficial to creep feed the calf during winter than it is to feed higher levels of supplement to the cow. The objective of this experiment was to determine the influence of level of cow supplementation and creep feeding on cow and calf performance in a fall-calving beef production system in central Oklahoma.

Materials and Methods

Cattle and treatments. This study was conducted at the Range Cow Research Center located west of Stillwater, Oklahoma. Fifty-six and 51 multiparous, fall-calving Angus and Hereford x Angus cows (ages 3 to 13) were used in a 2 x 2 factorial design during yr 1 and yr 2, respectively. From calving (late August through mid-October) through the end of breeding (early Jan.), cows were managed as a single contemporary group and supplemented to achieve an average body condition score of 5.0 by the end of breeding. Cows were assigned to one of four treatments with two replications of each treatment; therefore eight pasture groups were used during each year. Treatments consisted of high and low winter cow nutrition, applied from the end of breeding through forage green-up (mid Apr.), and creep feeding of calves or no creep applied during the same period. The four high-cow nutrition groups received the equivalent of 6 lb/d of 20% protein cubes prorated for 4 d/wk feeding. The four low cow nutrition groups received 2 lb/d of 40% protein cubes prorated for 4 d/wk feeding. Creep feed contained 20% CP (DM basis) and included: 25% soybean meal, 25% cracked corn, 25% wheat middlings, 18% soybean hulls, 5% salt, and 1% calcium carbonate offered ad libitum.

Pastures and weighing conditions. Pastures consisted of abundant native tall grass prairie (predominately Indian Grass, Big Bluestem, and Little Bluestem) with a stocking rate of 10 ac per AUY. Cows remained on the same pasture unit year round. Hay was fed only during extreme inclement weather conditions. Treatment groups were rotated through the pastures every two wk to reduce the possibility of pasture effects on animal performance. Cows and calves were weighed and condition scored prior to the initiation of the study and at 28-d intervals through weaning. All weights were recorded after a 16-h removal from feed and water.

Economics. For the economic analysis, creep feed was valued at $160 per ton. The high-energy 20% range cube supplement fed to cows was also valued at $160 per ton, whereas the 40% high-protein supplement was priced at $225 per ton. Each additional pound of calf weight gain above the low cow nutrition, no creep group was assigned a value of $.55 /lb.

Milk production. Recent research indicates that milk yield increases with increased supplementation during late lactation (Okine et al., 1997). Increased milk production may not be economical if calves compensate during the spring and early summer grazing period. Therefore, a second experiment was conducted during late winter to determine if the two levels of cow supplementation altered milk production. Thirty-nine multiparous, Angus and Hereford x Angus fall-calving cows were allotted to one of two treatments: 2 lb/d of 40% CP supplement (Low), and 6 lb/d of 20% CP supplement (High). Cows were managed as a single contemporary group prior to the experiment. Milk production was measured on d 0 and 22 using the following weigh-suckle-weigh technique: 12 hours prior to the weigh-suckle-weigh calves were separated from their dams. At approximately 0600 h, cows were nursed until dry then separated from their calves. At 1200 h, calves were weighed and immediately allowed to nurse until the cow was dry. When the calf quit nursing, calves were weighed again. The difference in the pre- and post-nursing weights was considered to be the dam's milk production. Calves remained separated until approximately 1800 h when the same procedure was repeated. Cows were arranged from high to low milk production using the d 0 estimates and randomly assigned to treatment in groups of two. This was done to insure similar milk production potential for both treatment groups. Beginning on d 1, cows were individually fed 10.5 (High) or 3.5 lbs (Low) of their respective supplement on Monday, Wednesday, Friday and Saturday for the first 14 d of adaptation, followed by 7 d of daily feeding (6 lbs to High cows and 2 lbs to Low cows).

Statistics. For Exp. 1, data were analyzed using two-way analysis of variance with cow nutrition treatment, calf creep treatment, cow age, year, and all significant interactions as sources of variation. Milk production data (Exp. 2) were analyzed using only supplement treatment in the model.

Results and Discussion

The first year of the study was conducted during a mild winter compared to weather conditions during yr 2. From January 7 through April 14, 2000, ambient temperature dropped below 20°F on 6 different days and a minimum of .5" precipitation occurred on 29 d. During the same time period in 2001, ambient temperature dropped below 20°F on 26 different days and a minimum of .5" precipitation occurred on 25 d. Hay feeding was not required during the treatment period in 2000 while hay was fed on 10 d in 2001. Standing, dormant native forage was abundant at all times during both years. The second year, forage availability was measured and averaged 3,250 lbs per acre in January and 2,500 lbs per acre in April.

The high level of cow supplementation tended ($P=.07$) to reduce cow weight loss and BCS loss ($P<.05$) during the treatment period (Table 1). Interestingly, the high level of cow winter supplement slightly increased ($P<.05$) cow weight gain during early summer, compared to cows receiving the low level of winter supplement. As a result, overall cow weight gain from January through July was greater ($P<.05$) for cows receiving the high level of winter supplement. Similarly, overall (January though April) body condition score gain was greater ($P < .05$) for cows receiving the high level of winter supplement. Creep feeding the calves had no significant effect on cow weight change or body condition change during either period.

Both creep feeding and the high level of winter cow supplementation resulted in increased ($P<.05$) calf weight gain during the treatment period (Table 1). In fact, creep feeding resulted in 91 lbs of additional calf weight gain when cows were fed the low level of winter supplement, compared to 69 lbs of additional weight gain when cows were fed the high level of winter supplement (cow nutrition by creep feeding interaction $P<.05$). During the early summer grazing period, calves that had previously been fed creep gained 7% less weight compared to calves that had not been fed creep during winter ($P<.05$). Therefore, during spring and early summer grazing, non-creep fed calves did not fully compensate for lower winter weight gain. As a result, total weight gain from January through July was 18% greater ($P<.05$) for creep fed calves and 79% of the weight gain due to creep feeding in the winter was maintained through weaning in July.

When calves were not creep fed, the high level of cow supplementation increased ($P<.05$) calf weight gain through April and tended ($P=.13$) to increase total calf weight gain from January through July.

Creep fed calves nursing cows receiving the restricted supplementation treatment had significantly greater (0.7 lb/hd/day; $P<.03$) creep intake. This resulted in a 32% improvement in conversion of creep feed to calf weight gain compared to calves nursing cows receiving the high level of winter supplement. Creep intake was greater ($P<.01$) during the second year of the experiment, presumably due to more severe weather conditions compared to the first year. Cow nutrition level had no effect on calf weight at weaning.

Table 1. Effects of cow supplement and creep feed on cow and calf performance						
	Low supplement		High supplement			
Item	No creep	Creep	No creep	Creep	SEM	P[a]
Number of cow/calf pairs	27	27	26	27	--	--
Initial cow weight, lbs	1151	1135	1142	1141	23	
Initial cow body condition score	4.9	5.1	4.9	4.9	.3	
Cow weight change, lbs						
Jan to Apr	-101	-112	-97	-88	8	
Apr to July	240	242	248	267	9	CN
Jan to July	138	129	150	179	10	CN, X
Cow condition score change						
Jan to Apr	-.69	-.82	-.55	-.39	.08	CN
Apr to July	1.51	1.32	1.41	1.34	.11	--
Jan to July	.81	.50	.86	.96	.11	CN
Calf weight change (lb)						
Jan to Apr	99	190	128	197	5	CR, CN, X
Apr to July	240	214	229	221	7	CR
Jan to July	339	404	357	418	9	CR
Creep feed and supplement						
Average daily creep intake (lb)		4.3		3.6	.1	CN
Lb of creep feed per lb added gain through April[b]		4.7		5.2	.3	--
Lb of creep feed per lb added gain through July[b]		6.8		7.1	.7	--
Weaning weight	621	697	641	702	13	CR

[a]CR=Calf creep effect (P<.05), CN=Cow nutrition effect (P<.05), X=Treatment interaction (P<.05)

[b]Calculated by using the additional ADG due to creep / creep feed intake.

The second experiment was conducted to quantify differences in actual milk production. Overall, milk production was low in these fall-calving cows, averaging only 8.5 lbs per day. This was likely due to the stage of lactation, low-quality forage during late-winter, and thin body condition of the cows (BCS = 4.0 ± 0.2). Nevertheless, the restricted cow supplementation treatment resulted in a 22% decline (P=.09) in milk production.

Table 2 contains the supplement costs for each of the four treatment groups as well as the added weaning weight that was available for sale in July. The low cow nutrition, no creep group was used as the control group to which each of the other treatments were compared. Using this approach, the value of added weaning weight was less than the additional feed cost for high cow nutrition, no creep, and for high-cow nutrition with creep. Only the low level of cow nutrition with creep treatment produced enough pounds of additional weaning weight to offset the additional feed costs. It should be recognized that this simple evaluation does not include the added cost of equipment and labor associated with creep feeding.

Table 2. Cost of cow supplements and creep feed vs value of added weaning weight ($ per head)				
	Low supplement		High supplement	
Item	No creep	Creep	No creep	Creep

Cow supplement cost	22.15	22.15	47.04	47.04
Calf creep cost	--	33.01	--	28.07
Total treatment cost	22.15	55.16	47.04	75.11
Cost above LN[a]	--	33.01	24.89	52.96
Added weaning wt	--	65.3	18.3	79.0
Value added gain	--	35.92	10.07	43.45
Addition net return	--	+2.91	-14.82	-9.21
[a]Low supplement, no creep treatment				

Implications

Creep feeding during late winter does not influence fall-calving cow body condition score or weight change and therefore cannot be relied upon to reduce nutritional stress of fall-calving beef cows during this time. Higher levels of cow supplementation increase milk production and slightly reduce cow weight and body condition loss during the winter. Creep feeding fall-born calves during late winter dramatically increases calf weight by spring and when creep feeding is discontinued in the spring, a high percentage of the added weight gain is maintained through weaning in July. Additionally, conversion of creep feed to calf weaning weight is more efficient when the cow receives a lower level of winter supplement. Diverting a portion of the winter supplement from the fall-calving cow to the calf appears to be more economical than feeding the cow to meet nutritional requirements.

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Acknowledgements

The authors thank Mark Anderson, Randy Jones, Joe Steele, and Duane Williams at the Range Cow Research Center.
