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Effect of Gestation and Supplementation on Intake of Low-Quality Forage

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Summary

Eighteen spring-calving heifers were paired by expected calving date and assigned to treatment. Treatments were a high undegradable intake protein supplement (CON) or one based on dry corn gluten feed (TRT). Heifers were fed to consume low-quality hay ad libitum. Supplement type did not affect body condition, milk production, or calf ADG. TRT heifers lost less weight than CON heifers. There was no effect of supplement on forage intake. Intake changed cubically with respect to calving; decreasing 17% during the three weeks prior to calving, and increasing 18% the week after calving.

Introduction

Pre-partum nutrition has proven to be an important determinant of subsequent reproductive performance, calf health and performance and overall ranch profitability. Many spring-calving herds rely heavily on low-quality forages to meet the nutritional needs of cows and heifers. However, often these forages are of low enough quality that passage rate is slowed, resulting in reduced intake. Some research has indicated that advancing gestation may inhibit intake immediately prior to calving, as fetal development exerts a physical limitation. In addition to reduced capacity to accommodate large volumes of forage, changes in hormonal profile occurring before parturition may inhibit intake as well. The net result is low intake of a low-quality feed at a time when nutrient requirements are increasing.

Gestating heifers are particularly at risk due to their reduced capacity to consume bulky feeds and their higher nutrient requirements relative to mature cows. Gestating heifers grazing native range in the Nebraska Sandhills consumed only 1.3% of BW (2001 Nebraska Beef Report, pp. 19-22), which translates into a negative energy balance during late gestation. Providing a non-bulky, energy-dense supplement late in gestation may improve female performance by correcting energy deficiencies that occur as a result of intake depression.

The objective of this trial was to examine the effect of gestation on intake of low-quality forage and to compare the effect of two supplements on intake, BCS, weight change, and milk production.

Procedure

The study was conducted at the Gudmundsen Sandhills Laboratory near Whitman, NE. Eighteen spring-calving heifers (894.8 $\pm$ 71.0) were paired by expected calving dates and assigned to one of two treatments. Treatments (Table 1) included an undegradable intake protein (UIP) supplement (CON; n = 4), and a dry corn gluten feed-based supplement (TRT; n = 5). Grass hay was fed for ad libitum consumption. Refusals were weighed weekly, with hay and ort samples collected at that time for DM analysis. Upland (3.8% CP, 48% TDN) and meadow (9.1% CP, 58% TDN) hays were ground with a bale processor and combined such that the quality of forage offered was similar to what would commonly be available through standing winter range (1997 Nebraska Beef Report, pp. 3-6). Both supplements were formulated to meet metabolizable protein (MP) and energy requirements (2000 Nebraska Beef Report, pp. 7-10). The supplements used and the feeding schedule of each were based on a previous study (2003 Nebraska Beef Report, pp. 5-8) in which the CON supplement was used to meet metabolizable protein requirements, while the TRT supplement was designed to meet energy demands as well as protein requirements. In general, the amount of each increased as gestation advanced, however the TRT supplement was increased to a larger extent (Table 1).

The trial began December 18 and concluded May 7, with weights and body condition scores (BCS) recorded on two consecutive days at those times. Heifers were weighed and assigned BCS every 28 days throughout the study, with data taken in the morning before

Table 1. Composition and feeding schedule of treatment supplements.

Item	Treatment CON	Treatment TRT
Ingredient, % DM		
Dry gluten feed	—	72.00
Feather meal	40.00	—
Sunflower meal	30.00	22.40
Wheat middlings	26.25	—
Molasses	2.50	2.50
Bentonite	—	2.50
Salt	1.00	—
Starch	—	0.25
Fat	—	0.25
Vitamin premix	0.26	0.05
Trace mineral premix	—	0.05
Feeding schedule, lb/day		
January	1.0	3.6
February 1 to 14	1.1	5.1
February 15 to calving	1.6	6.8

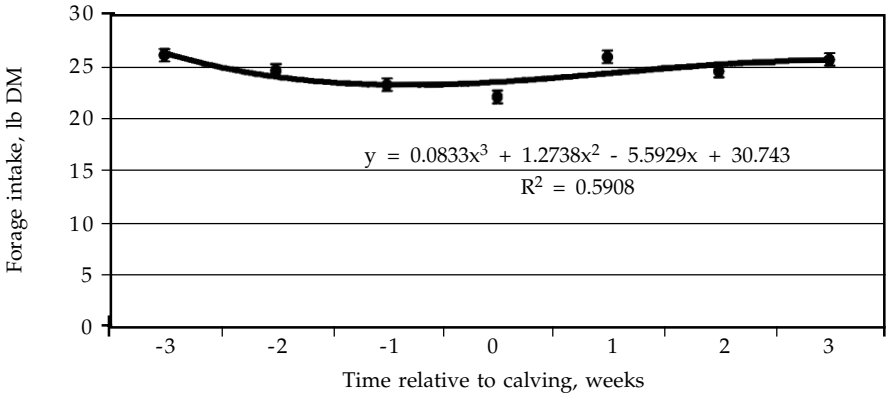

Figure 1. Change in voluntary forage intake three weeks before and after calving. Week 0 represents the week both heifers in the pen calved. Intake changed cubically (P = 0.03) over time.

feeding. Milk production was measured in May using a 12-hour weigh-suckle-weigh. Briefly, calves were sorted for approximately eight hours, commingled and allowed to nurse, then re-sorted for approximately 12 hours. Calves were then weighed, allowed to nurse, and re-weighed. The difference in the two weights was assumed to be from milk intake. Calf birth weights and ADG from birth to the conclusion of the trial were recorded.

In the intake analysis, time zero represents the last intake measured before the second heifer in each pen had calved. Times (1, 2, etc.) represent weeks relative to calving, with negative numbers representing weeks prior to calving and positive numbers after calving. A pen remained on the treatment supplement and experimental hay mixture until both heifers had calved, at which time all heifers were fed a common supplement and ad libitum meadow hay.

Results

Voluntary forage intake was not affected by treatment, and no time by treatment interaction was detected. Previous data have shown that supplementing at high levels can reduce voluntary forage intake, although studies showing this effect have not been conducted with heifers in late gestation. A substitution effect was not observed in this study, even with TRT supplement fed as high as 6.8 lb per day. If heifers in late gestation are eating to meet the high energy demands associated with rapid fetal development but are limited by physical fill, it appears supplements can be fed at a high level without reducing forage intake.

Forage intake changed cubically ($P < 0.03$) during a seven-week period around calving (Figure 1). Maximum DM intake for the entire trial (26.3 lb) occurred three weeks prior to calving, and was 17% lower (21.9 lb) at calving. By the week after calving, intake had returned to 25.7 lb, an 18% increase.

Total DM intake differed ($P < 0.01$) by treatment before calving (Figure 2). Relative to CON, TRT heifers averaged 17% higher DM intakes during the five-week period prior to calving. This is attributable to the fact that TRT heifers received 5.2 lb more supplement than CON heifers, without a concomitant reduction in forage intake. Few data are available that report intakes during this stage of production. Forage and heifer descriptors were used in the NRC (1996) Nutrient Requirements of Beef Cattle model to compare predicted vs observed intakes. The model under-predicted total DM intake for all heifers, with predicted total intake similar to observed forage intake. Total intake for CON heifers was 4 to 5% higher than predicted. Because TRT heifers were fed higher levels of supplement, there was a larger under-prediction (25%) of total DM intake.

Average calving date was March 19. Heifers calved within six days of their pen mates with one exception, in which the pair calved 14 days apart. The average number of days between heifers within a pen was 2.1 days. The pen with the two-week lag between heifers showed a nearly level intake pattern through-

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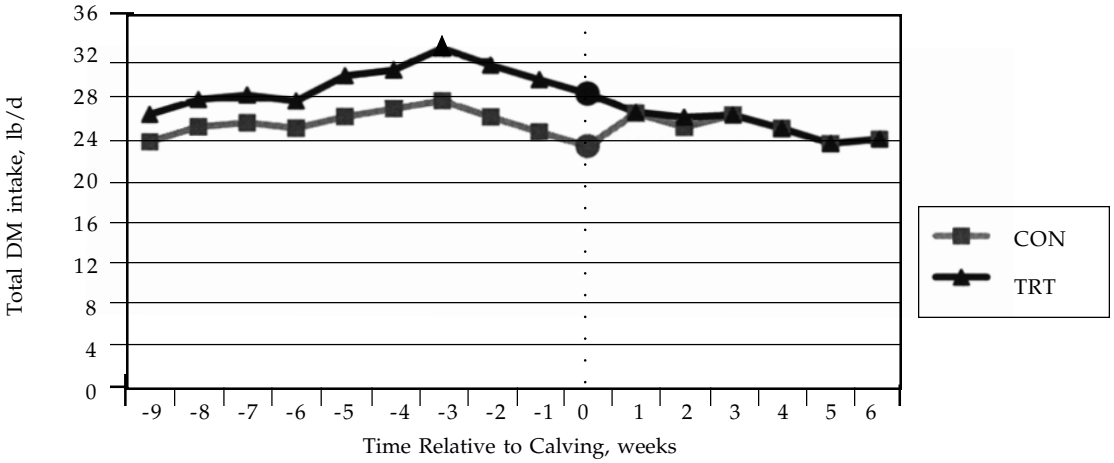

Figure 2. Effect of supplement on total dry matter intake over time. 'CON' = undegradable intake protein supplement; 'TRT' = dry corn gluten feed-based supplement. Values within a week differed (P < 0.05) between treatments from -8 to 0 weeks.

out, likely due to the increased intake during lactation of one heifer, masking the decreased intake during late gestation of the other.

Heifers weighed 895 lb in January and did not differ by treatment. By May, CON heifers had lost 54 lb, compared to three lb for TRT (P = 0.02). The lack of differences in forage intake suggests that weight differences were not due to treatment effects on rumen fill. Average BCS was 5.2 in January and 5.0 in May and was not affected by treatment. Weight and BCS data appear to disagree, although more animals may be necessary to detect treatment effects on body condition. While no difference was observed in condition, the difference in weight change may suggest that supplementing a high-energy feed in a non-bulky form allowed TRT heifers to maintain energy balance. With a loss of over 50 lb, heifers in the CON group appear to have been in a negative energy balance entering the breeding season. A larger number of animals is necessary to measure differences in reproductive performance that could result from treatments applied during gestation.

Some producers express concern that feeding higher levels of energy in late gestation may lead to heavier birth weights and an increased incidence of dystocia. Average birth weight in this trial was 78.7 lb, and was not affected by treatment. Two heifers from each treatment were assisted at calving. Average milk intake by calves nursing CON heifers was 14.0 lb, and 10.8 lb for TRT (P = 0.12). Calf weight in May (167.7 lb) and calf ADG from birth to May (1.79 lb/day) were not affected by treatment.

In conclusion, voluntary forage intake by bred heifers changed cubically with respect to calving. Intake declined prior to calving and increased rapidly after calving. Feeding a high level of a supplement high in digestible fiber did not reduce forage intake, did not affect birth weights or calf performance and decreased cow weight loss.

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