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Supplementing Beef Cows Grazing Cornstalk Residue with a Distillers Based Cube

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Summary

A 4-year study is being conducted to determine the effect of excess undegradable intake protein supplementation using a cube that is 2/3 dried distillers grains (DDG) to beef cows in late gestation on cow and calf performance and the performance of heifer calves whose dams were supplemented with protein. Feeding a supplement containing DDG did not influence calf birth and weaning weights, cow body weight prior to calving, and calving interval. Cow body condition score and percentage of cows cyclic prior to breeding increased for supplemented cows.

Introduction

Profitability for cow/calf producers is driven by reproduction. Beef cow reproductive performance is directly related to body condition. The greatest cost to cow/calf enterprises is the feeding of stored feeds through winter months. Wintering cows on cornstalk residue is a common practice for cow/calf producers in Nebraska and across the corn-belt region. As the ethanol industry expands, the availability of dried distillers grains (DDG) will become more accessible for cow/calf producers. Dried distillers grains are an excellent protein and energy source; therefore, they can be used as a supplement when grazing medium to low-quality forages.

Supplementing protein during the last trimester may impact the cow's female offspring by altering development of the reproductive axis, growth and development of the fetus, and subsequent performance of the female offspring. The objectives of our study are to assess the effects of supplementing undegradable intake protein (UIP) to beef cows while grazing cornstalk residue on cow and calf performance and fetal programming.

Procedure

Multiparous, crossbred, spring-calving beef cows are being used in a 4-year experiment conducted at the University of Nebraska–Lincoln, Dalbey-Halleck Research Unit near Virginia, Neb. In each year, cows are blocked by age, BCS, weight and calving interval and assigned randomly to one of two treatments: supplemented (SUPP; n = 247) with protein (25% CP, 7.10% fat) in the form of a range cube that was approximately 2/3 DDG while grazing cornstalk residue during the last trimester of pregnancy, or not supplemented (CON; n = 247) during the last trimester while grazing cornstalk residue.

Changes in body weight and body condition score (BCS) are used as predictors of nutritional status and are recorded three times annually: October, February, and May (weaning/stalks initial weight; off stalks weight/pre-calving; and pre-breeding, respectfully). Body condition scores are assigned independently by two technicians each time the cows are weighed. Cows are weighed once, without restriction of feed or water, in October, and 2-day weights and BCS are collected in February when cows are removed from the residue fields. Weights and BCS are recorded 10 days apart in May prior to the initiation of the breeding season. Calving season begins approximately the first of March and weaning occurs in mid-October of each year. Calf birth weights are recorded within 24 hours of parturition. Calf weaning weights are evaluated on an adjusted weight basis using to BIF guidelines. Cows are exposed to fertile bulls for a 62-day breeding season beginning approximately May 23 of each year. Pregnancy is diagnosed via rectal palpation approximately 60-days after the end of the breeding season.

Corn ear-drop is estimated prior to grazing in two 178 acre, irrigated cornstalk residue fields located on the same section of land near Pickerell, Neb. An equation developed by Wilson, et al., (*2004 Nebraska Beef Report*, pp. 13-15) is used to determine residue grazing days. SUPP cows receive on average 2.2 lb/cow supplement daily on a DM basis three times per week throughout the supplementation period until the start of the calving season. After calving begins, the two treatment groups are combined and managed as a single group on dormant pasture and fed a base diet consisting of smooth bromegrass and alfalfa hay.

Heifers are developed in a pasture then in a dry-lot from October to the end of May each year. An initial and final BCS are recorded and BW are collected 14 days apart until the beginning of the breeding season. Heifers are fed smooth bromegrass hay ad libitum and fed DDG at a rate of 0.6% BW on a DM basis. Diets are adjusted monthly to target an ADG of 1.3 lb/heifer.

Blood samples are drawn from cows 10 days apart immediately before the start of the breeding season to determine serum progesterone concentrations to assess ovarian luteal activity. Blood samples are drawn 14 days apart beginning in December (year 1) and January (year 2) to determine when heifers became pubertal. Serum progesterone concentrations were determined by radioimmunoassay. Serum progesterone concentrations $\geq$ 1 ng/mL are used to determine if a cow has resumed ovarian luteal activity or a heifer has become pubertal.

Estrus in heifers is synchronized using two injections of prostaglandin $F_{2\alpha}$ (PGF) administered 14-days apart with an 18 gauge, 1.5 inch needle. Estrus detection is performed for 5

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days following the second PGF injection, and heifers observed in estrus are bred by artificial insemination (AI) approximately 12 hours later. Heifers are then exposed to fertile bulls for approximately 45 days while grazing pastures beginning 10 days after the final AI on May 27 (year 1) and May 23 (year 2). Conception rates to AI are determined via transrectal ultrasonography approximately 45 days after the final AI on July 18 (year 1) and July 6 (year 2). A second ultrasound 45 days following removal of bulls is performed to determine final pregnancy rates.

Performance data and age at puberty were analyzed using PROC MIXED of SAS. Percentage of heifers reaching puberty, estrous synchronization response, conception rate to AI, pregnancy rates, and percentage of cows cyclic prior to the initiation of the breeding season were analyzed using Chi-square procedures in PROC GENMOD of SAS. Carryover effects from the previous year's treatment were analyzed as a covariate in multi-year analyses.

Results

Cornstalk residue grazing periods averaged 89 days while supplementation periods averaged 108 days and ear drop averaged 1.1 bu/ac. Cow performance and body condition data are presented in Table 1. No carryover effects from year 1 to year 2 were noted. There was no difference between groups in BW in October, February, and May and no significant change in BW from pre-calving to pre-breeding. However, SUPP cows gained more weight during the cornstalk grazing period than CON cows (63 lb vs. 51 lb, respectively). From the end of cornstalk grazing until prior to the start of the breeding season, both groups lost a similar amount of BW.

Initial BCS in October was similar between groups. Body condition scores were different in February (end of cornstalk grazing) and in May (prior to the breeding season) and were greater ($P = 0.001$) for SUPP

Table 1. Performance of cows that were either supplemented or not supplemented with a distillers grains based cube in late gestation while grazing corn stalk residue.

	SUPP[a]	CON[b]	*P*-value
Oct. Wt, lb	1279	1282	0.81
Feb. Wt, lb	1342	1333	0.41
May Wt, lb	1258	1236	0.16
Change in Wt, Oct. - Feb., lb	63	51	0.008
Change in Wt, Feb. - May, lb	-96	-97	0.95
BCS, Oct.	5.5	5.5	0.59
BCS, Feb.	5.8	5.5	0.001
BCS, May	5.6	5.4	0.001
Change in BCS, Oct. - Feb.	0.3	0.0	0.001
Change in BCS, Feb. - May	-0.1	-0.2	0.30
Cows cyclic prior to breeding[c], %	84.5	76.0	0.06
Cow pregnancy rate	92.0	95.0	0.28
Calving interval	365	365	0.70
Calf birth wt, lb	87	87	0.83
Calf weaning wt, lb[d]	547	548	0.86

[a]Cows receiving protein supplement during the final trimester.
[b]Cows not receiving protein supplement during the final trimester.
[c]Percentage of cows that had resumed ovarian activity prior to the breeding season.
[d]Calf weaning weight adjusted for age of dam, age of calf, and calf sex.

Table 2. Performance of heifers whose dams were either supplemented or not supplemented in late gestation[a].

	Year 1		Year 2		Year
	SUPP[b]	CON[c]	SUPP[b]	CON[c]	*P*-value
Initial wt, lb	573	577	569	579	0.83
Final wt, lb	816	817	771	773	0.001
Initial BCS	5.4	5.4	5.6	5.6	0.001
Final BCS	5.7	5.7	5.4	5.4	0.001
ADG[d], lb	1.27	1.28	0.89	0.86	0.01

[a]Treatment means are presented by year due to a year effect for final weight, initial BCS, final BCS and ADG.
[b]Heifers from dams receiving protein supplement during the final trimester.
[c]Heifers from dams not receiving protein supplement during the final trimester.
[d]Calculated ADG from weaning to breeding.

Table 3. Reproductive performance of heifers whose dams were either supplemented or not supplemented in late gestation.

	SUPP[a]	CON[b]	P-value
Age at puberty, day	315	326	0.08
Estrus response[c], %	85.0	84.2	0.88
Time of estrus, hours[d]	67.7	69.2	0.66
AI conception rate[f], %			
Year 1	65.4	50.0	0.29
Year 2	72.0	85.7	0.22
AI pregnancy rate[g], %			
Year 1	56.7	37.0	0.14
Year 2	60.0	80.0	0.09
Overall pregnancy rate[eh], %	86.7	85.2	0.87

[a]Heifers from dams receiving protein supplement during final trimester.
[b]Heifers from dams not receiving protein supplement during final trimester.
[c]Percentage of heifers detected in estrus within 5 days following second PGF injection.
[d]Time elapsed between second PGF injection and observed standing estrus.
[e]Data presented for year 1 only.
[f]Proportion of heifers detected in estrus that conceived to AI service.
[g]Percentage of total group of heifers that conceived to AI service.
[h]Percentage of total group of heifers that became pregnant.

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compared to CON cows. The magnitude of these changes in BCS likely have limited biological significance, especially when BCS is greater than 5.0 at all dates it was recorded. Calf birth and adjusted weaning weights were not influenced by dam supplementation strategy. Percentage of cows pregnant was not different for SUPP or CON cows. Calving interval was similar between groups; however, percentage of cows cyclic prior to breeding tended ($P = 0.06$) to be greater for SUPP cows compared to CON cows. Calving interval between the treatment groups is similar because the breeding season begins at a fixed date each year. The restricted breeding season does not allow cows that become cyclic early the opportunity to rebreed.

Heifer performance is reported in Table 2. Analyses indicate a significant year effect. Heifers from SUPP and CON dams did not differ in initial weight. Final weight, initial BCS, final BCS, and ADG did not differ between SUPP and CON heifers within year. Final weight, initial BCS, final BCS, and ADG were greater in year 1 than year 2. The lighter final weights and lower ADG in year 2 were likely due to the lower ambient temperature and greater precipitation during the winter feeding period in 2007 compared to 2006.

Heifer reproductive performance is presented in Table 3. Age at puberty tended to be lower ($P = 0.08$) for heifers from SUPP vs. CON dams. There was no difference in percentage responding to synchronization or the hours from the last PGF injection to estrus. In year 1, there was a tendency ($P = 0.14$) for heifers from SUPP dams to have a higher AI pregnancy rate. In year 2, heifers from CON dams tended ($P = 0.09$) to have a higher AI pregnancy rate. AI conception rate and overall pregnancy rate did not differ between treatments in either year.

Conclusions

Based on the first two years of this study, incorporating DDG in supplement for cows grazing cornstalk residue in their final trimester tends to increase the percentage of cows cycling prior to the start of the breeding season. More research is needed to determine the effect of supplementation during late gestation on the reproductive performance of the resulting heifer calves.

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