# Supplementing Gestating Beef Cows Grazing Cornstalk Residue

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**Summary**

*A 5-year study evaluated the effects of protein supplementation to beef cows grazing cornstalks in late gestation on both cow and calf weight, and the reproductive performance of heifer progeny. Supplementation improved cow BCS at the end of cornstalk grazing. Calf weight, cow pregnancy rates, and reproductive traits of subsequent heifer progeny were not impacted by supplementation. Supplementing mid- to late-gestation beef cows grazing cornstalks has minimal impact on cow performance or fetal programming of heifer progeny.*

## Introduction

Corn residue CP levels are reported from 3.3 to 5.5%, which does not meet the requirements of a mid- to late-gestation beef female. Supplementation may be necessary when grazing low-quality forages. Prior research suggests supplementation of the dam during late gestation impacts fetal development and subsequent reproductive efficiency of the female progeny (*2006 Nebraska Beef Cattle Report*, p. 10). Therefore, the objectives of this study were to evaluate the effects of supplementing cows grazing cornstalk residue in late gestation on both cow and calf performance and the reproductive performance of heifer progeny.

## Procedure

*Cow and Calf Management*

Multiparous, crossbred (Simmental x Angus), spring-calving beef cows (n = 832) were used in a 5-year experiment conducted at the University of Nebraska–Lincoln (UNL), Dalbey-Halleck Research Unit near Virginia, Neb. Cows were blocked annually by age, BCS, BW, and calving date and assigned randomly to one of two treatments: 1) supplemented (SUPP) with protein/energy via a range cube (Table 1) that was two-third dried distillers grains (DDG) while grazing cornstalk residue during the last trimester of pregnancy, or 2) not supplemented (CON). Data are reported as pooled across all years for 2005 (158 head), 2006 (165 head), 2007 (172 head), 2008 (166 head), and 2009 (171 head).

Changes in BW and BCS were used as predictors of nutritional status and recorded three times annually: October, February, and May (months represent weaning/stalks initial weight; off-stalks weight/pre-calving; and pre-breeding, respectively). BCS was assigned independently by two technicians and averaged. Cows were weighed once, without restriction of feed or water, in October, and 2-day weights and BCS were collected in February. BW and BCS were recorded 10 days apart in May prior to breeding.

Corn eardrop was estimated in each field prior to grazing in two 178 acre, irrigated corn fields located on the same section of land near Pickerell, Neb. Eardrop was similar for each field each year and averaged 1.0 bu/ac. An equation (*2004 Nebraska Beef Cattle Report*, p. 13) was used to determine grazing days and the amount of supplement fed. SUPP cows began receiving supplement 20 days after the start of grazing (Nov. 1), and cows were fed 2.2 lb/head/day (DM) on average for the entire period.

(Continued on next page)

**Table 1. Dried distillers grains cube ingredients and nutrient composition.**

| Item | Year 1[a] | Years 2 and 3[b] | Year 4[c] | Year 5[d] |
|---|---|---|---|---|
| Dried distillers grains, % | 65.0 | 65.0 | 65.0 | 65.0 |
| Field peas, % | — | 22.5 | 15.5 | — |
| Wheat midds, % | 16.5 | 5.5 | 12.5 | 13.0 |
| Malt sprouts, % | — | — | — | 15.0 |
| Non-fat dried milk, % | 11.4 | — | — | — |
| Molasses, % | 3.6 | 5.0 | 5.0 | 5.0 |
| Calcium carbonate, % | 2.0 | 2.0 | 2.0 | 2.0 |
| Lignin sulfonate, % | 1.5 | — | — | — |
| Nutrient composition[e] | | | | |
| Crude Protein, % | 25.0 | 24.1 | 23.5 | 24.5 |
| Crude Fat, % | 7.1 | 6.7 | 7.0 | 7.5 |
| Crude Fiber, % | 9.0 | 7.2 | 6.5 | 7.82 |
| Calcium, % | 1.00 | 0.98 | 0.97 | 0.97 |
| Phosphorus, % | 0.75 | 0.66 | 0.69 | 0.73 |
| Potassium, % | 0.80 | 0.82 | 0.82 | 0.71 |

[a]Supplemented for the 2004-2005 grazing period.
[b]Supplemented for the 2005-2006 and 2006-2007 grazing period periods, respectively.
[c]Supplemented for the 2007-2008 cornstalk grazing period.
[d]Supplemented for the 2008-2009 cornstalk grazing period.
[e]% of DM.

Cows were supplemented three times per week until the end of stalk grazing (Feb. 1). After cornstalks, groups were managed separately until the start of calving (March 1), at which time they were combined and managed together on dormant pasture and fed a diet of smooth bromegrass and alfalfa hay. Cows and calves grazed cool- and warm-season pastures from approximately April 15 to Oct. 15 (weaning).

Blood samples were drawn twice 10 days apart immediately before breeding to determine cyclicity status. Serum progesterone ($P_4$) concentrations $\geq$ 1 ng/ml were used to establish if a cow had resumed normal estrous cycles. Cows were exposed to Simmental x Angus bulls at a bull:cow ratio of 1:25 for 60 days beginning May 23. Pregnancy was diagnosed via rectal palpation 90 days after bull removal.

**Table 2. Effects of late gestation supplementation on cow and calf performance.**

| | Treatment | | | |
|---|---|---|---|---|
| Item | SUPP[a] | CON[b] | SEM | *P*-Value |
| Oct. BW, lb | 1263 | 1265 | 23.5 | 0.79 |
| Feb. BW, lb | 1351 | 1327 | 16.5 | 0.19 |
| May BW, lb | 1247 | 1243 | 9.7 | 0.75 |
| Change in BW, Oct.-Feb., lb | 89 | 62 | 15.0 | 0.20 |
| Change in BW, Feb.-May, lb | -112 | -81 | 12.3 | 0.14 |
| BCS, Oct. | 5.4 | 5.4 | 0.09 | 0.89 |
| BCS, Feb. | 5.6[d] | 5.4[e] | 0.08 | 0.02 |
| BCS, May | 5.4 | 5.3 | 0.07 | 0.32 |
| Change in BCS, Oct.-Feb. | 0.19[d] | 0.03[e] | 0.05 | 0.03 |
| Change in BCS, Feb.-May | -0.14 | -0.11 | 0.09 | 0.72 |
| Cyclic, % | 76 | 71 | 0.05 | 0.46 |
| Pregnancy rate, % | 94 | 91 | 0.02 | 0.18 |
| Calving interval, day | 367 | 366 | 1.6 | 0.80 |
| Calf birth weight, lb[c] | 86 | 85 | 1.0 | 0.27 |
| Calf weaning wt, lb[c] | 552 | 548 | 11.4 | 0.35 |

[a]SUPP = cows supplemented 2.2 lb/head/day (DM basis) while grazing cornstalks.
[b]CON = cows not supplemented while grazing cornstalks.
[c]Actual weights including both steer and heifer progeny.
[d-e]Within a row, means without common superscripts differ at $P \leq 0.05$.

**Table 3. Effects of dam supplementation on performance of heifer progeny.**

| | Treatment | | | |
|---|---|---|---|---|
| Item | SUPP[a] | CON[b] | SEM | *P*-Value |
| Initial BW, lb | 612 | 609 | 22.4 | 0.79 |
| Final BW, lb | 770 | 774 | 25.3 | 0.60 |
| Initial BCS | 5.3 | 5.3 | 0.07 | 0.93 |
| Final BCS | 5.4 | 5.4 | 0.10 | 0.48 |
| ADG, lb/day | 0.97 | 1.01 | 0.09 | 0.20 |

[a]SUPP = heifers born of cows supplemented while grazing cornstalks.
[b]CON = heifers born of cows not supplemented while grazing cornstalks.

**Table 4. Effects of dam supplementation on heifer reproductive performance.**

| | Treatment | | | |
|---|---|---|---|---|
| Item | SUPP[a] | CON[b] | SEM | *P*-Value |
| Age at puberty, day | 343 | 336 | 10.8 | 0.23 |
| Estrus response, % | 84 | 78 | 0.31 | 0.39 |
| Time of estrus, hour[c] | 71 | 76 | 3.36 | 0.14 |
| A.I. conception rate, %[d] | 56 | 61 | 0.08 | 0.69 |
| A.I. pregnancy rate, %[e] | 46 | 47 | 0.08 | 0.93 |
| Overall pregnancy rate, % | 75 | 78 | 0.57 | 0.64 |

[a]SUPP = heifers born of cows supplemented while grazing cornstalks.
[b]CON = heifers born of cows not supplemented while grazing cornstalks.
[c]Time elapsed between second PGF injection and observed standing estrus.
[d]Proportion of heifers detected in estrus that conceived to AI service.
[e]Percentage of total group of heifers that conceived to AI service.

*Heifer Management*

Weaned heifer progeny (n = 306) grazed dormant pasture for 60 days, and were then placed in a drylot from Jan. 1 until the end of May. Heifers were fed smooth bromegrass hay ad libitum and DDG at 0.6% BW daily (DM). Initial and final BCS were collected and BW was recorded every 14 days until breeding. Blood samples were drawn 14 days apart beginning in December to determine attainment of puberty. Serum $P_4$ concentrations $\geq$ 1 ng/ml for two consecutive sampling dates were used to establish if a heifer reached puberty.

Estrus was synchronized using two injections of prostaglandin $F_{2\alpha}$ (PGF) administered 14 days apart. Estrus detection was performed for five days following the second PGF injection, and heifers observed in estrus were bred by AI 12 hours later. Heifers were exposed to Angus bulls for 45 days beginning 10 days after the final AI. Heifers grazed cool- and warm-season pastures from the time of bull exposure until the end of the growing season. AI conception and pregnancy rates were determined via ultrasound 45 days post AI. A second ultrasound was performed 45 days after bull removal to establish final pregnancy rates.

*Statistical Analysis*

Performance data and age at puberty were normally distributed and analyzed using PROC MIXED of SAS (SAS Inst., Inc., Cary, N.C.). Estrous synchronization response, conception rate to AI, pregnancy rates, and percentage of cows cyclic prior to breeding were binomially distributed and analyzed using PROC GLIMMIX of SAS (SAS Inst., Inc., Cary, N.C.). The model for all analyses included the fixed supplementation treatment effect. Because treatments were applied on a field basis, the experimental unit was field and the appropriate error term to test for differences between treatments was year by treatment.

## Results

*Cow and Calf Performance*

Cow performance data are summarized in Table 2. Cow BW was similar at initiation and end of cornstalk grazing. Additionally, cow BW was not different at the start of the breeding season. No significant ($P = 0.14$) change in cow BW between groups occurred from either weaning to pre-calving or from pre-calving to pre-breeding. Interestingly, SUPP cows lost more weight than CON cows (-112 lb vs. -81 lb, respectively) from pre-calving to pre-breeding. BCS between groups was similar at weaning and pre-breeding. BCS was greater ($P = 0.02$) for SUPP cows at pre-calving. As expected, the change in BCS while on cornstalks was greater ($P = 0.03$) for SUPP than CON cows (0.19 vs. 0.03, respectively). However, these differences in BCS are so small that they likely have no biological significance. Calf birth and weaning weights were not affected by dam treatment. Calving interval, percentage of cows cyclic prior to breeding, and final pregnancy rates were not influenced by supplementation (Table 2).

*Heifer Performance and Reproduction*

Supplementation had no effect ($P = 0.20$) on heifer initial or final BW, initial or final BCS, or ADG (Table 3). Age at puberty was not influenced by dam supplementation (Table 4). Neither the percentage of heifers responding to synchronization nor the hours from the last PGF injection to estrus were different ($P = 0.14$). No differences were found in either AI conception or pregnancy rate, or final pregnancy rates. Our results agree with previous data suggesting there is no fetal programming effect on reproduction for cows supplemented protein during mid- to late-gestation when wintered on cornstalks (*2011 Nebraska Beef Cattle Report*, p. 5).

## Conclusions

Supplementing cows grazing cornstalks in mid- to late-gestation did not improve cow reproduction or calf performance. Furthermore, supplementation did not affect growth or reproduction of heifer progeny. Results imply protein supplementation is not necessary for cows grazing cornstalks, given they begin the grazing period in adequate BCS (≥ 5).

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