Impact of Pre- and Postpartum Nutrition on March-calving Cow and Progeny Productivity

Jacki A. Musgrave
Devin L. Broadhead
L. Aaron Stalker
Rick N. Funston

Summary with Implications

March-calving cows were fed hay or grazed corn residue prepartum, and then either fed hay or grazed subirrigated meadow postpartum. Combinations of these different feeding strategies impacted body weight (BW) and body condition score (BCS) during the pre- and postpartum period; however, resulted in similar pregnancy rates. Although differences were not observed in cow pregnancy rates, a benefit in pre-weaning growth was observed for calves from the dams in postpartum meadow treatment. A tendency for an improvement in marbling score was observed for steers born to cows fed hay prepartum, perhaps indicating a higher plane of nutrition prepartum may improve quality grade.

Introduction

Feed costs are one of the greatest inputs in beef production systems. High costs of grazed forage have necessitated the evaluation of alternative systems. Corn residue can be utilized in many areas as a more economical feed source. Researchers (2009 Nebraska Beef Report, pp. 5–8) observed increased BW and BCS in cows grazing corn residue in the prepartum period with pregnancy rates similar to cows grazing winter range. Additional research (2006 Nebraska Beef Report, pp. 7–9) evaluated feeding hay or grazing subirrigated meadow postpartum and observed greater gains in BW and BCS in cows grazing meadow, however, no differences in pregnancy rate.

Cow BCS at calving is a good indicator of the cow's ability to rebreed, however postpartum nutrition can also influence reproduction. Additionally, the interaction of nutrients provided during the pre- and postpartum segments of beef production may also impact calf performance.

Objectives of this study were to evaluate systems that reduced the use of high cost grazed forage in the pre- and postpartum period. The effects of feeding hay or grazing corn residue prepartum and subsequently feeding hay or grazing subirrigated meadow postpartum on cow reproduction and subsequent calf productivity in a March-calving herd were evaluated.

Procedure

March-calving multiparous, Husker Red (5/8 Red Angus, 3/8 Simmental) cows (yr 1, n = 72; yr 2, n = 65; yr 3, n = 64) were blocked by age and allotted to 1 of 2 prepartum (Dec 1 to Feb 28) treatments: ad libitum hay (7.7% CP and 56.8% TDN, **HPRE**) or corn residue (1.5 AUM/ac, **CPRE**). From Feb 28 (precalving) until parturition, cows were managed in a common group and fed grass hay in a drylot. Each of these groups were divided postpartum and half received ad libitum hay (**HPOST**) or grazed subirrigated meadow (**MPOST**). Cows remained on postpartum treatments from parturition through a 45 d breeding season (July 20). After this cows were managed as one group grazing native upland range until calves were weaned Nov 1.

Weight and BCS of all cows were recorded at the beginning (Dec 1) and end (Feb 28, precalving) of the prepartum period, prebreeding (May 15), and weaning (Nov 1). A veterinarian diagnosed pregnancy via rectal palpation at weaning.

Calves were weighed at birth, prebreeding, and weaning. Steer calves remained in drylot on ad libitum hay for 2 weeks post weaning before being shipped 104 miles to a feedlot at the West Central Research and Extension Center, North Platte, NE. Steers received a Synovex Choice (100 mg trenbolone acetate (**TBA**) and 14 mg estradiol benzoate (**EB**)) at the beginning of the feeding period. Steers were re-implanted with Synovex Plus (200 mg TBA and 24 mg EB) 105 d later (110 d prior to harvest). Steers were weighed at feedlot entry and reimplant. Steers were on a finishing diet similar to previous research (2009 Nebraska Beef Report, pp. 5–8). Hot carcass weight was determined at harvest; carcass characteristics were evaluated 24 h following harvest. Final BW was calculated from HCW, based on an average dressing percent of 63%.

Results

Cow Variables

Cows on HPRE gained more BW (105 ± 18 lb) and BCS (0.52 ± 0.13) than cows on CPRE during the prepartum period ($P < 0.01$). Cows on HPRE weighed more and had greater BCS precalving than CPRE cows ($P < 0.01$; 1,226 vs 1,129 ± 17 lb and 5.78 vs 5.20 ± 0.11 BCS for HPRE and CPRE, respectively). Hay CP and TDN (7.7% CP and 56.8% TDN) were greater than previously reported values for corn residue (2009 Nebraska Beef Report, pp. 5–8; 5.2% CP and 52.7% TDN), likely accounting for much of this difference. Cows on HPRE tended to have a greater BW and maintained a greater BCS prebreeding ($P < 0.06$; 1,107 vs 1,074 ± 15 lb and 5.40 vs 5.09 ± 0.11 BCS for HPRE and CPRE, respectively). However, CPRE cows had greater BW gain and BCS postpartum (May 15 to Nov 1) than HPRE cows ($P < 0.01$; 46 vs 35 ± 8 lb for SPRE vs HPRE, respectively) likely due to a compensatory gain effect. These data agree with previous research (2006 Nebraska Beef Report, pp. 7–9) which reported cows receiving a protein supplement prepartum had greater BW and BCS at precalving and prebreeding and similarly, nonsupplemented cows had greater BW and BCS gain in the postpartum period. Other research (Freetly et al., 2000 J. Anim. Sci.78: 2790) has reported compensatory

Table 1. Body weight, BCS, and reproductive performance of cows fed hay or allowed to graze corn residue prepartum or fed hay or allowed to graze subirrigated meadow postpartum

	Hay[1]		Residue[2]			*P*-value[3]		
Item	Hay[4]	Meadow[5]	Hay	Meadow	SEM	Pre	Post	Pre × Post
Cow BW, lb								
Dec. 1	1,066	1,115	1,068	1,090	15	0.49	0.05	0.39
Precalving	1,197	1,252	1,123	1,135	17	<0.01	0.10	0.25
Prebreed	1,068	1,144	1,056	1,088	15	0.06	0.01	0.20
Wean	1,111	1,172	1,118	1,159	14	0.83	0.01	0.51
BW change, lb								
Prepartum	133	137	55	44	17	<0.01	0.86	0.65
Postpartum	42	28	63	73	8	<0.01	0.79	0.19
Cow BCS								
Dec 1	5.07	5.41	5.02	5.34	0.08	0.47	<0.01	0.90
Precalving	5.73	5.83	5.18	5.22	0.11	<0.01	0.54	0.81
Prebreed	5.22	5.58	4.89	5.29	0.11	<0.01	<0.01	0.74
Wean	5.37	5.69	5.31	5.68	0.11	0.65	<0.01	0.75
BCS change								
Prepartum	0.66	0.41	0.16	-0.12	0.13	<0.01	0.08	0.90
Postpartum	0.14	0.11	0.43	0.39	0.08	0.02	0.75	0.95
Pregnancy rate, %	96	94	98	96	3	0.58	0.52	0.89
Calving date, Julian d	82	81	78	80	1.5	0.11	0.64	0.41
Calved 1st 21 d, %	66	71	82	77	6	0.12	0.99	0.44

[1]Cows fed ad libitum hay from December 1 to February 28 (prepartum).
[2]Cows grazed corn residue prepartum.
[3]Pre = prepartum treatment main effect; Post = postpartum treatment main effect; Pre × Post = prepartum × postpartum treatment interaction.
[4]Cows fed ad libitum hay from parturition to the completion of a 45 d breeding season (July 20, postpartum).
[5]Cows grazed subirrigated meadow postpartum.

gain of cows with restricted intake from the beginning of the second trimester until d 28 of lactation. Restricted cows had greater gains from 28 d to 205 d than nonrestricted cows. At 205 d postpartum, restricted cows had similar BW as nonrestricted cows.

Cows on MPOST had a greater BW and BCS at prebreeding and weaning than cows on HPOST ($P < 0.01$; 1,118 vs 1,063 ± 15 lb and 5.44 vs 5.06 ± 0.11 BCS at prebreeding; 1,166 vs 1,116 ± 14 lb and 5.69 vs 5.34 ± 0.11 BCS at weaning for MPOST vs HPOST, respectively). Esophageal fistulated cattle were used to quantify the nutritional quality of subirrigated meadow adjacent to the meadow pasture used in this study. In June, quality was 16.3% CP and 67.7% TDN. July values were 13.5% CP and 62.9% TDN. These values are much greater than the hay at 7.7% CP and 56.8% TDN, accounting for the differences seen in BCS and BW for MPOST cows. This difference carried through Dec 1 as MPOST cows had greater BW and BCS than HPOST cows ($P < 0.05$; 1,102 vs 1,067 ± 15 lb and 5.38 vs 5.05 ± 0.08 MPOST vs HPOST, respectively).

Despite differences in BW and BCS, pregnancy rates for pre- or postpartum treatments were similar ($P \geq 0.50$, Table 1).

Calf Variables

Calf birth, prebreeding and weaning BW; weaning rate; and ADG were similar for prepartum treatments ($P \geq 0.16$, Table 2). Calves born to MPOST cows had greater birth ($P = 0.05$), breeding, ($P < 0.01$) and weaning ($P < 0.01$) BW than HPOST calves and greater ADG ($P < 0.01$) prebreeding ($P = 0.01$) and from birth to weaning ($P < 0.01$). Previous research (2006 Nebraska Beef Report, pp. 7–9) also observed a greater weaning BW and ADG to weaning for calves born to cows that grazed subirrigated meadow for 30 d postpartum compared with those fed hay during the same period.

Feedlot Performance

Even though differences ($P < 0.01$) were observed in weaning BW for MPOST (558 ± 8 lb) vs HPOST (527 ± 8 lb), feedlot entry weights were similar ($P = 0.16$). This contrasts other research (2006 Nebraska Beef Report, pp. 7–9), which reported greater weaning BW and feedlot entry BW for steers on meadow treatment postpartum. Steers from HPRE cows tended to have a greater marbling score than CPRE steers ($P = 0.06$; 487 vs 437 ± 20 for HPRE vs CPRE, respectively) which is similar to previous research (2009 Nebraska Beef Report, pp. 5–8) where greater marbling scores were observed in steers from cows receiving protein supplement prepartum than those from unsupplemented dams. Supplemented cows would have been on a higher plane of nutrition as would the HPRE cows in the current study. This could explain the tendency for greater marbling scores observed in the

Table 2. Preweaning growth performance of calves born to cows fed hay or allowed to graze corn residue prepartum or fed hay or allowed to graze subirrigated meadow postpartum

	Hay[1]		Residue[2]			*P*-value[3]		
Item	Hay[4]	Meadow[5]	Hay	Meadow	SEM	Pre	Post	Pre × Post
Calf BW, lb								
Birth	77	81	74	79	2	0.23	0.05	0.77
Prebreed	179	204	178	198	6	0.60	<0.01	0.66
Wean	532	564	523	552	8	0.22	<0.01	0.81
Calf ADG, lb/d								
Birth to Prebreed	2.48	3.01	2.53	2.90	0.12	0.82	0.01	0.53
Prebreed to Wean	1.92	1.96	1.88	1.93	0.03	0.20	0.15	0.93
Birth to Wean	2.02	2.15	2.00	2.10	0.03	0.26	<0.01	0.75
Wean Rate, %	91	98	94	98	0.03	0.60	0.13	0.60

[1]Calves from cows fed ad libitum hay from December 1 to February 28 (prepartum).
[2]Calves from cows grazed corn residue prepartum.
[3]Pre = prepartum treatment main effect; Post = postpartum treatment main effect; Pre × Post = prepartum × postpartum treatment interaction.
[4]Calves from cows fed ad libitum hay from parturition to the completion of a 45 d breeding season (July 20, postpartum).
[5]Calves from cows grazed subirrigated meadow postpartum.

present study. No differences in any other feedlot variables were observed between pre- and postpartum treatments. Based on a producer's available resources, either of the pre- and postpartum treatments evaluated produce acceptable cow and calf performance. Greater postpartum nutrition realized with meadow grazing did result in greater weaning weights when compared with feeding hay.

Jacki A. Musgrave, research technologist, Gudmundsen Sandhills Laboratory

Devin L. Broadhead, research technologist, West Central Research and Extension Center

L. Aaron Stalker, professor, BYU-Idaho

Rick Funston, professor, West Central Research and Extension Center

Table 3. Feedlot performance and carcass characteristics of steer calves born to cows fed hay or allowed to graze corn residue prepartum or fed hay or allowed to graze subirrigated meadow postpartum

	Hay[1]		Residue[2]			*P*-value[3]		
Item	Hay[4]	Meadow[5]	Hay	Meadow	SEM	Pre	Post	Pre × Post
Steer BW, lb								
Feedlot entry	553	565	543	566	11	0.70	0.16	0.63
Re-implant	958	955	942	974	21	0.95	0.55	0.45
Final	1,336	1,336	1,313	1,352	30	0.92	0.54	0.54
Steer ADG, lb/d								
Entry to re-implant	3.84	3.74	3.81	3.89	0.15	0.70	0.96	0.58
Re-implant to final	3.50	3.45	3.36	3.44	0.11	0.51	0.86	0.54
Overall	3.66	3.60	3.58	3.66	0.09	0.93	0.96	0.55
HCW, lb	842	842	827	852	19	0.92	0.54	0.54
12th rib fat, in	0.61	0.64	0.58	0.57	0.04	0.30	0.92	0.66
Marbling[6]	520	508	448	503	18	0.08	0.28	0.12
LM, in^2	13.99	13.75	13.65	13.92	0.27	0.77	0.95	0.38
Yield Grade	3.19	3.33	3.17	3.10	0.18	0.51	0.85	0.59
USDA Choice, %	96	85	73	82	12	0.33	0.93	0.43

[1]Steers from cows fed ad libitum hay from December 1 to February 28 (prepartum).
[2]Steers from cows grazed corn residue prepartum.
[3]Pre = prepartum treatment main effect; Post = postpartum treatment main effect; Pre × Post = prepartum × postpartum treatment interaction.
[4]Steers from cows fed ad libitum hay from parturition to the completion of a 45 d breeding season (July 20, postpartum).
[5]Steers from cows grazed subirrigated meadow postpartum.
[6]Where 400 = small^0.