Combined Analysis on the Effects of Late Gestation Supplementation in a Spring Calving Beef Herd

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Summary with Implications

Data were compiled from 4 independent studies conducted over 13 years in the Nebraska Sandhills. This combined analysis evaluated the effects of late gestation supplementation on cow and calf productivity in a spring calving herd. Cows wintered on dormant range, sub-irrigated meadow or corn residue. Late gestation supplementation improved pregnancy rates regardless of supplement amount or over winter treatment. Supplement did not affect cow body weight and condition score. Calves born to cows fed supplement had greater weaning weights regardless of when they were weaned.

Introduction

Grazing dormant pastures in the Nebraska Sandhills reduces production costs by feeding less harvested feed. Supplementing the cow during mid to late gestation can help supply nutrients to meet the higher metabolic demands of the dam. Research has determined ruminally degradable protein (RDP) is necessary to maintain BCS of gestating beef cows when extending the grazing season on dormant forage. Feeding supplement to cows grazing winter range during the last trimester of gestation can increase calf BW at weaning (*2006 Nebraska Beef Cattle Report*, pp. 7–9). Even with increased progeny performance, there has been lack of evidence that late gestation supplementation benefits any cow production traits, including reproduction (*2018 Nebraska Beef Cattle Report*, pp. 18–20). It is possible more data points or analyzing multiple studies of similar treatments may show different results. The objective of this study was to determine if a combined analysis would demonstrate effects from supplementation on cow production traits, reproduction, and calf production traits.

Table 1. Effects of late gestation supplementation[1] on cow productivity

	Supplement				
Item	NS	SUP1	SUP2	SE[2]	*P*-Value
Cow BW, lb					
Initial	1,089	1,100	1,082	12.42	0.18
Weaning	1,093	1,102	1,091	8.60	0.32
BW change	-1.58	-1.78	-3.93	7.94	0.67
Cow BCS[3]					
Initial	5	5	5	0.08	0.23
Weaning	5	5	5	0.05	0.75
BCS change	-0.09	-0.10	-0.12	0.07	0.75
Calving date[4], d	82	83	81	1.85	0.26
Calved in first 21 d[5], %	84	86	85	0.05	0.53
Pregnancy rate[6], %	90[a]	94[b]	93[b]	0.02	0.01

[1]Supplement: NS:0 lb/(cow • d) Dec 1 to Mar 1;SUP1: 1 lb DM/(cow • d) Dec 1 to Mar 1; 1 lb DM/(cow • d) Jan 15 to Mar 1; SUP2 lb DM/(cow • d) Jan 15 to Mar 1.

[2]Standard error of the least squares mean.

[3]Scale of 1 (emaciated) to 9 (extremely obese).

[4]Day of year calving occurred where January 1 = d 1.

[5]Cows calving within 21 d calculated by finding difference between birth date and breeding date and subtracting from 285.

[6]Pregnancy rate calculated by dividing the number of cows determined pregnant by the number of cows at the beginning of the production year.

[abc]Within a row, means lacking a common superscript letter differ ($P < 0.05$).

Procedure

Studies were conducted over a 13 year period at the Gudmundsen Sandhills Laboratory, Whitman, NE. Data were compiled from 4 independent studies that spanned from 2001 to 2016 (*2018 Nebraska Beef Cattle Report*, pp. 18–20; *2012 Nebraska Beef Cattle Report*, pp. 15–17; *2011 Nebraska Beef Cattle Report*, pp. 5–7, *2009 Nebraska Beef Cattle Report*, pp. 5–8; *2006 Nebraska Beef Cattle Report*, pp. 7–9; *2006 Nebraska Beef Cattle Report*, pp.10–12). All studies had similar designs based on the consideration of late gestation supplementation and weaning periods.

Among all studies, 712 crossbreed (¾ Red Angus, ¼ Simmental), March-calving multiparous cows (479 ± 57 kg) were assigned to different overwinter treatments and weaning periods the first year. Cows were wintered on dormant range, sub-irrigated meadow, or corn residue. The 3 weaning treatments between all the involved studies were: 1) Nov, 2) Aug 18 vs Nov 7, or 3) early Oct vs early Dec. The original goal for these different weaning periods was to see how these dates affected the dam and their progeny. Three amounts of supplementation (32% CP, 89% TDN) were used: NS (0 lb (DM)/ (cow per day)), SUP1 (1 lb DM/ (cow per day)) and SUP2 (2 lb DM/ (cow per day)).

Cow BW (body weight) and BCS (body condition score) was measured at the beginning and end of the supplementation period, prebreeding and weaning. The average amount of days for supplementation was 90 or 45 days depending on the treatment. Calf BW and BCS were measured at prebreeding and weaning. Within all studies, cows were

Table 2. Effects of late gestation supplementation[1] on steer progeny productivity

	Supplement				
Item	NS	SUP1	SUP2	SE[4]	*P*-Value
Birth BW, lb	77[a]	79[b]	79[b]	1.2	0.02
Wean BW, lb	494[a]	505[b]	514[b]	6.28	< 0.01
Calf ADG, lb/d					
Birth to Wean	2.16[a]	2.23[b]	2.27[b]	0.04	< 0.01
Post weaning performance					
Live Weight	1,310	1,303	1,307	5.21	0.71
HCW, lb	825	820	825	5.21	0.71
12th rib fat, in	0.54	0.53	0.52	0.07	0.58
Marbling[2]	467	487	479	11.78	0.01
LM, in[2]	14	14	14	0.00	0.81
USDA yield grade	2.92	2.87	2.89	0.09	0.76

[1]Supplement: NS:0 lb/(cow • d) Dec 1 to Mar 1;SUP1: 1 lb DM/(cow • d) Dec 1 to Mar 1; 1 lb DM/(cow • d) Jan 15 to Mar 1; SUP2 lb DM/(cow • d) Jan 15 to Mar 1.

[2]Marbling: Small00 = 400, Small50 = 450, Modest00 = 500.

[abc]Within a row, means lacking a common superscript letter differ ($P < 0.05$).

Table 3. Effects of late gestation supplementation[1] on heifer progeny productivity

	Supplement				
Item	NS	SUP1	SUP2	SEM[2]	P-Value
Birth BW, lb	77	77	75	0.00	0.27
Wean BW, lb	485[a]	498[b]	492[b]	6.69	0.07
Calf ADG, lb/d					
Birth to Wean	2.16[a]	2.23[b]	2.27[b]	0.04	< 0.01
Post Weaning Performance					
Puberty Status[3], %	65	64	68	0.65	0.89
Prebreeding BW, lb	741	750	717	26	0.39
Prebreeding BCS[4]	5	5	5	0.10	0.80
Pregnancy diagnosis BW, lb	827	847	847	13.38	0.09
Pregnancy diagnosis BCS	6	6	6	0.04	0.80
Pregnant[5], %	90	89	91	0.67	0.94
Calved in first 21 d[6], %	70	69	79	0.48	0.46
1st calf wean BW, lb	441	434	445	8.55	0.60

[1]Supplement: NS:0 lb/(cow • d) Dec 1 to Mar 1;SUP1: 1 lb DM/(cow • d) Dec 1 to Mar 1; 1 lb DM/(cow • d) Jan 15 to Mar 1; SUP2 lb DM/(cow • d) Jan 15 to Mar 1.

[2]Standard error of the least squares mean.

[3]Puberty Status: Considered pubertal if blood plasma progesterone concentration > 1ng/mL.

[4]Scale of 1 (emaciated) to 9 (extremely obese).

[5]Pregnancy rate calculated by dividing the number of cows determined pregnant by the number of cows at the beginning of the production year.

[6]Heifers calving within 21 d calculated by finding difference between birth date and breeding date and subtracting from 285.

[abc]Within a row, means lacking a common superscript letter differ ($P < 0.05$).

managed as a single group post treatment period.

Within all studies, steer calves remained in drylot and were offered *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. 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 at reimplant. Steers were slaughtered in mid-June (Tyson Fresh Meats, Lexington, NE). Carcass data was collected 24 hours following slaughter and final BW was calculated from HCW (Hot Carcass Weight) based on an average dressing percentage of 63%. Carcass data included HCW, yield grade, LM area, marbling, and 12th rib fat. Heifer management will be listed within each specific study that was referenced since the treatments varied between each individual study.

Cows assigned to the same winter supplement treatment and weaning period within winter pasture served as the experimental unit. Replicated treatment means within year were used for analyses of cow and calf response variables and carcass evaluation. In other words there was more than one group of each treatment. Model fixed effects included winter supplement treatment, weaning period, and all interactions. Year and residual error were included in the model as random effects. Effects of treatment were considered significant when $P < 0.05$.

Results

Within any amount, supplementation did not affect cow BW or BCS ($P = 0.18$). Contrary to the results of each study that comprises the analysis, this analysis demonstrated any amount of protein supplementation during late gestation positively affected pregnancy rates ($P = 0.01$). Each study utilized in this analysis saw no benefit of supplementation to cows during the third trimester of gestation on pregnancy rates. However in the combined analysis there was no difference between SUP1 and SUP2. Even with the impact on pregnancy rates in this analysis, protein supplementation did not affect calving date or the percentage of the herd calving within the first 21 days ($P = 0.26$).

Within this analysis, protein supplementation provided to the dam affected steer progeny birth ($P = 0.02$) and weaning BW ($P < 0.01$). Once progeny were born, steer calves had a higher ADG from birth to weaning when their dams were fed any level of protein supplementation ($P < 0.01$). The NS group had an overall ADG of 2.16 lb/d compared with SUP1 of 2.23 and SUP2 of 2.27 lb/d.

The NS steers had a marbling score of 467 while SUP1 and SUP2 groups had a score of 487 and 479, respectively. Live BW for NS groups was 1,310 lb while SUP1 and SUP2 progeny weighed 1,303 lb and 1,307 lb ($P = 0.71$). Supplementation level did not impact ($P \geq 0.58$) live weight, HCW, 12^{th} rib fat, LM, or USDA yield grade.

Focusing on the supplementation effects on heifer progeny birth and weaning BW this analysis demonstrated no effect on birth BW ($P = 0.27$). At weaning supplementation tended to affect BW ($P = 0.07$) of heifer progeny with NS averaging 485 lb and SUP1 and SUP2 averaging 498 lb and 492 lb per calf. These results suggest supplementation significantly affecting ADG of each group ($P < 0.01$). This analysis showed neither supplementation amount impacted puberty status ($P = 0.89$). Prebreeding BW and BCS were not affected by any amount of protein supplement to dam throughout this analysis ($P = 0.39$). These same results held true when considering BCS at pregnancy diagnosis ($P = 0.80$). Supplementation tended to affect BW at pregnancy diagnosis ($P = 0.09$) with NS having an average BW of 827 lb while SUP1 and SUP2 had an average BW of 847 lb for both groups. Pregnancy rate was not affected by supplementation ($P = 0.94$). Heifers from SUP1 and SUP2 dams had a similar percentage of calves born in the first 21 days of calving. This also held true in the weaning BW of the calves born to the heifer progeny ($P = 0.60$). Overall, this analysis demonstrated dam supplementation affects certain stages of heifer BW, but did not affect heifer reproduction measures.

In conclusion, the above results demonstrate that combining multiple data sets in similar environments may show us more accurate results when discussing supplementation and other treatments. Producers can start to see more applicable results with these higher numbers to evaluate.

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