Methods to Increase Productivity of Spring Calving Production Systems in the Nebraska Sandhills

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Summary with Implications

Feeding supplement to cattle grazing dormant winter range increased cow BW and BCS and calf performance, but not pregnancy rate. Using a CIDR to shorten the post-partum interval in a cow herd with existing acceptable reproductive performance did not improve pregnancy rate. Feeding creep feed to calves increased weaning BW but should be considered within the context of a cost/benefit analysis. Additional years of data collection may be necessary to draw definitive conclusions.

Introduction

Extending the grazing season to include grazing dormant pasture decreases production costs. Research has determined supplemental RDP is necessary to maintain BCS of gestating cows grazing winter range in the Nebraska Sandhills. Feeding supplement to cows grazing winter range during the last trimester of gestation has been shown to increase calf BW at weaning but it is not known if the timing of supplement feeding optimized progeny performance. Undernutrition during gestation causes suboptimal conditions in the maternal uterine environment, which translates to depressed progeny performance. Potential cost savings could be achieved if the amount and duration of supplement feed was reduced. Further efficiency might be achieved if supplemental feed delivered directly to the calf could undo the negative effects of under-nutrition to dam during gestation.

Administration of exogenous progesterone can shorten the post-partum interval. If weaning occurs at a constant day for all calves in a herd, those born to cows with a shorter post-partum interval will be older and therefore weigh more than contemporaries born to cows that became pregnant later in the breeding season, thus increasing net returns of calves sold at weaning.

Objectives of this study were to determine effects of late-gestation supplementation, post-partum progestin administration, and creep feeding on productivity in spring calving systems.

Procedure

A 2-yr experiment used 120 crossbred (Red Angus, Simmental), March calving cows at the Gudmundsen Sandhills Laboratory, near Whitman, Nebraska. Cows were stratified by BW within age and treatments were assigned randomly in a 4 x 2 x 2 factorial arrangement: 1) No supplement from Dec 1 to Mar 1 (**DM0**), 1 lb of supplement from Dec 1 to Mar 1 (**DM1**), 1 lb of supplement from Jan 15 to Mar 1 (**JM1**), or 2 lb of supplement from Jan 15 to Mar 1 (**JM2**) (32% CP; 89% TDN); 2) administration of exogenous progesterone post-partum via a controlled internal drug release device (EAZI-Breed CIDR insert containing 1.38 g of progesterone; Zoetis Inc., Florham Park, NJ) for 7 d and prostaglandin $F_{2\alpha}$ (5 mL Lutalyse, Zoetis Inc.) administered on day seven (**CIDR**), or no progesterone administration (**NoCIDR**); and 3) unrestricted access by the calf to creep feed which contained an intake limiter (Accuration, Purina Animal Nutrition LLC, Gray Summit, MO) from July 15 to Nov 1 (**Creep**) or no access to creep feed (**NoCreep**). The study began in December when cows were turned in to 1 of 8 upland range pastures (86 ac) where supplement treatments were delivered on a pasture basis 3 days/week until March 1. Beginning March 1 cows were managed as a single group and fed hay until the end of the calving season. On May 28 CIDR inserts were administered to cows assigned to the CIDR treatment. On June 4 CIDR inserts were removed and cows were administered prostaglandin $F_{2\alpha}$. All cows were exposed to fertile bulls (1:25 bull:cow ratio) for 45 days in a common pasture, with breeding season ending July 15. The non-creep treatment occupied 1 pasture and creep treatments occupied 2 separate pastures, for a total of 3 pastures.

Cow BW and BCS were measured at the beginning and end of the supplementation period pre-breeding and at weaning. Calf BW was measured at birth, the start of the breeding season, and weaning. BW was taken after at least 12 hr without feed and water.

Cows were removed from the study for failure to wean a calf or to become pregnant and were not replaced. Therefore, the number of cows decreased throughout the 2 years of data collection. Cows external to the experiment were introduced into pastures to maintain constant stocking rates for each pasture during the experiment.

Cows assigned to the same winter supplement, CIDR and creep treatment within winter pasture served as the experimental unit. Replicated treatment means within year were used for analyses of cow and calf response variables. There were 4 observations per treatment replication. Model fixed effects included winter supplement treatment, CIDR treatment, creep treatment and all possible interactions. Year and residual error were included in the model as random effects. Effects of treatment were considered significant when $P < 0.05$. There were no interactions ($P > 0.18$) among treatments; therefore, data are reported as main effects.

Results

Regardless of supplement amount offered, there was a notable fluctuation in cow initial BW to cow weaning BW. Cows assigned to the DM0 treatment had the greatest differences in BW from Dec to May. The greatest loss in BW occurred during the period between start of calving (March) to start of breeding (May) for all 4 treatments of supplement (Table 1). Treatments fed supplement maintained

Table 1. Effects of winter supplement[1], post-partum progesterone administration[2], and calf access to creep feed[3] on cow body weight, body condition score (BCS), calving date, calving rate, weaning rate, pregnancy rate, and calf body weight

	Supplement				Progesterone		Calf feed			P-Value		
	DM0	DM1	JM1	JM2	CIDR	No CIDR	Creep	No Creep	SE[4]	Supp	Progest	Feed
Cow BW, lb												
Initial (Dec)	1,049	1,078	1,054	1,043	1,047	1,065	1,054	1,058	8	0.06	0.07	0.61
Calving (Mar)	992[c]	1,098[a]	1,034[b]	1,043[b]	1,041	1,043	1,027	1,056	7	< 0.01	0.91	0.03
Breeding (May)	950[c]	1,023[a]	981[b]	990[b]	979	992	979	994	5	< 0.01	0.22	0.16
Weaning (Nov)	1,052[b]	1,102[a]	1,067[b]	1,067[b]	1,065	1,078	1,078	1,067	15	0.02	0.24	0.29
Cow BCS[5]												
Initial (Dec)	4.9	5.0	5.0	5.0	5.0	5.0	5.0	5.0	0.1	0.78	0.80	0.39
Calving (Mar)	4.8[b]	5.2[a]	5.0[b]	5.2[a]	5.0	5.1	5.0	5.1	0.1	< 0.01	0.45	0.73
Breeding (May)	4.5[b]	4.9[a]	4.7[ab]	4.8[a]	4.7	4.7	4.7	4.7	0.1	< 0.01	0.48	0.33
Weaning (Nov)	5.2	5.2	5.3	5.4	5.3	5.3	5.3	5.2	0.2	0.33	0.62	0.51
Calving date[6], d	82	88	86	83	83	87	86	84	2	0.16	0.13	0.31
Born in 21 d[7], %	0.80	0.70	0.82	0.84	0.80	0.78	0.74	0.84	0.06	0.34	0.68	0.08
Calving rate[8], %	0.97	1.00	0.98	0.98	0.98	0.98	0.98	0.99	0.1	0.58	1.00	0.32
Weaning rate[9], %	0.94	0.98	0.95	0.97	0.95	0.97	0.95	0.97	0.1	0.51	0.58	0.44
Pregnancy rate[10], %	0.86	0.96	0.91	0.88	0.90	0.91	0.92	0.89	0.1	0.26	0.77	0.43
Calf BW, lb												
Birth (Mar)	77	79	75	77	77	77	77	77	1	0.12	0.61	0.22
Breeding (May)	163	161	154	163	161	159	159	163	2	0.46	0.60	0.17
Weaning (Nov)	522	516	518	522	518	520	542	496	7	0.92	0.83	< 0.01

[1]DM0: 0 kg/(cow • d) Dec 1 to Mar 1; DM1: 1lb DM/(cow • d) Dec 1 to Mar 1; JM1: 1 lb DM/(cow • d) Jan 15 to Mar 1; JM2: 2 lb DM/(cow • d) Jan 15 to Mar 1.
[2]CIDR: CIDR insert containing 1.38 g of progesterone for seven d and prostaglandin $F_{2\alpha}$ administered on d 7 from May 28 to June 4.
[3]Creep: unrestricted access by the calf to creep feed which contained an intake limiter from July 15 to Nov 1.
[4]Standard error of the least squares mean (n = 4 observations per treatment replication [2/yr]).
[5]Scale of 1 (emaciated) to 9 (extremely obese).
[6]Day of yr calving occurred where January 1 = d 1.
[7]Cows calving within 21 d calculated by finding difference between birth date and breeding date and subtracting from 285.
[8]Calving rate calculated by dividing the number of cows to calve by the number of cows at the beginning of the production yr.
[9]Weaning rate calculated by dividing the number of cows to wean a calf by the number of cows at the beginning of the production yr.
[10]Pregnancy rate calculated by dividing the number of cows determined pregnant by the number of cows at the beginning of the production yr.
[abc]Within a row, means lacking a common superscript letter differ (*P* < 0.05).

BW. Differences in BW among supplement treatments were most notable at the start of the breeding season where DM0 cows had the lightest (*P* < 0.05) BW, JM1 and JM2 cows intermediate, with DM1 cows having the heaviest BW. Cow BCS was lower (*P* < 0.05) at the start of the breeding season for DM0 cows than for cows assigned to DM1 and JM2 treatments, with JM1 cows being intermediate. Differences in BW and BCS caused by the supplementation treatment did not affect measures of reproductive efficiency such as calving date (*P* = 0.16), calving rate (*P* = 0.58), weaning rate (*P* = 0.51), and pregnancy rate (*P* = 0.26). Previous research examining effects of supplement fed to cows grazing winter range has demonstrated decreased weaning rate in cows not fed supplement in some studies but no effects in others (2002 Nebraska Beef Report, pp.3–4). Supplement treatment did not affect calf BW at birth (*P* = 0.12), at beginning of dam's breeding season (*P* = 0.46), or at weaning (*P* = 0.92). Similar research (2006 Nebraska Beef Report, pp.7–9, 2012 Nebraska Beef Report, pp. 15–17) has consistently demonstrated decreased BW at weaning of calves born to cows not fed supplement during winter. Similar BW at weaning between calves born to cows not fed supplement and those fed supplement in this experiment was not expected. Being year 2 of a 3-year study, more definitive conclusions may be drawn after the third year of data.

Whether or not cows were administered a CIDR did not affect (*P* > 0.13) BW, BCS, reproductive measures, or calf BW. Exogenous progesterone was not expected to affect cow BW or BCS. Potential increased calf age and therefore, increased BW at weaning as a result of earlier conception in the breeding season due to progesterone administration was not realized (*P* = 0.83). Allowing calves access to creep feed increased calf BW at weaning by 46 lb (P< 0.05). Even with the increased BW at weaning, the value of gain needs to outweigh the extra cost of creep feeding to be a recommended practice. These benefits can vary from year to year depending on cost of gain. Total amount of creep that disappeared from feeder was 2.65 lbs DM/(calf • d).

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