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Effect of supplementation during the breeding season on a May-calving beef herd in the Nebraska Sandhills

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ABSTRACT

A 4-yr study at the Gudmundsen Sandhills Laboratory, Whitman, Nebraska, evaluated the effects of supplementation during the breeding season on May-calving heifers and primiparous cows. Beginning mid-July, and throughout a 45-d breeding season, heifers and primiparous cows grazed upland range and received either (1) no supplement (n = 128 heifers, 67 primiparous cows) or (2) 0.45 or 0.91 kg/animal per day for heifers and primiparous cows, respectively, of a 32% CP (DM) supplement (n = 129 heifers, 68 primiparous cows). Cows and heifers were synchronized using a single prostaglandin $F_{2\alpha}$ injection 5 d after bull placement (1:20 bull-to-cow ratio). Pregnancy was diagnosed via transrectal ultrasonography in mid-October or November for heifers and primiparous cows, respectively. Weaning occurred at pregnancy diagnosis. Body weight and BCS were taken at several time points throughout the year. Heifer BW and BCS following supplementation were unaffected by treatment ($P \geq 0.10$). Primiparous cow BW and BCS were greater in supplemented cows at the time of pregnancy diagnosis ($P < 0.01$). Pregnancy rate was similar ($P \geq 0.41$) between treatments for both age groups. Treatment did not affect calf BW at birth or dystocia rates for primiparous cows ($P \geq 0.17$). Calf BW at weaning was greater ($P < 0.01$) for supplemented primiparous dams. Supplementation during the breeding season did not affect pregnancy rates in young beef females, despite BW and BCS changes in primiparous cows.

Key words: beef heifer, May calving, reproduction, supplementation

INTRODUCTION

In the northern Great Plains, calving in early summer better matches high forage quality to the increased nutrient demand of lactation. Early lactation occurs when forage CP and DE are greatest, thus providing abundant energy and requiring fewer harvested feed inputs (Stockton et al., 2007). Griffin et al. (2012) demonstrated similar pregnancy rates among multiparous cows in 3 different calving systems (May, June, and August); however, younger females exhibit a decrease in pregnancy rate in a May- versus March-calving system (70 vs. 87%, respectively; Springman et al., 2017). Forage seasonality (warm vs. cool season), precipitation levels, and ambient temperature affect the quality and quantity of forage available during the breeding season. As forage matures into late summer in the Nebraska Sandhills, forage CP declines and NDF increases (Lardy et al., 1997). As cell wall constituents increase, voluntary intake is decreased (Van Soest, 1964). This corresponds with declining forage quality during the breeding season of a May-calving herd. Therefore, the inability of younger females to physically consume enough energy from the low-quality range forages may be negatively affecting pregnancy rates (Funston et al., 2016). Inadequate CP or energy intake after calving and during the breeding season has been shown to lower pregnancy rates and extend the length of the postpartum interval (Stockton et al., 2007). Therefore, we hypothesized supplementing CP during the breeding season would help meet nutrient demands and improve pregnancy rates in May-calving heifers and primiparous cows. The objective of this study was to determine the effects of supplementing May-calving heifers and primiparous beef cows during the breeding season on ADG and reproductive response.

MATERIALS AND METHODS

Heifer Management

The University of Nebraska Animal Care and Use Committee approved the procedures and facilities used in this experiment. A 4-yr study was conducted at Gudmundsen Sandhills Laboratory, Whitman, Nebraska, to determine the effect of CP supplementation during the breeding season on subsequent growth and pregnancy rates in heifers and primiparous cows in a May-calving herd. Crossbred (5/8 Red Angus, 3/8 Simmental), yearling replacement heifers (n = 257) with an average initial BW of 304 ± 2 kg grazing Sandhills native range received either no supplement (**NSP**) or a 32% CP supplement at a rate of 0.45 kg/animal per day (**SUP**; Table 1) beginning 2 wk before and terminated at the end of the breeding season. Supplement was delivered 3 times per week on a pasture (35.6

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Table 1. Composition and nutrient analysis of supplement fed to May-calving heifers and primiparous cows during the breeding season

Item	Value
Ingredient, % of diet	
Dried distillers grains plus solubles	62.0
Wheat middlings	11.0
Cottonseed meal	9.0
Dried corn gluten feed	5.0
Molasses	5.0
Calcium carbonate	3.0
Trace minerals and vitamins[1]	3.0
Urea	2.0
Nutrient	
CP, % DM	31.6
RUP, % CP	41.0
TDN, % DM	89.4

[1]Formulated to provide 80 mg/0.45 kg of BW of monensin (177 mg/kg).

ha) basis. No replications of pasture were conducted. Nutrient predictions of the breeding season diet are presented in Table 2.

Prior to this study, heifers were randomly assigned to 1 of 2 development treatments from January to May (Springman et al., 2017). Heifers were offered either meadow hay ad libitum and fed supplement at a rate of 1.8 kg/animal per day or allowed to graze dormant meadow and fed supplement at a rate of 0.45 kg/animal per day. Heifers were blocked by development treatment and randomly assigned to breeding treatment for the current study.

Blood samples (5 mL) were collected on d −10 and 0 of the breeding season. A heifer with a plasma progesterone concentration greater than 1 ng/mL at either collection time was considered pubertal (Roberts et al., 2017). Body weight was recorded at each blood collection, and initial BW was considered an average of the 2 time points.

Approximately July 15, fertile bulls were placed with heifers at a 1:20 bull-to-heifer ratio for a 45-d breeding season. Heifers were synchronized using a single prostaglandin $F_{2\alpha}$ (Lutalyse, Zoetis Animal Health, Parsippany, NJ) injection 5 d after bulls were introduced. After the supplementation period, all heifers were managed as a single herd and grazed dormant winter range. Pregnancy was diagnosed via transrectal ultrasonography (Aloka, Hitachi Aloka Medical America Inc., Wallingford, CT), and BW and BCS were measured in October, a minimum of 45 d following bull removal. Heifers were removed from the herd if they failed to become pregnant or were injured at pregnancy diagnosis.

In the subsequent year following supplementation, prepartum BW and BCS were recorded 14 d before an expected calving date of May 1. The first day 2 or more heifers calved was considered the start of the calving season and was used to calculate percent calved in the first 21 d. Calf birth BW, sex, and birth date were recorded, and a calving ease (**CE**) score (1 = no assistance to 4 = caesarian section; Burfening et al., 1978) was assigned at parturition. A CE score of 2 or greater was considered dystocia. Following the birth of the first calf, heifers were then considered primiparous cows. Heifers were removed from the herd if calf death or injury occurred after calving.

Primiparous Cow Management

In a continuation of the heifer phase, 2-yr-old primiparous cows not previously removed from the breeding herd (n = 135) were used to evaluate supplementation effects during their second breeding season. The average initial

Table 2. Predicted breeding season nutrient values of the diet (NRC, 2000) supplied to either heifers or primiparous cows in a May-calving herd[1]

	Heifer		Primiparous cow	
Item	NSP	SUP	NSP	SUP
Predicted DMI, kg/d	7.5	7.5	9.0	9.3
Diet-supplied CP, %	9.7	11.0	9.7	11.9
Diet-supplied TDN, %	59.0	61.0	59.0	62.0
MP[2] balance, g/d	118	149	62	193
RDP balance, g/d	−99	−145	−119	−216
NE balance, Mcal/d	4.1	4.7	−0.6	0.8

[1]Heifers and primiparous cows grazing upland range were offered either no supplement (NSP) or a 32% CP (DM) supplement delivered 3 times/wk on a pasture basis (SUP). Heifers received 0.45 kg of supplement per animal per day, and primiparous cows received 0.91 kg of supplement per animal per day. Supplementation began 2 wk before and throughout a 45-d breeding season.

[2]MP = metabolizable protein.