Effects of Early and Late Fall Calving of Beef Cows on Gestation Length and Pregnancy Rate

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Story in Brief

Effects of early and late fall calving on gestation length and pregnancy rate were evaluated in beef cows. Sixty fall calving cows were blocked according to age and prior calving date and allocated for insemination in late fall (Nov. 7 or 8) or winter (Jan. 4 or 7). Cows were treated with gonadotropin-releasing hormone (GnRH) on d 0, prostaglandin $F_{2\alpha}$ on d 7, and GnRH and inseminated on d 9. All cows grazed native grass pastures and were fed supplemental protein in the winter to control body condition scores (BCS, 1=emaciated and 9=obese) such that cows maintained a BCS of at least 5 during breeding, 4 or greater at the end of winter supplementation, and greater than or equal to 6 at calving. The percentage of cows with ovarian function at the start of breeding and percentage of cows pregnant were not significantly different for the early and late calving seasons. Early fall born calves had lighter birth weights and shorter gestation lengths than late fall born calves. Exposure of early cows to heat stress in late gestation could have caused the initiation of early parturition.

Key Words: Fall Calving, Beef Cows, Gestation Length

Introduction

Forage and environmental conditions are favorable for fall calving in Oklahoma and this warrants research to evaluate the optimal time for fall calving. The fall breeding season in Oklahoma typically occurs from early November to the middle of February. Fall calving cows may require more protein supplementation in winter than spring calving cows, but fall calving cows are better able to utilize warm season grasses to increase body energy reserves prior to calving (Bagley et al., 1987). Selk et al. (1990) found that fall born calves had lighter birth weights than spring born calves (OSU Research Report, 1990). Fall calves tend to have greater value than spring born calves at weaning (Bagley et al., 1987). Body condition at calving influences reproductive performance in spring (Selk et al., 1988) and fall (Rakestraw et al., 1986) calving cows. The objectives of this study were to determine the effects of time of fall calving on reproductive performance, birth weight, and gestation length.

Materials and Methods

Angus x Hereford cows (n=60) were randomly allotted into early (E) and late (L) fall calving groups. Cows were on the same treatment for 2 yr. Insemination of early cows commenced on November 7 or 8, calved beginning July 25, and were weaned May 20. Insemination of late cows commenced on January 4 or 7, began calving September 5, and were weaned July 15 (Table 1). Synchronization of ovulation was accomplished by treatment with gonadotropin-releasing hormone (GnRH, 100µg Cystorelin, Abbott Laboratories) on d 0, prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$, Lutalyse 25 mg, Pharmacia Upjohn) on d 7, and GnRH (100µg) on d 9 (CO-Synch, Geary et al. 1998). Cows were inseminated on d 9, 48 h after treatment with $PGF_{2\alpha}$. Cows were exposed to two fertile bulls from d 13 or 17 to d 48. The same bulls were used to inseminate and mate early and late cows within a year.

Table 1. Schedule of Events for Early and Late Cows

	Start of Breeding	Calving	Weaning
Early	Nov 7 or 8	July 25	May 20
Late	Jan 4 or 7	Sept 5	July 15

E and L cows grazed separate native grass pastures near Stillwater Oklahoma, with rotation of the groups among four pastures every two weeks. One to two kg/hd/day of supplemental protein (40 % CP) was fed to E and L cows throughout the winter months to achieve body condition scores (BCS) of ≥ 5 until the end of the breeding season, ≥ 4 until the end of the winter feeding period. The total amount of supplement was the same for both herds. Cows had access to native grass hay when snow or ice covered the pastures. Weight and BCS were assessed every month.

Concentrations of progesterone in blood plasma were quantified on d -7, 0, 7, 9, and 16 by radioimmunoassay. Cows that had plasma progesterone > 1 ng/mL in at least one sample were designated as having luteal activity. Cows with progesterone > 1ng/mL on d -7, 0, or 7, < 1 ng/mL on d 9, and > 1 ng/mL on d 16, and calved less than 293 d after AI, were designated to have conceived by AI. Calves born greater than 293 d after AI, and with dams without synchronized ovulation based on progesterone, were designated as sired by natural service. Pregnancy was verified by rectal palpation 3 to 4 mo after insemination. The effects of season of fall calving on gestation length and pregnancy rates were evaluated using Proc Mixed (SAS 1990). The statistical models included season, year, and season by year interactions.

Results and Discussion

Body condition was greater for early (5.2) than late (4.9) cows in yr 1 ($P<0.05$, Table 2). This was likely caused by splitting the initial herd into two herds resulting in a much shorter postpartum period for the early than late cows (E = 59.2, L = 112.7, $P<0.05$). However, pregnancy rate was not influenced by the small differences in BCS. In the second yr, cows were similar days postpartum at breeding, and BCS was less for the E (E = 5.2, L = 5.6, $P<0.05$) cows. However in both years, BCS were adequate and close to the goal of 5.0 or greater. In yr 1, 91% of the early cows and all the late cows had luteal activity at the start of breeding. All early and late cows in yr 2 had luteal activity. Pregnancy rates were not influenced by breeding season and averaged 88 and 95% for yr 1 and 2, respectively. Postpartum intervals were short for early cows and long for late cows in yr 1 because of the initiation of the experiment. Postpartum intervals were similar for early and late cows in yr 2.

Table 2. Reproductive Characteristics and BCS of Early and Late Fall Cows					
Season	Year	PP, d	BCS at Breeding	Cycling, %	Pregnancy, %
E	1	59.2 [a]	5.2 [e]	91 [a]	88.5
L	1	112.7 [c]	4.9 [f]	100 [b]	88.5
E	2	75.6 [b]	5.2 [e]	100 [b]	93.1
L	2	77.2 [b]	5.6 [f]	100 [b]	96.0
SEM		2.5	0.1		

a,b,c,d Means within column differ P<0.05

e,f Within year differ P<0.05

Birth weights were less and gestation lengths were shorter for the calves resulting from AI for early than late cows in both years (Table 3). Elevated ambient temperature in August probably caused heat stress in the cows at the time of calving. This was not the case in the late calving season. Decreased placental blood flow or increased corticoid levels in the heat stressed cows may have caused the shortened gestation lengths which resulted in lighter calves.

Table 3. Birth Weight, Gestation Length, and Calving Temperature at Early and Late Calving				
Season	Year	Birth Weight, kg[a]	Gestation Length, d	Temperature at Calving, C°
E	1	33.9 [b]	279.1 [b]	34.3
L	1	35.6 [c]	285.3 [c]	19.1
E	2	36.5 [d]	278.2 [b]	35.3
L	2	40.9 [e]	282.4 [c]	25.4
SEM		1.4	2.4	1.6

a Year P<0.008

b,c Means within year 1 differ P<0.04

d,e Means within year 2 differ P<0.04

To further evaluate the hypothesis that ambient temperature affects birth weight, natural service calves were evaluated since calves in the early calving season were born later in the summer and therefore in a cooler environment. There were no significant differences between the weights of the early and late calves that resulted from natural mating in either year (Table 4).

Table 4. Birth Weight of Calves from Natural Service

Season	Year	Weight, kg	Temperature, C^o
E	1	33.7	32.9
L	1	33.5	12.3
E	2	36.1	27.5
L	2	37.4	15.5
SEM		1.1	3.1

Implications

Late gestational heat stress may induce premature parturition and lighter birth weights in late summer calving cows. Late summer calving may reduce dystocia in first calf heifers. Economic evaluation of the effects of early vs late fall calving on weaning weight and total cost of production will be determined.

Literature Cited

Bagley C. P. et al. 1987. J Anim. Sci. 64:687.

Rakestraw J. et al. 1986. Therio. 26:461.

Selk et al. 1988. J Anim. Sci. 66: 3153.

Selk et al. 1990. Okla. Agr. Exp. Sta. Res. Rep. MP-129:9.

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