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Early weaning in Northern Great Plains beef cattle production systems: I. Performance and reproductive response in range beef cows ☆

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ABSTRACT

A study was conducted to determine if early weaning spring born calves can be an alternative management strategy during drought and if early weaning facilitates rebreeding of young cows. Our objectives were to determine effects of early weaning at the start of breeding on cow body weight, body condition score, and reproductive performance with or without estrous synchronization and AI in two herds in the Northern Great Plains, USA. In Exp. 1 and 2, crossbred cows were stratified within cow age by postpartum interval, and calf sex, and were assigned within strata to one of two weaning treatments at the start of breeding when calves averaged 80-d of age: (1) early weaned (permanent calf removal); or (2) no weaning (calves suckled cows until normal weaning approximately 210-d of age). Cows in Exp. 1 were exposed to natural service whereas cows in Exp. 2 were exposed to estrous synchronization for AI using a CIDR for 7 d with GnRH at CIDR insertion and $PGF_{2\alpha}$ at CIDR removal followed by natural service. In Exp. 3, cows were stratified within breed by age, postpartum interval, calf sex, and AI sire and were assigned within strata to one of two weaning treatments at the start of breeding, as described for Exp. 1 and 2. Estrous cycles of all cows were synchronized for AI using one of two protocols including 14 d CIDR+$PGF_{2\alpha}$ 16 d following CIDR removal (primiparous cows) or a CIDR insert for 7 d with GnRH at CIDR insertion and $PGF_{2\alpha}$ at CIDR removal (multiparous cows). Cows in Exp. 2 and 3 were bred by AI approximately 12 h after observation of estrus or by timed AI at 80 h after $PGF_{2\alpha}$ concurrent administration of GnRH. Artificial insemination (Exp. 2), breeding season pregnancy rate, and day of conception was not influenced ($P > 0.10$) by weaning treatment for Exp. 1 and 2. However, early weaned cows in Exp. 3 had 12.0% greater ($P = 0.03$) AI pregnancy rates and conception occurred 3.78 d earlier ($P = 0.03$) than normal weaned cows. At the time of normal weaning, cows that had their calves removed at early weaning were heavier and had greater body condition ($P < 0.01$) than normal weaned cows in each experiment. We conclude that early-weaning beef cows at the start of the breeding season improved BW gain and BCS allowing those females to enter winter in greater BCS then NW cows, but improvements in reproductive performance were inconsistent.

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1. Introduction

Cow–calf producers may optimize beef cow performance by implementing early weaning of calves particularly during times when forage quantity and/or quality are insufficient to meet cow requirements (e.g., drought) or when there is concern about impacts of low body condition on subsequent reproductive success (especially young cows). Lactation stress during periods of drought can exhaust nutritional stores in beef cows resulting in BW loss and decreased reproductive performance.

Suckling delays the onset of estrus in beef cows (Short et al., 1972), and early weaning before the breeding season has shortened the postpartum anestrous period and increased pregnancy rates (Laster et al., 1973; Lusby et al., 1981). Primiparous heifers have benefited from higher planes of nutrition when compared to multiparous cows during the anestrous period (Hansen et al., 1982), which would also suggest a benefit to early weaning. Lactating cows consume more forage than gestating cows (Galindo-Gonzalez et al., 2007; Marston and Lusby, 1995) and research has shown for each kg increase in milk yield a 0.33–0.37 kg (R^2=0.52 and 0.64, respectively) increase in daily forage dry matter intake (DMI) throughout lactation (Johnson et al., 2003). Thus indicating the removal of the demands of lactation early in the postpartum period should allow for the repartitioning of dietary nutrient towards maternal tissue and allow cows to be in greater body condition going into month where dietary forage is less nutrient dense (Waterman et al., 2007). Furthermore, the removal of lactational demands reduces intake demands and may conserve pasture resources that are valuable especially during extended drought conditions. Young cows (2 and 3-yr-olds) that are still partitioning nutrients for growth should benefit the most from early weaning strategies.

Reproductive protocols that induce estrous cycles are available for beef producers today that were not available 30 years ago. The objectives of this study were to determine effects of early weaning at the start of the breeding season compared to normal weaning at 7 months of age (Exp. 1) and the value of early weaning in association with applied reproductive strategies (Exp. 2 and 3) on reproductive performance, cow age, body weight (BW) gain, and body condition score (BCS) of beef cow herds in the Northern Great Plains, USA.

2. Material and methods

2.1. Study sites

The study was conducted at two locations in the Northern Great Plains, USA. For Exp. 1 and 2 the research was conducted at the USDA-ARS, Fort Keogh Livestock and Range Research Laboratory (LARRL), located approximately 1.6 km west of Miles City, MT 59301 (46°22′N 105°5′W), USA, at an average elevation of 730 m. Average annual precipitation is 340 mm with the majority occurring from April through September from convectional thunderstorms (Fig. 1). Predominant grass genera at this location included wheatgrass (*Pascopyron*), needlegrass (*Hesperostipa*), and grama (*Bouteloua*) within a mixed-grass dominated rangeland (Küchler, 1964). The average annual forage standing crop at the study site is 870 ± 14 kg/ha (Grings et al., 2005). Average daily temperatures range from −5 °C in January to 24 °C in July with daily maximum temperatures occasionally exceeding 37 °C during summer and daily minimums occasionally dropping below −40 °C during winter (WRCC, 2006).

For Exp. 3 the research occurred in Central Montana, approximately 5 km northeast of Judith Gap, MT 59453 (46°41′N 109°45′W), USA, at an average elevation of 1270 m. Annual precipitation for this region is 383 mm with the majority of that moisture accumulating from April through October (Fig. 1). Predominant forages in pastures at this location included wheatgrass (*Pascopyron*) and needlegrass (*Hesperostipa*) with slighter amounts of alfalfa (*Medicago*), grama (*Bouteloua*), junegrass (*Koeleria*), and bluegrass (*Poa*). Average daily temperatures, at this site, range from −3 °C in February to 21 °C in July with daily maximum temperatures occasionally exceeding 37 °C during summer and daily minimum temperatures occasionally dropping below −40 °C during winter (WRCC, 2006).

2.2. Animals, measurements and management

The LARRL Institutional Animal Care and Use Committee approved all animal handling and experimental procedures utilized in the present studies. Three similar experiments were conducted; two at LARRL and a third in a commercial production situation, Judith Gap. Each experiment had approximately twice as many early weaned (EW; weaned at approximately 80-d of age) cows as normal weaned (Control) cows to balance calf weaning treatments. While normal weaned calves remained on their dam until time of normal weaning (approximately 7 months of age) early weaned calves (approximately 2.5 months of age) received one of the following diets: (1) 17.5% CP (69% RDP and 7.53 MJ/kg NEm) or (2) 17.5% CP (57% RDP and 7.69 MJ/kg NEm) from time of early to normal weaning.

In Exp. 1, crossbred cows (predominantly Angus × Hereford) at the LARRL location (2005) calved over a 87 d period from March 1, 2005 to May 27, 2005 (primiparous cows March 14, 2005 through May 6, 2005 with a mean of March 30, 2005 ± 1.2 d; multiparous cows March 1, 2005 through May 27, 2005 with a mean of April 25, 2005 ± 0.9 d) and were stratified within cow age by calf sex and age then randomly assigned within strata to one of two weaning treatments at the start of breeding. Cows (n=338) had calves removed at the start of breeding (n=220; 78.1 ± 0.96 d postpartum) or at normal weaning (n=118; at approximately 210.5 ± 0.96 d postpartum). Cows were bred by natural service (bull:cow ratio of 1:23) without synchronization for a 58-d breeding season on July 5, 2005. Breeding pastures (n=2) contained both early weaned cows and normal weaned cows (cows with calves still nursing) and cows were assigned to a breeding pasture that contained either Angus or Polled Hereford bulls to maximize heterosis. Each breeding pasture contained a similar number of early and normal weaned