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Effect of 2 ovulation synchronization protocols on reproductive performance of May-calving cows

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ABSTRACT

A 2-yr experiment was conducted using Red Angus × Simmental cows (yr 1, n = 145; yr 2, n = 162). Cows were randomly assigned to 1 of 2 treatments: (1) cows received gonadotropin-releasing hormone (GnRH; 100 μg, i.m.) on d 0, prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$; 25 mg, i.m.) on d 7, and GnRH (100 μg, i.m.) with fixed-time AI (TAI) 48 h after $PGF_{2\alpha}$ (CO-Synch); or (2) cows received GnRH (100 μg, i.m.) and controlled internal drug release device (CIDR) insertion on d 0, $PGF_{2\alpha}$ (25 mg, i.m.) and CIDR removal on d 7, and GnRH (100 μg, i.m.) with TAI 60 h after $PGF_{2\alpha}$ (CO-Synch + CIDR). Five days after TAI, bulls were placed with cows for 45 d. Cows synchronized with the CO-Synch + CIDR protocol had increased (P < 0.01) AI and overall pregnancy rates compared with cows synchronized utilizing the CO-Synch protocol. Due to increased AI pregnancy rates, CO-Synch + CIDR cows calved 5 d (±1 d) earlier (P < 0.01), resulting in a greater (P < 0.01) proportion of cows calving within the first 21 d of the calving season compared with CO-Synch cows. Calf crop weaned per cow exposed was increased (P = 0.02) for CO-Synch + CIDR. Weaning BW per cow exposed was also greater (P = 0.04) for CO-Synch + CIDR. In conclusion, pregnancy rates were greater for CO-Synch + CIDR compared with the CO-Synch synchronization protocol, resulting in more calves born earlier in the calving season and a $55.22/cow increased net return utilizing the CO-Synch + CIDR protocol.

Key words: artificial insemination, beef cow, controlled internal drug release, ovulation synchronization

INTRODUCTION

In the north-central Great Plains, the breeding season for spring-calving systems coincides with high forage nutrient values (Adams et al., 1996); however, harvested forage is often needed to support increased cow nutrient demands during late gestation and early lactation. Moving the calving season to early summer could reduce harvested forage inputs (Clark et al., 2004), but would shift the breeding season to late summer, coinciding with reduced forage nutrient quality and increased environmental temperatures, possibly affecting reproductive performance (De Rensis and Scarmuzzi, 2003). Ovulation synchronization may allow more cows to become pregnant earlier as forage quality declines throughout the breeding season, which in turn can shorten the calving season, increase calf uniformity, and decrease AI labor (Lamb et al., 2001; Larson et al., 2006). Protocols using prostaglandin $F_{2\alpha}$ (**$PGF_{2\alpha}$**), gonadotropin-releasing hormone (**GnRH**), or a progestin have been developed to induce cyclicity and successfully synchronize estrus in beef cows (Thompson et al., 1999). The CO-Synch protocol [in which $PGF_{2\alpha}$ is administrated 7 d after GnRH, followed by a second injection of GnRH, and fixed-time AI (**TAI**) 48 h after $PGF_{2\alpha}$ administration] was compared with and without controlled internal device release (**CIDR**); however, TAI occurred at 60 h and reported pregnancy rates were 43 and 54%, respectively (Larson et al., 2006). When utilizing the CO-Synch protocol, 5 to 20% of cows will exhibit estrus before and immediately after $PGF_{2\alpha}$ administration; therefore, it is recommended for TAI to occur 48 h after $PGF_{2\alpha}$ administration (Kojima et al., 2000; Lamb et al., 2001; Larson et al., 2006). Adding a CIDR improved AI pregnancy rates in cows TAI 56 h after $PGF_{2\alpha}$ administra-

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tion (Dobbins et al., 2009). A direct comparison of these 2 protocols with recommended timing of AI has not been made. Therefore, the objective of the current experiment was to compare the effects of utilizing the CO-Synch or CO-Synch + CIDR TAI protocol on reproductive performance of May-calving cows.

MATERIALS AND METHODS

The University of Nebraska-Lincoln Institutional Animal Care and Use Committee approved the procedures and facilities used in this experiment.

Cow Management and Ovulation Synchronization

Red Angus × Simmental Cows (yr 1, n = 145, 2–8 yr old; yr 2, n = 162, 2–9 yr old) were used in a 2-yr experiment at the Gudmundsen Sandhills Laboratory (Whitman, NE). Cows were blocked by age and previous calving date and randomly assigned to 1 of 2 ovulation synchronization protocols (Figure 1). Cows assigned to CO-Synch received 100 μg i.m. of GnRH (Cystorelin, Merial, Duluth, GA) on d 0, 25 mg i.m. of $PGF_{2\alpha}$ (dinoprost tromethamine; Lutalyse, Zoetis, Florham Park, NJ) on d 7, and GnRH with TAI 48 h after $PGF_{2\alpha}$ administration. Cows assigned to CO-Synch + CIDR received GnRH with a CIDR device (Zoetis) on d 0. At d 7 the CIDR was removed, $PGF_{2\alpha}$ was administered, and GnRH with TAI was completed 60 h after $PGF_{2\alpha}$ administration. Cows were AI to 1 of 3 sires equally represented across treatments. Two of the sires were repeated both years, with the third sire differing between years. Five days after TAI, cows were placed with bulls for 45 d. Final pregnancy rate was determined using transrectal ultrasonography (Aloka SSD 500 with 7.5-MHz linear probe, Aloka Co. Ltd., Wallingford, CT) 45 d after bull removal. Artificial insemination conception rates were determined based on calving date, with day from TAI to calving calculated at 281 (±4 d) based on average gestation lengths reported in previous literature for AI sires (Larson et al., 2006). Days to calving were calculated as days from TAI to calving for all cows that calved. Cow BW and BCS were measured at breeding, pregnancy determination, and calving. Percent calf crop weaned per cow exposed was calculated by multiplying final pregnancy rate by weaning rate. Weaning weight per cow exposed was calculated by multiplying actual weaning weight by percent calf crop weaned per cow exposed.

Economic Analysis

Cows were assigned an opportunity cost based on National Slaughter Cattle Summary reported by the USDA Agricultural Marketing Service (USDA-AMS, 2009a, 2010) to reflect the cow value before the breeding season. Costs associated with ovulation synchronization ($PGF_{2\alpha}$, GnRH, and CIDR) were derived from the Estrus Synchronization Planner (Beef Reproduction Task Force, 2011). Semen and labor costs were based on actual costs. Net cost of 1 pregnant cow was calculated using the procedure by Feuz (1992). Total value of culled cows was subtracted from the total cost of all synchronized cows. Total costs were then divided by the number of cows synchronized divided by the TAI pregnancy rate or final pregnancy rate (for TAI or final pregnancy economic analysis, respectively) minus death loss to determine the total net cost of 1 pregnant cow.

Additionally, an economic analysis was conducted evaluating the number of calves weaned per cow synchronized. The difference in calves weaned per cow exposed was multiplied by the calf weaning value, as previously described (Stalker et al., 2006). Cow value at pregnancy diagnosis (cull value) was based on National Slaughter Cattle Summary reported by the USDA Agricultural Marketing Service (USDA-AMS, 2009b, 2011a). Calf weaning value was calculated based on Nebraska weighted average feeder cattle price reported for the given year at the time of weaning as reported by USDA Agricultural Marketing Service (USDA-AMS, 2009c, 2011b).

Statistical Analysis

The experiment was replicated over 2 yr, with cows being blocked by age and previous calving date and randomly assigned to 1 of 2 ovulation synchronization protocols each year; thus, cow was the experimental unit. Data were analyzed utilizing the MIXED and GLIMMIX procedures of SAS (SAS Institute Inc., Cary,

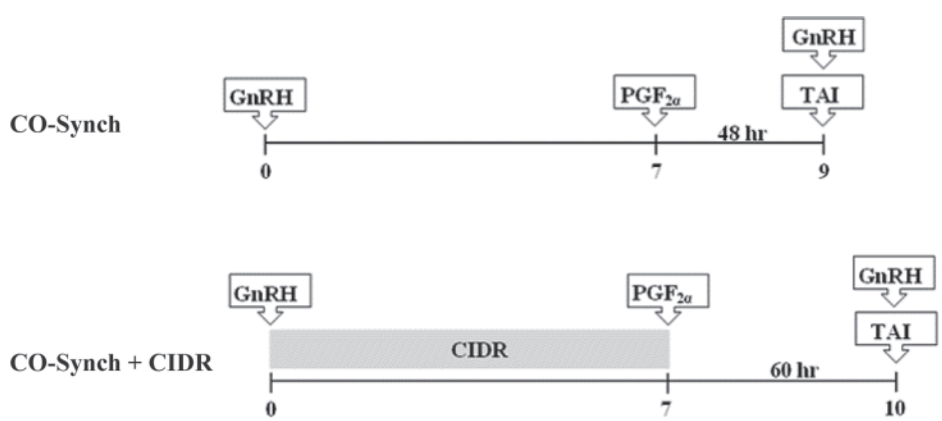

Figure 1. Treatment schedules for cows assigned to CO-Synch and CO-Synch + controlled internal drug release (CIDR) protocols. Cows assigned to CO-Synch were administered gonadotropin-releasing hormone (GnRH; 100 μg, i.m., Cystorelin, Merial, Duluth, GA) on d 0, prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$; 25 m.g., i.m., Lutalyse, Zoetis, Florham Park, NJ) on d 7, and GnRH and fixed-time AI (TAI) 48 h after $PGF_{2\alpha}$ administration. CO-Synch + CIDR cows received GnRH and CIDR insertion on d 0, on d 7 CIDR was removed and $PGF_{2\alpha}$ was administered, and GnRH and TAI took place 60 h after $PGF_{2\alpha}$ administration.

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