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Select Synch and Co-Synch protocols using a CIDR yield similar pregnancy rates after a fixed-time insemination in suckled *Bos indicus* × *Bos taurus* cows

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ABSTRACT

Primiparous and multiparous suckled *Bos indicus* × *Bos taurus* cows were used to compare a Select Synch + controlled internal drug release (CIDR) and timed artificial insemination (AI) protocol (SSC) to a modified CO-Synch + CIDR protocol (COS). Five separate groups of cows were utilized (n = 659) and within a group, cows were allotted to two treatments on the basis of body condition score (BCS) taken 10 days before and days postpartum at CIDR insertion (Day 0). Blood samples were collected on Day −10 and 0 for assessment of circulating concentrations of progesterone to determine estrous cycling status. Cows in both treatments received intramuscular (im) GnRH (100 μg) and a CIDR inserted on Day 0. On Day 7, the SSC treatment had CIDR removed and received im PGF2α (25 mg), whereas COS treatment had CIDR removed and received im PGF2α (25 mg) on Day 7.5. In the SSC treatment, estrus was detected daily at 0700 and 1700 hours for 72 hours after PGF2α administration, and cows were artificially inseminated 8 to 12 hours after a detected estrus. Cows failing to exhibit estrus were subjected to timed-AI and received im GnRH (100 μg) 76 ± 4 hours after PGF2α administration. In the COS treatment, cows received im GnRH (100 μg) and were fixed-time artificially inseminated at 64 ± 4 hours after PGF2α administration. Although group differences ($P < 0.05$) existed for synchronized AI pregnancy rates, there were no significant interactions of group with any variable analyzed; hence, groups were pooled for further evaluation. Within the SSC treatment, the 72-hour estrous response was 50.6% (168 of 332). Conception rate of cows in estrus was 66.1% (111 of 168), and timed-AI pregnancy rate for nonresponders was 32.3% (53 of 164). Overall synchronized AI pregnancy rates were similar ($P > 0.05$) for SSC (49.4%; n = 164 of 332) and COS (47.1%; n = 154 of 327). Estrous cycling status and days postpartum did not ($P > 0.05$) influence synchronized AI pregnancy rates but BCS did ($P < 0.05$). Cows with a BCS greater than or equal to 5 had synchronized AI pregnancy rates of 50% compared to 39% for cows with BCS lesser than 5.0. In summary, the modified COS protocol yielded similar synchronized AI pregnancy rates compared to the SSC protocol, and it appears that the modified COS protocol has the potential to be an effective timed-AI protocol in suckled *Bos indicus* × *Bos taurus* cows.

1. Introduction

Development of a synchronization protocol that achieves acceptable and repeatable pregnancy rates in *Bos indicus* × *Bos taurus* cattle is important in subtropical regions of the world where a majority of cattle contain some

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Bos indicus genetics. Numerous synchronization protocols have been developed in *Bos taurus* cattle that yield acceptable AI pregnancy rates while minimizing the number of cattle workings and days needed to detect estrus. One of the more consistent protocols in *Bos taurus* cattle is the Select Synch + controlled internal drug release (CIDR) and timed artificial insemination (AI) protocol (SSC) [1]. This protocol includes GnRH administration at the initiation of a CIDR insert followed 7 days later with PGF2α with estrous detection and AI for 72 hours plus a timed-AI and GnRH 72 to 84 hours after PGF2α administration for cattle not exhibiting estrus by 72 hours. In a multi-site field study, Larson et al. [1] reported synchronized AI pregnancy rates of 58% in suckled *Bos taurus* cows. In contrast, there are only a few studies with limited cattle numbers in suckled *Bos indicus* × *Bos taurus* cows synchronized with the SSC where synchronized AI pregnancy rates range from 37% to 54.4% [2,3].

Because estrus can be difficult to detect in cattle of *Bos indicus* breeding [4,5], an additional approach to synchronization is to eliminate estrous detection and conduct a fixed-time AI. A common fixed-time AI protocol in *Bos taurus* cattle is the CO-Synch + CIDR protocol (COS) with fixed-time AI conducted either 48 [6] or 60 hours [1] after PGF2α administration resulting in AI pregnancy rates of 44% and 54%, respectively. In contrast, synchronization of *Bos indicus* × *Bos taurus* cows with the COS with a fixed-time AI at 48 hours yielded pregnancy rates between 33% and 39% [7,8]. In *Bos indicus* × *Bos taurus* cows synchronized with the Select Synch + CIDR protocol, Saldarriaga et al. [8] reported that the average interval from CIDR removal to the onset of estrus was 70 hours, which was considerably greater than the mean interval to estrus of 55 hours observed in *Bos taurus* cattle [9,10]. Zalauga et al. [11] further reported that cows of *Bos indicus* × *Bos taurus* breeding synchronized with a COS with a fixed-time AI at 66 hours had a greater follicle diameter at the timed-AI, which was associated with greater pregnancy rates. Therefore, in *Bos indicus* × *Bos taurus* cattle, developing protocols to increase follicular diameter at timed-AI appears to be critical for maximizing AI pregnancy success. Potential methods to accomplish this include moving the timed-AI from 48 to 60 hours after PGF2α administration and (or) extending the duration of CIDR placement and thereby extending the duration of follicular growth before an induced ovulation.

Therefore, the objective of this experiment was to evaluate the effectiveness of a Select Synch + CIDR and timed-AI (SSC) protocol compared to a modified COS with the duration between CIDR insertion and removal extended from 7 to 7.5 days and the interval from PGF2α administration to timed-AI extended to approximately 60 hours in suckled *Bos indicus* × *Bos taurus* cows.

2. Materials and methods

2.1. Animals

The experiment was conducted from January to May during a single year at two locations in northern Florida. All procedures during this experiment were approved by the University of Florida's Institutional Animal Care and Use Committee. Five groups of primiparous and multiparous suckled *Bos indicus* × *Bos taurus* cows (n = 659) were used. Cow age, estrous cycling status, body weight, body condition score (BCS: 1 = severely emaciated, 5 = moderate, 9 = very obese) [12], and days postpartum (DPP) at CIDR insertion for each group are presented in Table 1. Groups 1 (n = 173) and 3 (n = 193) contained 100% multiparous cows. Group 2 contained 93 primiparous cows (first calf at 2 years) and 39 multiparous cows, group 4 contained 26 primiparous cows (first calf at 3 years) and 68 multiparous cows, and group 5 contained 12 primiparous cows (first calf at 3 years) and 35 multiparous cows. The degree of *Bos indicus* (Brahman based) breeding was approximately 10% to 40% for groups 1, 2, and 3 with the remainder being *Bos taurus* (Angus, Charolais) breeding. For groups 4 and 5, breed composition was known and it was 25% to 75% *Bos indicus* (Brahman based) with the remainder being *Bos taurus* (Angus based). Groups 1, 2, and 3 were started on the experimental protocol in three consecutive weeks and groups 4 and 5 were started on the experimental protocol 3 weeks after group 3 with 3 weeks between the start of each group. Calves remained with cows throughout the experiment and were only temporaily separated from cows when cattle were worked through the handling facilities during the synchronization protocol.

2.2. Experimental design

Ten days before CIDR insertion (Day −10) and at CIDR insertion (Day 0), blood samples were collected by jugular venipuncture into evacuated tubes with an anticoagulant (EDTA; Becton, Dickinson and Company, Franklin Lakes, NJ, USA) for the determination of circulating concentrations of progesterone to evaluate estrous cycling status. After collection, blood samples were immediately placed on ice

Table 1
Physical description (mean ± standard deviation) and estrous cycling status for suckled *Bos indicus* × *Bos taurus* cows in each group used in the study.

Group	n	Estrous cycling status (%)[a]	Cow age (range)	Body weight, kg (range)	Body condition score (range)[b]	Days postpartum (range)
1	173	59.0	6.5 ± 1.9 (3–10)	557 ± 55 (418–705)	5.4 ± 0.7 (3.5–7.0)	74.0 ± 17.5 (48–128)
2	152	38.2	2.4 ± 0.6 (2–7)	463 ± 49 (367–630)	5.2 ± 0.5 (4.0–7.0)	75.4 ± 16.3 (47–102)
3	193	59.6	6.6 ± 2.0 (4–10)	562 ± 57 (432–730)	5.5 ± 0.6 (4.0–7.0)	62.8 ± 5.9 (54–99)
4	94	64.9	5.2 ± 2.2 (3–12)	561 ± 61 (427–736)	5.1 ± 0.6 (3.5–6.5)	71.3 ± 13.2 (50–99)
5	47	66.0	5.1 ± 1.8 (3–12)	557 ± 67 (397–736)	5.1 ± 0.7 (3.5–6.5)	53.8 ± 8.4 (41–69)

[a] Blood samples were collected on Days −10 and 0 (controlled internal drug release insertion) of the experiment to determine estrous cycling status. A cow was defined as estrous cycling if either sample had progesterone concentrations greater than or equal to 1 ng/mL and anestrus if progesterone concentrations were lesser than1 ng/mL at both samples.
[b] Body condition score (Scale 1–9): 1 = severely emaciated, 5 = moderate; 9 = very obese.