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Evaluation of two progestogen-based estrous synchronization protocols in yearling heifers of *Bos indicus* × *Bos taurus* breeding

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Abstract

Yearling *Bos indicus* × *Bos taurus* heifers (n = 410) from three locations, were synchronized with either the Select Synch/CIDR+timed-AI (SSC+TAI) or 7-11+timed-AI (7-11+TAI) treatments. On Day 0 of the experiment, within each location, heifers were equally distributed to treatments by reproductive tract score (RTS; Scale 1–5: 1 = immature, 5 = estrous cycling) and body condition score. The 7-11+TAI treatment consisted of melengestrol acetate (0.5 mg/head/d) from Days 0 to 7, with $PGF_{2\alpha}$ (25 mg im) on Day 7, GnRH (100 μg im) on Day 11, and $PGF_{2\alpha}$ (25 mg im) on Day 18. The SSC+TAI heifers received the same carrier supplement (without MGA) from Days 0 to 7, and on Day 11 they were given 100 μg GnRH and an intravaginal CIDR (containing 1.38 g progesterone). The CIDR were removed on Day 18, concurrent with 25 mg $PGF_{2\alpha}$ im For both treatments, estrus was visually detected for 1 h twice daily (0700 and 1600 h) for 72 h after $PGF_{2\alpha}$, with AI done 6 to 12 h after a detected estrus. Non-responders were timed-AI and received GnRH (100 μg im) 72 to 76 h post $PGF_{2\alpha}$. The 7-11+TAI heifers had a greater ($P < 0.05$) estrous response (55.2 vs 41.9%), conception rate (47.0 vs 31.3%), and synchronized pregnancy rate (33.5 vs 24.8%) compared to SSC+TAI heifers, respectively. Heifers exhibiting estrus at 60 h (61.7%) had a greater ($P < 0.05$) conception rate compared to heifers that exhibited estrus at ≤ 36 (35.3%), 48 (31.6%), and 72 h (36.2%), which were similar ($P > 0.05$) to each other. As RTS increased from ≤ 2 to ≥ 3, estrous response, conception rate, synchronized pregnancy rate, and 30 d pregnancy rate all increased ($P < 0.05$), irrespective of synchronization treatment. In conclusion, the 7–11+TAI treatment yielded greater synchronized pregnancy rates compared to SSC+TAI treatment in yearling *Bos indicus* × *Bos taurus* heifers.

Keywords: Artificial insemination; Beef heifers; CIDR; Estrous synchronization; MGA

1. Introduction

Estrous synchronization is a reproductive management tool that allows for an increased number of cattle displaying estrus over a 3 to 5 d period, thereby allowing for either minimal estrus detection or timed-AI (without estrus detection). The Select Synch protocol, commonly used to synchronize estrus in *Bos taurus* cattle, utilizes GnRH with prostaglandin $F_{2\alpha}$ ($PGF_{2\alpha}$) 7 d later [1,2], followed by 5 d of estrus detection. However, premature expression of estrus prior to $PGF_{2\alpha}$ commonly occurs, resulting in the need for additional estrus detection [3]; this can be eliminated by giving exogenous progestogen between GnRH and $PGF_{2\alpha}$ [4,5]. The addition of a progesterone insert, e.g., the Eazi-Breed™ CIDR® (CIDR) to the Select Synch protocol, combined with estrus detection for 72 h after CIDR removal and timed-AI + GnRH for non-responders, also known as the Select Synch/CIDR+timed-AI protocol, is an effective estrus

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Table 1
Characteristics of yearling *Bos indicus* × *Bos taurus* heifers synchronized with two progestogen-based estrous synchronization protocols (LSMeans ± SEM).

Location	No.	Reproductive tract score[a]	Body condition score[b]
1	61	3.8 ± 0.14	5.5 ± 0.05
2	119	3.6 ± 0.10	5.0 ± 0.04
3	230	3.7 ± 0.07	5.0 ± 0.03

[a] Reproductive tract score (Scale 1–5): 1 = immature, 5 = estrous cycling.
[b] Body condition score (Scale 1–9): 1 = severely emaciated, 5 = moderate; 9 = very obese.

synchronization protocol in yearling *Bos taurus* heifers [6]. However, the effectiveness of this protocol in yearling *Bos indicus* × *Bos taurus* heifers has not been thoroughly evaluated.

The 7–11 synchronization protocol consists of a 7 d melengestrol acetate (MGA) treatment, with $PGF_{2\alpha}$ on the last day of MGA, followed by GnRH 4 d later. Seven days after GnRH, $PGF_{2\alpha}$ is given to synchronize estrus [7]. The 7–11 protocol is effective in *Bos taurus* cattle [7,8], but there are apparently no reports regarding the effectiveness of the 7–11 protocol in yearling heifers of *Bos indicus* × *Bos taurus* breeding. The rationale for this protocol is that GnRH 4 d after MGA + $PGF_{2\alpha}$ ovulates the majority of large follicles, which results in synchronous follicle development when $PGF_{2\alpha}$ is given 7 d later. When this protocol was recently used to synchronize suckled postpartum Brangus and Angus cows (estrous cycling and anestrous), 94.4% ovulated in response to GnRH treatment [9]. The resulting 5-d estrous response, conception, and synchronized pregnancy rates were similar between Angus and Brangus cows. Since GnRH effectively ovulates and synchronizes follicles when administered 4 d after a short-term (7 d) progestogen treatment in Brangus cows, the 7–11 protocol could be effective in yearling heifers of *Bos indicus* × *Bos taurus* breeding.

The objective of the present experiment was to evaluate the effectiveness of the 7–11 + timed-AI and Select Synch/CIDR+timed-AI synchronization protocols in yearling heifers of *Bos indicus* × *Bos taurus* breeding.

2. Materials and methods

2.1. Animals

The experiment was conducted at three locations in North Central Florida from January to March. Yearling (12–15 mo) *Bos indicus* × *Bos taurus* heifers (n = 410) were used. The proportion of *Bos indicus* breeding ranged from approximately 25–50%, with the remainder being *Bos taurus* breeding (Table 1).

2.2. Experimental design

At the start of the experiment (Day 0) heifers were evaluated for and equally distributed by reproductive tract score (RTS) [10] and body condition score (BCS; Scale 1–9; 1 = severely emaciated, 5 = moderate, 9 = very obese) [11] to one of two progestogen-based synchronization protocols, including the 7–11 + timed-AI (7–11 + TAI) and Select Synch/CIDR + timed-AI (SSC + TAI) protocols (Fig. 1). A single technician with several years experience of conducting RTS performed the RTS exams at all locations. The 7–11 + TAI heifers received MGA (MGA®200 premix, Pfizer Animal Health, New York, NY, USA) in a carrier supplement fed at a rate of 0.9 kg/head/d, to deliver 0.5 mg MGA/head/d from Days 0 to 7 of the experiment. Heifers were given $PGF_{2\alpha}$ (25 mg im; Lutalyse® Sterile Solution, Pfizer Animal Health, New York, NY, USA) on the last day of MGA. On Day 11, heifers received GnRH (100 μg im; Cystorelin®, Merial, Duluth, GA, USA), followed by $PGF_{2\alpha}$ (25 mg im; Lutalyse® Sterile Solution) on Day 18. The SSC + TAI heifers received the same carrier supplement without MGA from Days 0 to 7. On Day 11, a CIDR (1.38 g progesterone; Eazi-Breed™ CIDR®, Pfizer Animal Health) was inserted concomitant with GnRH (100 μg im; Cystorelin®). The CIDR were removed on Day 18 concurrent with $PGF_{2\alpha}$ (25 mg im; Lutalyse® Sterile Solution). The MGA supplement and the supplement without MGA were dispensed into feed bunks to promote uniform consumption.

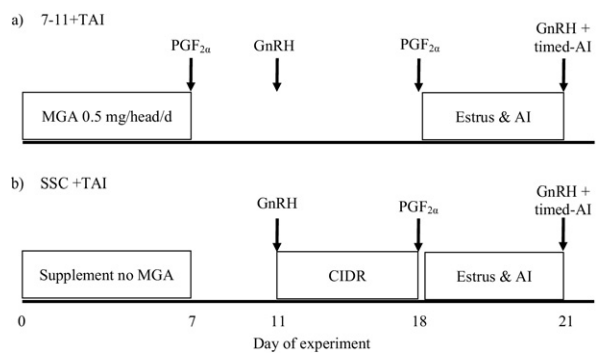

Fig. 1. Experimental design evaluating the effects of two progestogen-based synchronization treatments in yearling *Bos indicus* × *Bos taurus* heifers. a) 7-11+ timed-AI (7-11+TAI). b) Select Synch/CIDR+timed-AI (SSC+TAI). Heifers not exhibiting estrus by 72 h were timed-AI and concurrently given GnRH (100 μg im) between 72 and 76 h.