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SHORT COMMUNICATION

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Effect of oestrous resynchronization on the reproductive efficiency of zebu cows

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Abstract

The aim of this study was to develop a resynchronization strategy before the return of oestrus in cows diagnosed as not pregnant after fixed-time artificial insemination (TAI). A total of 839 cows, approximately 45 days post-partum, were synchronized using TAI. On day 0, intravaginal progesterone-releasing devices were inserted and 2 mg of oestradiol benzoate was administered. Eight days later (D8), the progesterone-releasing devices were removed and oestradiol cypionate (0.5 mg, eCG [300 IU]) and prostaglandin (7.5 mg) were administered. All cows were inseminated between 48 and 56 hr after device removal (D10). Thirty days after TAI, cows that were not diagnosed as pregnant by ultrasound were immediately resynchronized and again inseminated at a fixed time. The hormonal protocol used in the first and second rounds of TAI was the same. The pregnancy rate after the first TAI was 52%, and after the second TAI, it was 49%. The increase in the total pregnancy rate (synchronization + second oestrous synchronization) compared to a single synchronization was 23.5%. In conclusion, resynchronization of oestrus and ovulation in zebu cows that had previously undergone TAI protocols is effective in increasing the reproductive efficiency.

KEYWORDS
bovine, pregnancy, synchronization, TAI

1 | INTRODUCTION

Optimizing the reproductive efficiency maximizes beef cattle profitability. There are different strategies to optimize the reproductive efficiency, including synchronization of oestrus and fixed-time artificial insemination (TAI), which have been widely used to improve the reproductive efficiency of the herd (McDougall & Loeffler, 2004). Fixed-time artificial insemination uses commercially available hormones to mimic the reproductive cycle of cows and heifers. It is therefore possible to perform artificial insemination (AI) at pre-determined times, even in post-partum anoestrous females (Baruselli, Sales, Sala, Vieira, & Filho, 2012). Currently, these protocols are the most commonly used methods to synchronize follicular wave emergence and ovulation in TAI in cows (Bó et al., 2018).

The use of TAI has proved to be crucial in the induction and/or synchronization of oestrus during the post-partum period and/or near puberty. On average, only 50% of cows become pregnant post-TAI treatment. Thereafter, a second TAI treatment in the same breeding season by an oestrous resynchronization is expected to increase this by at least 20%, conferring an overall pregnancy rate of ≥70%, which contributes to a reduction in the service period (Colazo et al., 2006). The present study aimed to evaluate the effect

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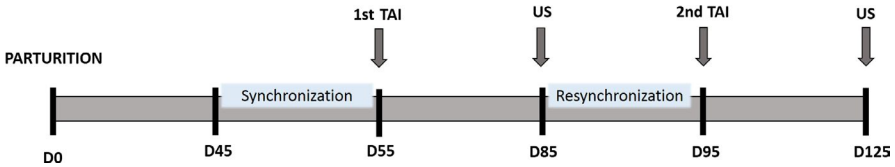

FIGURE 1 Reproductive management of cows submitted to fixed-time artificial insemination (TAI) programme. D, day; Ultrasound, US

of oestrous resynchronization on the pregnancy rate of previously inseminated cows by TAI in the tropics using zebu cows.

2 | MATERIALS AND METHODS

All animals were handled at commercial farms during routine management and TAI procedures. Cows were provided with a high standard of veterinary care, and animal welfare was considered at all times.

Bos indicus cows (n = 839) were used in this study, allocated to two commercial farms located in western Pará. All cows were aged 4.5 ± 0.12 years and with an initial body condition score of 3.0 ± 0.05 (range 1–5). All animals were kept in the same conditions being reared in on pasture area dominated by *Brachiaria sp*, access to water, and mineral supplementation was ad libitum.

All cows underwent a rigorous selection process based on gynaecological examination before being included in the study. Approximately 45 days post-partum, which was established based on previous calf birth date, all cows were synchronized and then inseminated at a fixed-time (1st TAI). After 30 days, cows that were not diagnosed as pregnant by ultrasound were immediately resynchronized and again inseminated at a fixed-time (2nd TAI) and were then resubmitted to a second ultrasound to diagnose pregnancy (Figure 1).

For synchronization and resynchronization of oestrus, on day 0 (D0) the cows received an intravaginal progesterone-releasing device (CIDR, Zoetis Animal Health; 1.9 mg of progesterone) which remained in the cranial portion of the vagina for 8 days. A 2.0 mg of oestradiol benzoate (EB; RIC BE®, Tecnopec) via intramuscular injection (IM) was administered on D0. On day 8 (D8), the progesterone-releasing device was removed and all cows received 0.5 mg of oestradiol cypionate (ECP; E.C.P®, Zoetis), 300 IU of equine chorionic gonadotropin (eCG; Novormon®, Zoetis) and 7.5 mg of prostaglandin (PGF2α; Lutalyse®, Zoetis) all administered via IM. Between 48 and 56 hr (D10) after the progesterone-releasing device was removed, FTAI was performed by a single technician. Pregnancy diagnosis was performed by ultrasonography 30 days after the first and subsequently the second TAI treatments. The pregnancy rate was defined as the number of pregnant cows divided by the total number of cows submitted to TAI. The differences in pregnancy rates between the first and second TAI treatments were evaluated via chi-square statistical tests. A significance level of $p \leq 0.05$ was set.

3 | RESULTS

The pregnancy rates obtained in the first and second TAI are shown in Table 1. The pregnancy rates after the first TAI were 52% (437/839), and in the resynchronized cows, it was 49% (197/402). No differences were observed in the pregnancy rate among first and second TAI ($p > 0.05$). The increase in the total pregnancy rate (synchronization plus a second oestrous synchronization) compared to a single synchronization was 23.5%.

4 | DISCUSSION

Oestrous synchronization resulted in a pregnancy rate of 52%. This is in agreement with previous studies that reported a pregnancy rate of 50% after synchronization (Bo, Baruselli, & Mapletoft, 2013), including a study conducted in the Amazon region (Pereira et al., 2018). However, lower pregnancy rates of 38.6% (Torres-Júnior et al., 2014) and 41.9% (Sá Filho et al., 2014) have been reported. The differences in the reported studies could be attributed to several different factors. For example, different progesterone sources used in the synchronization protocol (Patron et al., 2019), farm management and mineral supplementation (Minervino, Cardoso, & Ortolani, 2008), body condition scores of cows (Pereira et al., 2018) and control of reproductive diseases in the herd (El-Tarabany & AL-Marakby, 2019), which can all affect the pregnancy rates after TAI, making it difficult to compare across studies. Oestrous resynchronization reduces the service time and therefore increases the reproductive efficiency of the herd (Sá Filho et al., 2014). In this study, oestrous resynchronization resulted in 49% pregnancy rate, similar to the 52.7% reported elsewhere (Campos, Marinho, Lunardelli, Morotti, & Seneda, 2013). Despite the resynchronization (2nd TAI) has a lesser impact than the first TAI, due to the lower proportion of the herd is inseminated, the resynchronization of

TABLE 1 Effect of oestrous synchronization and resynchronization on the gestation rate of cows submitted to TAI

Cows[a]	Synchronization (1st TAI)	Resynchronization (2nd TAI)	Overall pregnancy rate (%)	Pregnancy rate increase[b] (%)
Pregnant	437/839 (52.0%)	197/402 (49.0%)	634/839 (75.5%)	197/839 (23.5%)
Non-pregnant	402/839 (48.0%)	205/402 (51.0%)	-	-

*There was no significant difference in the chi-square test ($p < 0.05$).
**Total pregnancy rate increased after resynchronization TAI = fixed-time artificial insemination.

non-pregnant cows is extremely important to increase the herd pregnancy rate, especially when conception rates are low and oestrous detection rates are inadequate (Colazo et al., 2006).

In our experimental conditions, a cumulative pregnancy rate of 75.5% was obtained, thereby increasing the proportion of pregnant animals in the breeding season. These results are in agreement with Bó et al., (2002) that observed a cumulative pregnancy rate of 78.5%, are similar to the results of Campos et al., (2013) who reported a cumulative pregnancy rate of 76.6%, but are slightly less than the 81.6% conception rate reported by Oliveira et al., (2019) who used new progesterone-releasing devices.

Previous research (Irikura, Uematsu, Kitahara, Osawa, & Sasaki, 2018a, 2018b) showed an increase in pregnancy rate after a third artificial insemination (AI). Resynchronization facilitates greater use of TAI, which is favourable to allow for cross-breeding, replacement of genetically superior matrices, greater standardization of batches of calves and reduction in the amount of bulls needed. Our results along with the study by Irikura et al., (2018a, 2018b) suggest that future studies on resynchronization, followed by a third AI treatment under tropical conditions, could also aid in maximizing the reproductive efficiency.

5 | CONCLUSION

Resynchronization of oestrus and ovulation in cows previously treated via TAI protocols is effective for increasing the overall pregnancy rate per insemination in herds in western Pará. The increase in the total pregnancy rate (synchronization + second oestrous synchronization) compared with a single synchronization was 23.5%. Resynchronization is a leverage tool for regional genetic improvement by the incorporation of desired characteristics through the use of enhancer bulls according to the requirements of cattle breeders.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this article.

AUTHOR CONTRIBUTIONS

NSF, LLP and CMGS performed the field study and draft the paper. KKLN, WGV and AHHM designed the study, analysed data and revised the paper.

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