

Enhancing pregnancy rates in Bali cattle (*Bos javanicus*) through prostaglandin F_{2α}-based estrus synchronization

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ABSTRACT: This study evaluated the effectiveness of estrus synchronization using prostaglandin F_{2α} (PGF_{2α}) in Bali cattle and assessed the pregnancy outcomes following the initial treatment and subsequent resynchronization. Ten Bali cattle received two PGF_{2α} injections, administered 11 days apart, following standard recommendations. Animals exhibiting estrus were artificially inseminated, and pregnancy diagnosis was performed 30–45 days post-insemination using ultrasonography. Cattle that failed to conceive during the first cycle underwent a resynchronization protocol two weeks later. The synchronization protocol produced a 100% estrus response, with an initial pregnancy rate of 40% (4 cattle). Resynchronization of the six non-pregnant cattle yielded two additional pregnancies (33.3%), resulting in an overall pregnancy rate of 60%. These findings demonstrate that PGF_{2α} is effective in regulating the estrus cycle and enhancing the reproductive efficiency of Bali cattle, particularly when integrated with a resynchronization strategy.

Keywords:

estrus synchronization, prostaglandins, Bali cattle, pregnancy rate

■ INTRODUCTION

Bali cattle, an important component of Indonesia's native livestock, show strong adaptability to tropical conditions and efficient feed utilization. Their reproductive performance remains suboptimal owing to inadequate management, poor heat detection, and irregular estrus cycles, which reduce reproductive efficiency. Estrus synchronization regulates the estrus cycle, so multiple females exhibit estrus within a synchronized timeframe, facilitating efficient artificial insemination (AI) and reducing costs. Among available protocols, prostaglandin F_{2α} (PGF_{2α}) and its analogs are frequently used. PGF_{2α} induces luteolysis and corpus luteum (CL) regression, leading to decreased progesterone levels, return to the follicular phase, and estrus manifestation (Wiltbank *et al.* 2018). However, PGF_{2α} effectiveness depends on the animal's physiological status, particularly the presence of a functional corpus luteum (Haile *et al.* 2023).

The application of PGF_{2α} to Bali cattle is expected to accelerate and standardize the onset of estrus, increase pregnancy rates through artificial insemination (AI), and shorten calving intervals. Therefore, estrus synchronization using prostaglandin F_{2α} is an important strategy for improving reproductive efficiency and productivity in Bali cattle at the farm level.

■ MATERIALS AND METHODS

Animals: This study was conducted on ten adult female Bali cattle aged 5–6 years, each with a Body Condition Score (BCS) ranging from 2.5 to 3.5. Prior to treatment, all animals underwent a reproductive examination via rectal palpation to confirm the presence of a functional corpus luteum (CL). Cattle meeting this criterion received an intramuscular injection of PGF_{2α} at a dose of 25 mg dinoprost, followed by a second injection administered on day 11.

Estrus detection: Estrus occurred for four days after the second PGF_{2α} administration. Signs of restlessness, vulvar swelling, and clear cervical mucus discharge were noted, and the dominant follicle size was assessed via ultrasonography 48–72 h after the second injection. Cattle showing estrus were inseminated with frozen semen from Banteng bulls.

Pregnancy diagnosis: Pregnancy diagnosis was performed 30–45 days post-insemination via ultrasonography. Cattle that did not conceive during this first insemination were subjected to a resynchronization protocol two weeks after pregnancy status was confirmed.

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■ RESULTS AND DISCUSSION

Estrus synchronization using prostaglandin F_{2α} (PGF_{2α}) in ten Bali cattle resulted in a 100% estrus response, with all animals exhibiting behavioral and physiological signs of estrus (Figure 1). The first insemination following synchronization yielded a pregnancy rate of 40% (4 of 10 cattle). The six cattle that did not conceive during the initial cycle were subjected to a resynchronization protocol. All six animals again showed signs of estrus, and two additional pregnancies (33.3%) were confirmed in the second estrus. Overall, the combined synchronization and resynchronization treatments produced a total pregnancy rate of 60%.

PGF_{2α} administration effectively induces estrus and supports satisfactory conception in cattle. The 100% estrus response in the present study aligned with previous findings in Bali cattle, where estrus expression following PGF_{2α} injection approached complete synchronization (Mukkun *et al.* 2021). The initial pregnancy rate of 40% was lower than the 83.33% reported by Firmiati *et al.* (2023) in Bali cattle after synchronization. Similar variations exist in other breeds; Yeshimebet *et al.* (2017) found a 73.5% estrus response and 59.6% pregnancy rate in dairy cattle, whereas Haile *et al.* (2023) reported an 86.7% estrus response in local cows. Such variability suggests that pregnancy outcomes are influenced by multiple factors beyond hormonal therapy alone.

The resynchronization protocol used in this study yielded two additional pregnancies (33.3%) among the six initially non-pregnant cows, increasing the total pregnancy rate to 60%. This demonstrates that resynchronization can enhance cumulative reproductive efficiency and provide farmers with more predictable and manageable insemination schedules. Variation in responsiveness between cows during the first treatment cycle may be influenced by the functional status of the corpus luteum, age, physiological condition, nutritional status, and the timing of artificial insemination.

The interval to estrus following PGF_{2α} administration typically ranges from 48 to 96 h and most commonly occurs around 60–72 h. However, this timing may vary depending on the synchronization protocol (single vs. double injection), stage of the estrus cycle at injection, parity, and the animal's physiological and nutritional status. Two PGF_{2α} injections administered 11–14 days apart are commonly used to ensure effective luteolysis, particularly in cows lacking a functional corpus luteum at the time of the first injection (Malik, 2019; Kertawirawan *et al.* 2021). Prostaglandins exert their effects only when the corpus luteum is mature and functional, typically between days 5 and 17 of the estrus cycle. If treatment is administered during the follicular phase or when the corpus luteum is immature, luteolysis may be incomplete, leading to absent or delayed estrus responses (Wiltbank *et al.* 2015; Stevenson *et al.* 2012). Although PGF_{2α} reliably induces luteolysis and estrus, optimal pregnancy outcomes ultimately depend on post-luteolysis reproductive management, particularly the timing and accuracy of AI (Kertawirawan *et al.* 2021).

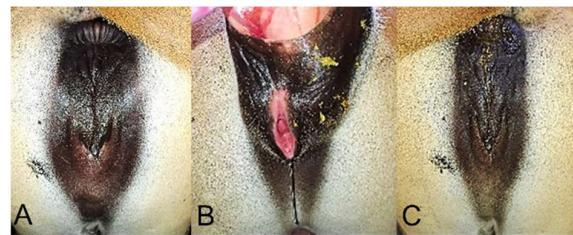


Figure 1. Clinical signs of estrus 48h (A, B) and 72h (C) after the 2nd injection of PGF_{2α} in Bali cattle, showed no significant differences.

■ CONCLUSION

Estrus synchronization using prostaglandin F_{2α} in Bali cattle achieved 40% pregnancy, which increased to 60% after resynchronization. This program is suitable for smallholder farms with proper care.

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