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Research Article

Intramuscular injection of prostaglandins with different trademarks in Balinese cattle (*Bos sondaicus*) on the speed and duration of estrus

Injeksi prostaglandin intramuskular dengan merek dagang berbeda pada sapi bali (Bos sondaicus) terhadap kecepatan dan lama estrus

Basri Fadiellah[1], I Gede Nano Septian[1*], Zaid Al Gifari[1]

[1] Faculty of Animal Sciences, University of Mataram, Mataram 83125, Indonesia

*email: nanoseptian@staff.unram.ac.id

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Abstract: The aim of this study was to compare the effectiveness of different brands of intramuscularly injected prostaglandin hormones on the speed and duration of estrus in Bali cattle. The study used 21 Bali cattle as subjects, divided into three treatment groups: P1 received 5 ml of Capriglandin, P2 received 5 ml of Lutalyse, and P3 received 2 ml of Juramate. The data collected included the speed and duration of estrus in hours. The results showed that for the speed of estrus onset, P1 required 69 hours, P2 56 hours, and P3 55 hours. Regarding the duration of estrus, P1 took 17 hours, P2 14 hours, and P3 13 hours. The findings indicate that the Juramate hormone resulted in the quickest onset of estrus, while the Capriglandin hormone led to a longer duration of estrus compared to the other hormones.

Keywords: Prostagladin; Estrus; Balinese Cows

Abstrak: Tujuan dari penelitian ini adalah untuk mengetahui perbandingan efektivitas hormon prostaglandin yang disuntikkan secara intramuskular dengan merek dagang yang berbeda, terhadap kecepatan dan lama estrus pada sapi Bali. Pada penelitian ini digunakan hewan coba yaitu sapi Bali dengan jumlah sapi sebanyak 21 ekor dengan menggunakan tiga perlakuan yaitu (P1) yang mengandung 5 ml capriglandin (P2), 5 ml lutalyses (P3), dan 2 ml juramate. Diperoleh data seperti kecepatan dan periode birahi dalam satu jam. Pengujian hormon capriglandin, lutalyse dan juramat terhadap kecepatan birahi menunjukkan (P1) membutuhkan waktu 69 jam, (P2) 56 jam dan (P3) 55 jam sedangkan periode birahi (P1) membutuhkan waktu 17 jam, (P2) 14 jam dan (P3) 13 jam. Dari penelitian ini menunjukkan reaksi hormon juramate mengakibatkan timbulnya estrus lebih cepat dan hormon capriglandin menunjukkan reaksi estrus yang lebih lama dibandingkan dengan hormon berahi.

Kata kunci: Prostagladin; Estrus; Sapi Bali

INTRODUCTION

Bali cattle are native to the island of Bali in Indonesia and are of Indonesian origin. Bali cattle have many advantages, which is why they are so widely kept by farmers. The following paper sets out to explore the advantages of Bali cattle (Pribadi *et al.*, 2014). It is evident that the species is characterised by high fertility levels, adaptability (Noor and Karmita, 2001), and a heterosis effect when crossed (Noor and Karmita, 2001). Heterosis effect is the superiority in performance of a crossbred offspring (hybrid) that exceeds the average or even the best of its parents. Furthermore, the Bali cattle is known to produce meat of a high quality and low fat percentage (Sampurna and Suatha, 2010; Hastang and Asnawi, 2014). In addition to the

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aforementioned points, the species is resistant to ticks and worms (Sampurna and Suatha, 2010). The aforementioned advantages highlight the need for both population and genetic improvement of Bali cattle. Central to enhancing overall livestock production is the optimization of reproductive efficiency.

Estrus synchronization is a reproductive technology that has been developed for the purpose of improving reproductive efficiency (Handayani *et al.,* 2012). The application of the estrus synchronization technique is intended to enable the simultaneous insemination (IB) of a number of synchronized female cows, thereby optimising the joint allocation of time and energy (Ismail, 2009; Sulfiatrianingsih, 2016).

In regions with seasonal feed availability, the relationship between food supply and lambing is critical for successful sheep production. To optimize this, **estrus synchronization** is used to align the timing of lambing with periods of abundant feed. This strategic approach ensures that the high nutritional demands of ewes and their growing lambs are met, leading to improved health and productivity. By controlling the birth schedule, producers can also efficiently manage their output to meet market demands. The underlying mechanism involves manipulating the estrous cycle, primarily by inhibiting the function of the **corpus luteum**, which allows for a controlled and simultaneous onset of estrus across the flock.

The objective of estrus synchronization in the embryo transfer programme is to equalize the condition of the female reproductive tract between donor and recipient cows. One type of hormone that is widely used in the estrus synchronization program is prostaglandin (PGF2α), which functions as an ingredient to lyse the corpus luteum and end the luteal period in the reproductive cycle (Balo *et al.,* 2003; Sulfiatrianingsih, 2016).

It is crucial to test different brands of prostaglandin hormones, such as Capriglandin, Lutalyse, and Juramate, because while all are widely used in livestock reproductive management, their specific formulations can impact efficacy. Each brand's active ingredient, whether dinoprost tromethamine (Lutalyse) or cloprostenol (Juramate), and its excipients can vary, potentially affecting its stability, bioavailability, and the animal's physiological response. Therefore, comparative testing is essential to determine which brand provides the most optimal luteolytic effect and achieves the highest success rates for estrus synchronization, pregnancy, or other reproductive goals within a specific animal population, ultimately ensuring the most cost-effective and successful breeding program (Fonsecal *et al.,* 2012).

MATERIALS AND METHODS

Study Site and Sampling Methods

The present study is to be conducted at the Livestock Service Office of Sumbawa Besar Regency, more specifically at the Animal Production and Health Unit of Lape Subdistrict, Sumbawa Besar Regency, from February to March 2019.

The present study utilised a sample of 21 sexually mature female Bali cows (*Bos sondaicus*), with ages ranging from two to two and a half years and in the heat cycle, obtained

from the Animal Health Unit of Lape Subdistrict, Sumbawa Besar Regency. The prostaglandin hormone was procured from an alternative veterinary pharmaceutical supplier in Surabaya.

Experimental Design

An experimental study was conducted using a completely randomized design (CRD) to evaluate the effects of three different prostaglandin hormone treatments on Bali cattle (*Bos sondaicus*). Twenty-one animals were randomly allocated to one of three groups, with each group comprising seven replicates. The treatments consisted of administering **Capriglandin** (P1) at a dosage of 5 ml, **Lutalyse** (P2) at 5 ml, and **Juramate** (P3) at 2 ml. The dosages were standardized based on manufacturer recommendations for adult cattle and were not adjusted for individual body weight. This approach accounts for the inherent differences in active ingredient concentration among the brands.

The results were analysed using one-way analysis of variance (ANOVA), which included the speed of estrus. This was measured from the application of PGF2α until the cattle exhibited one of the symptoms of estrus, which was characterised by swelling and discolouration of the vulva. The duration of this period was calculated in hours. The duration of estrus in Baliese cows is defined as the period commencing at the onset of estrus symptoms and concluding at the dissipation of such symptoms.

RESULTS AND DISCUSSION

The Estrus Speed

Based on the available methods, the results of estrus observation show the speed at which symptoms in the form of vulva swelling and discoloration appear after treatment, reflecting the animal's physiological response to the hormone (Irmaylin et al., 2012). This parameter is of crucial importance for the implementation of IB after estrus synchronization. The following report summarises the results of the observation of the effect of PGF2α injection on the speed of onset of estrus.

Table 1. Average speed of onset of estrus (hours)

Treatment	Average ± S.D
Caprilandin (P1)	69.6883 ± 5.99114
Lutalyse (P2)	56.2417 ± 28.01331
Juramate (P3)	55.5000 ± 27.33509

Notes: Statistical analysis there is no significant difference (P > 0.05).

The results of the injection of three PGF2α hormones into 21 Baliese cows demonstrated that the onset of estrus occurred after 69.68 hours, 56.24 hours, and 55.50 hours, respectively, following the injection of PGF2α hormones. The fastest hormone results were observed with Capriglandin, exhibiting an average speed of 69.68 hours, followed by Lutalyse at 56.24 hours and Juramate at 55.50 hours. The results of the one-way ANOVA analysis indicated that there was no significant effect (P > 0.05) on the speed of onset of estrus.

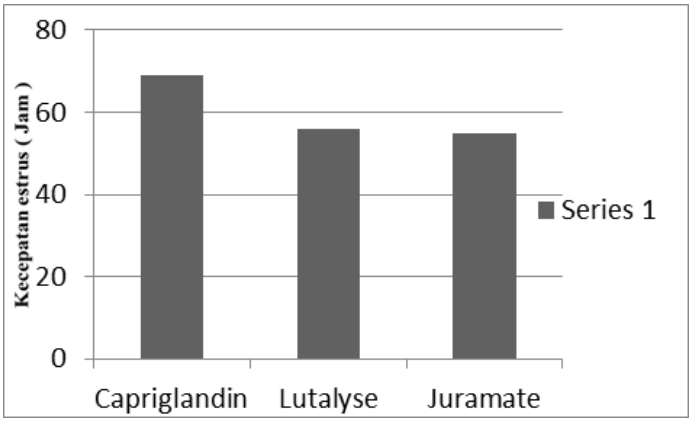

Figure 1. Speed of onset of Estrus after Pgf2α injection

This phenomenon is presumably attributable to the mechanism of action of drugs that exhibit a high degree of similarity in content and function with doses that effectively lyse the corpus luteum. This finding is consistent with the assertion posited by Toelihere (1985), which states that PGF2α exerts a pronounced inhibitory effect on blood flow to the ovaries, leading to regression of the CL. This is concomitant with a decline in progesterone hormones, resulting in the dissolution of the inhibitory effect of FSH and LH. Consequently, this precipitates follicular maturation and the advent of estrus.

Moreover, the absence of a significant difference in the speed of onset of estrus is likely attributable to the error of the lambing cycle. This assertion is corroborated by Hunter (1995), who demonstrated that when hormones are injected, cows are not in the luteal phase. Additional factors that may contribute to the absence of a significant difference in the speed of onset of estrus include the body condition of cows and forage feed factors and the same nutrition. This finding is in accordance with the opinion of Achyadi (2009). Based on the results of the Kebunting Examination (PKB) through rectal palpation, the cows used in this study have good reproductive health conditions (no disease), so that the results of the estrus speed are almost the same (Irmaylin et al. 2012). The following text is intended to provide a comprehensive overview of the subject matter. 2009). As demonstrated in Table 4.1 and Graph 4.1, Capriglandin treatment has been shown to be more efficacious than Lutalyse and Juramate. This can be attributed to the greater quantity of dinoprost, tromethamine and benzyl alcohol contained within Capriglandin. The function of these substances is to terminate the estrous cycle of non-pregnant female animals by eradicating the corpus luteum and instigating a new cycle (Yates *et al.,* 2011; Hafizuddin et al., 2012).

According to Toelihere (1985), the reaction to hormone injections can be observed on the third day, from pre-dawn through the morning. This observation is consistent with the physical symptoms in the vulva: redness, swelling, and warmth. In this study, these symptoms were checked at the research location through observations of three different drug brands. The onset of early estrus symptoms was separated by only a few hours.

The impact of administering PGF2α on the duration of the estrous cycle

The length of estrus is the time interval between the onset of estrus until the completion of estrus. The length of estrus is also influenced by age, body condition, and also the type of hormone used for synchronization or induction of estrus (Irmaylin et al., 2012). The results of observations of the effect of PGF2α injections with different doses on the length of estrus.

Table 2. Average duration of onset of estrus (hours)

Treatment	Average ± S.D
Caprilandin (P1)	17.7000 ± 3.09516
Lutalyse (P2)	14.0167 ± 7.24718
Juramate (P3)	13.7500 ± 7.60099

Notes: Statistical analysis there is no significant difference (P > 0.05)

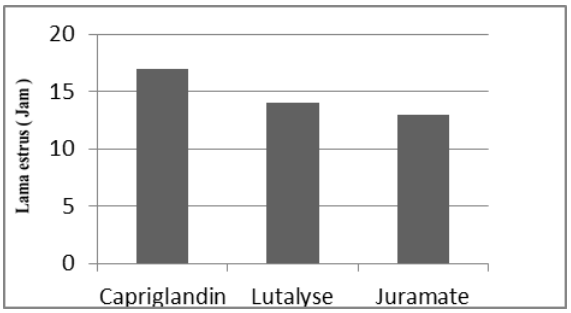

Figure 2 Duration of onset of Estrus after Pgf2α injection

The findings of this study demonstrated that the duration of estrus in Baliese cows was 17.70 hours for Capriglandin, 14.01 hours for Lutalyse, and 13.75 hours for Juramate (see Table 4.2 and Graph 4.2). The results of the one-way ANOVA analysis indicated that there was no significant effect (P > 0.05) on the duration of estrus hormone. In this study, the administered doses of Capriglandin and Lutalyse were identical at 5 ml, while Juramate was given at 2 ml; this difference in volume reflects the varying concentrations of active ingredients across brands rather than indicating superiority. While it is hypothesized that Capriglandin might offer an advantage by inducing a longer estrus duration, providing a wider window for detection and insemination, this claim is not well-supported by scientific literature. As noted by Maliawan (2002), the effect of PGF2α is generally considered to be limited to the process of corpus luteum regression, as the hormone is rapidly deactivated in the liver and lungs, rendering its influence on the overall length of estrus insignificant (Syawal, 2015).

Furthermore, the length of estrus occurs naturally, namely in the presence of high oestrogen hormone levels produced by the ovaries. This assertion is corroborated by the work of Irmaylin *et al* (2012), which states that PGF2α cannot be stored in tissues because its half-life is very short due to its rapid metabolism in the blood, lungs, kidneys and other tissues. It is hypothesised that a further factor influencing the duration of parturition is the similarity of body condition

exhibited by the cows. The results of the PKB examination, conducted via rectal palpation, indicate that the subjects (i.e. the cows) do not exhibit signs of reproductive disorders. Consequently, the physiological mechanisms are observed to function in accordance with the expected norm for each individual subject. This finding is further corroborated by the assertion of Hastono (2000), who posits that the duration of parturition is not directly proportional to the duration of gestation.

The final factor that may have caused the marked discrepancy in estrus duration is the uniform nutritional status of each cow due to the absence of variation in feeding. Nutritional intake has been demonstrated to influence cerebral function, thereby modulating the secretion of reproductive hormones by the endocrine system. As Achyadi (2009) asserted, nutritional factors exert a significant influence on the estrous cycle.

CONCLUSIONS

A one-way ANOVA statistical analysis revealed a P-value greater than 0.05, leading to the conclusion that there were no significant differences in the speed or duration of estrus following the intramuscular administration of prostaglandin hormones. This finding is consistent with observations showing that all three brands Capriglandin, Lutalyse, and Juramate were equally effective at inducing and synchronizing estrus in Bali cattle. Although minor differences in estrus onset time were observed, spanning only a few hours, this indicates a similar efficacy in triggering corpus luteum regression across all brands. Therefore, while all three brands successfully induced estrus, none demonstrated a measurably superior effect in either accelerating the onset or prolonging the duration of estrus compared to the others.

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