

E-ISSN: 2788-9297
P-ISSN: 2788-9289
<https://www.agrijournal.org>
SAJAS 2023; 3(2): 60-63
Received: 02-06-2023
Accepted: 08-07-2023

Sri Gustina
Department of Animal
Science, Faculty of Animal
Science and Fisheries,
Universitas Sulawesi Barat, Jl.
Prof. Dr. Baharuddin Lopa,
Tande Timur, Majene,
Indonesia

Fantri
Department of Animal
Science, Faculty of Animal
Science and Fisheries,
Universitas Sulawesi Barat, Jl.
Prof. Dr. Baharuddin Lopa,
Tande Timur, Majene,
Indonesia

**Besse Mahbuba We Tenri
Gading**
Department of Animal
Science, Faculty of Animal
Science and Fisheries,
Universitas Sulawesi Barat, Jl.
Prof. Dr. Baharuddin Lopa,
Tande Timur, Majene,
Indonesia

Mutmainna Mutmainna
Department of Animal
Production, Faculty of Animal
Science, Hasanuddin
University, Jl. Perintis
Kemerdekaan Km.10,
Makassar 90245, South
Sulawesi, Indonesia

Hasbi Hasbi
Department of Animal
Production, Faculty of Animal
Science, Hasanuddin
University, Jl. Perintis
Kemerdekaan Km.10,
Makassar 90245, South
Sulawesi, Indonesia

Correspondence Author:
Sri Gustina
Department of Animal
Science, Faculty of Animal
Science and Fisheries,
Universitas Sulawesi Barat, Jl.
Prof. Dr. Baharuddin Lopa,
Tande Timur, Majene,
Indonesia

The effect of PGF2 α injection to Bali cows on the success rate of artificial insemination

Sri Gustina, Fantri, Besse Mahbuba We Tenri Gading, Mutmainna Mutmainna and Hasbi Hasbi

Abstract

This study aimed to determine the effect of giving the PGF2 α hormone to Bali cows on the success rate of artificial insemination. The sample used was 120 non pregnant Bali cows. This study consisted of 2 treatment groups, those with and without PGF2 α hormone injection 60 samples respectively and then artificially inseminated. The parameters observed were onset of estrus, quality of estrus, and pregnancy rate. The data obtained were analyzed by T-test. The results of the study showed that the onset of estrus appeared the earliest at the 24-30 hours (63.33%) and the slowest at the 96 hours (3.33%) after injection. Estrus quality at score 3 and pregnancy rate did not differ between with and without PGF2 α injection (73.33% vs 68.33% and 81.67% vs 78.33%). In conclusion, the onset of estrus 63.33% occurred at the 24-30 hours and only 3.33% appeared at the 96 hours after injection, while the quality of estrus and pregnancy rates did not differ between with and without PGF2 α injection.

Keywords: Bali cattle, estrus, PGF2 α hormone, pregnancy rate

Introduction

Indonesia is a country with a tropical climate which allows sexual activity to occur throughout the year, so that reproduction and birth in cattle can occur at any time. Bali cattle are local Indonesian cattle which have a high carcass percentage and are resistant to heat stress as their advantages ^[1]. However, Bali cattle have problems with sub-optimal reproductive function. One of them is problems during estrus ^[2]. Cows have a short estrus period and sometimes invisible mating behavior, resulting in low reproductive performance. Optimum reproductive performance is what determines the success of productivity. Several indicators that can be seen to predict sub-optimal reproductive function in cows include low success of artificial insemination (AI), high incidence of silent heat ^[2] and long calving interval of 12-15 months ^[3].

Optimum reproductive performance can be achieved if the natural breeding program or the application of artificial insemination (AI) is carried out correctly at the age of puberty in heifers or after calving in cows ^[3]. Artificial insemination is a method or technique for inserting thawed and pre-processed semen from bull into the female genital tract using a special method and tool called an insemination gun ^[4]. AI failure can be influenced by various factors, including poor or low quality of frozen semen, inadequate or unskilled inseminators, breeders who are not or less skilled at detecting heat, late reporting or slow inseminator service, and reproductive disorders in cows ^[5, 6].

Estrus synchronization is a technique for increasing the efficiency of livestock production and reproduction, as well as optimizing the implementation of artificial insemination ^[7]. Synchronizing estrus by injecting PGF2 α in Bali cows has same function as the process of PGF2 α secretion by the endometrium to lysing the corpus luteum (CL) so that returning the estrus cycle to the follicular phase by stopping the progesterone synthesis. PGF2 α only works effectively to lyse the corpus luteum when given in the luteal phase ^[8]. The follicular phase begins with the elimination of the negative effects of progesterone so that the GnRH concentration increases and causes an increase in the production of Follicle Stimulating Hormone (FSH) and Luteinizing Hormone (LH). The benefits of injecting PGF2 α in estrus synchronization activities are optimization and efficiency of AI implementation, speeding up estrus return, overcoming silent heat problems and shortening Days Open (DO) ^[9]. Therefore, this research was conducted to find out whether administration of the PGF2 α affects the success rate of AI.

Materials and Methods

This research used 120 cows as samples which were divided into two treatment groups, with and without PGF2 α injection 60 cows respectively, then artificial insemination was carried out. Cows were synchronized with PGF2 α (Juramate) at a dose of 5 ml per cow intramuscularly (IM) and artificial insemination was carried out based on predetermined groups.

Parameters

- The onset of estrus is measured by observing the time interval between the appearance of estrus from the injection of PGF2 α [10].
- The quality of estrus is measured based on 3 categories, score 1 marked by the absence of mucus, score 2 with little mucus, and score 3 with a lot of mucus.
- Conception rate is measured by observing the reappearance of estrus in one period of the estrus cycle, which is observed on days 19, 20, and 21 after artificial insemination.

Analysis Data

The data obtained was evaluated to compare two groups of cows that were injected with the PGF2 α and not injected. The data was analyzed using the T-test with SPSS version 20 for Windows software.

Results and Discussion

Onset of Estrus

Onset of estrus is the speed at which lust appears. According to Suzana *et al.* [11] that estrus onset is the time of onset of estrus calculated starting from the injection of PGF2 α . Observation of the onset of estrus was carried out shortly after the injection of the PGF2 α until the onset of estrus [12]. Estrus onset was only observed in samples with PGF2 α injection, while in not injected samples was not observed. The results of the observations showed that the most signs of estrus occur on one day after injection and the longest after four days. The average appearance of estrus can be seen in Fig 1.

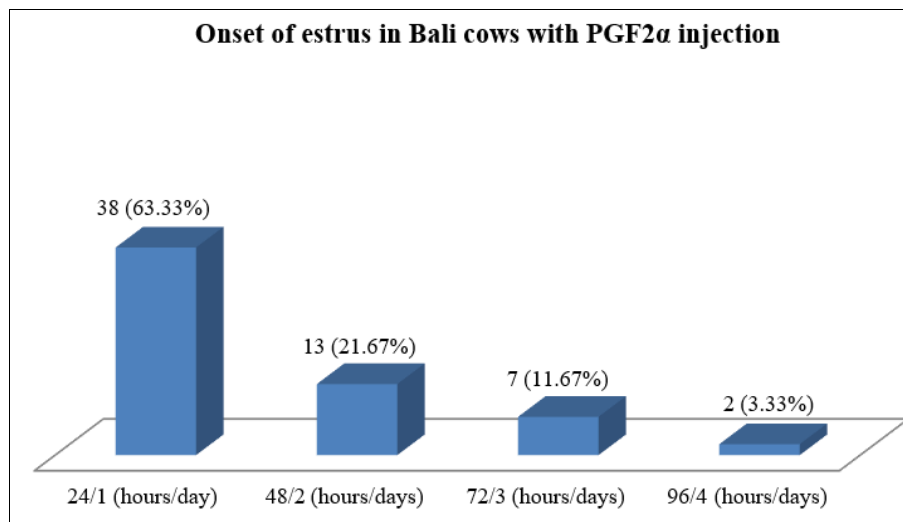


Fig 1: Onset of Estrus in Bali Cows

The earliest estrus appearance after the injection of the PGF2 α occurred at 24-30 hours or after one day as many as 38 cows and the latest was at the 96 hours or 4 days after the injection as many as 2 cows. The effectiveness of injecting the PGF2 α in this study was very high, reaching 63.33% on one day after injection. This result is not different from research conducted by Fauzi *et al.* [13] that the highest appearance of lust after PGF2 α injection occurred at 30-40 hours with a percentage of the population of 52.5%.

There are many factors that influence the timing of the estrus onset in livestock, including poor feeding conditions, maintenance and grazing systems that lack feed [12]. Dhayanti *et al.* [14] further stated that there are two factors that influence the onset of estrus, namely external factors in the form of the environment and internal factors in the form of age, genetics and livestock physiology.

PGF2 α is a hormone that can function as a controller of the estrus cycle, ovum transport, spermatozoa transport and birth [15]. Milvae *et al.* [16] added that PGF2 α will regress CL which is characterized by the cessation of progesterone production. Prostaglandin compounds (PGF2 α) are acidic, soluble in fat and are derivatives of unsaturated fatty acids containing 20 C atoms produced from phospholipid

membranes by the activity of phospholipid A2, cyclooxygenase, and other specific prostaglandin synthase [17].

Estrus Quality

The quality of estrus is grouped into 3 categories, no mucus (score 1), little mucus (score 2), and lots of mucus (score 3). Observation of the quality of estrus was carried out on livestock that had shown symptoms of estrus, whether had been injected with hormones or not. The results of observations of the quality of estrus of livestock, both those injected with hormones and not, can be seen in table 1.

Table 1: Observation of the estrus quality of livestock whether injected with or without PGF2 α

Estrus Quality (score)	Injected (n/%)	Not Injected (n/%)
1	12/20.00	3/5.00
2	4/6.67	16/26.67
3	44/73.33	41/68.33

Score 1: absence of mucus, score 2: little mucus, and score 3: a lot of mucus

Based on the results of statistical analysis, it reported that the estrus quality of cows injected with the PGF2 α did not show a significant difference compared to those without the

injection ($P>0.05$). Injected cows with the $PGF2\alpha$ showed symptoms of a lot of mucus with a swollen, wet and red vulva, the same as without the injection. Administration of $PGF2\alpha$ causes CL lysis resulting in the release of FSH and LH which are responsible for the growth and maturation of follicles, these follicles produce the hormone estrogen which is able to manifest estrus symptoms [18]. The estrogen acts to increase the sensitivity of the female genital organs which is characterized by changes in the vulva and the discharge of transparent mucus [3]. The results of this study are in accordance with Ardhani *et al.* [19] which states that the estrus response is characterized by clear mucus coming out of the genitals, restlessness and frequent moaning. Apart from that, the signs of lust are riding on other cattle and being quiet when being ridden on other and appetite decreases.

There were 60 cows injected with the $PGF2\alpha$ hormone, 44 of them (73.33%) showing symptoms of high estrus quality. Meanwhile, there were 41 un.injected cows (68.33%) who showed high quality symptoms of estrus. The quality of estrus needs to be observed and assessed to determine the effectiveness of the $PGF2\alpha$ hormone during synchronization in inducing estrus so that it can make it easier to detect estrus [20].

The appearance of estrus quality with varying mucous symptoms showed that not all cows are able to show clear oestrus symptoms. Estrus behavior will be indicated by the intensity of estrus and this condition depends on the

concentration of estrogen secreted [21]. Different qualities of estrus can be caused by differences in the maximum secretion of estrus hormones from each individual. The higher estrogen hormone produced, the higher quality of estrus that will appear. Tsiligianni *et al.* [22] explained that cervical mucus is produced by secretory cells found in the endocervix. Differences in the quality of estrus in cows can be caused by individual factors related to hormonal conditions, especially the condition of the estrogen in stimulating estrus activity.

The appearance of heat in cows greatly influences the success rate of AI. Bernardi *et al.* [23] suggested that the characteristics of cervical mucus play an important role in the success of conception, where it can be used to determine the right time for insemination to increasing the percentage of pregnancy, Tsiligianni *et al.* [22] also added that during estrus, steroid hormones from the ovaries influence the condition of the cervical mucus to facilitate spermatozoa transport.

Conception Rate

The success rate of artificial insemination is measured based on the pregnancy rate. This is done by looking at the reappearance of lust in 1 period of the estrus cycle, which is observed on days 19, 20 and 21 after artificial insemination. Pregnant cows are marked with the number 1, while those that are non-pregnant are 2. The results of observations of pregnancy rates can be seen in Fig. 2.

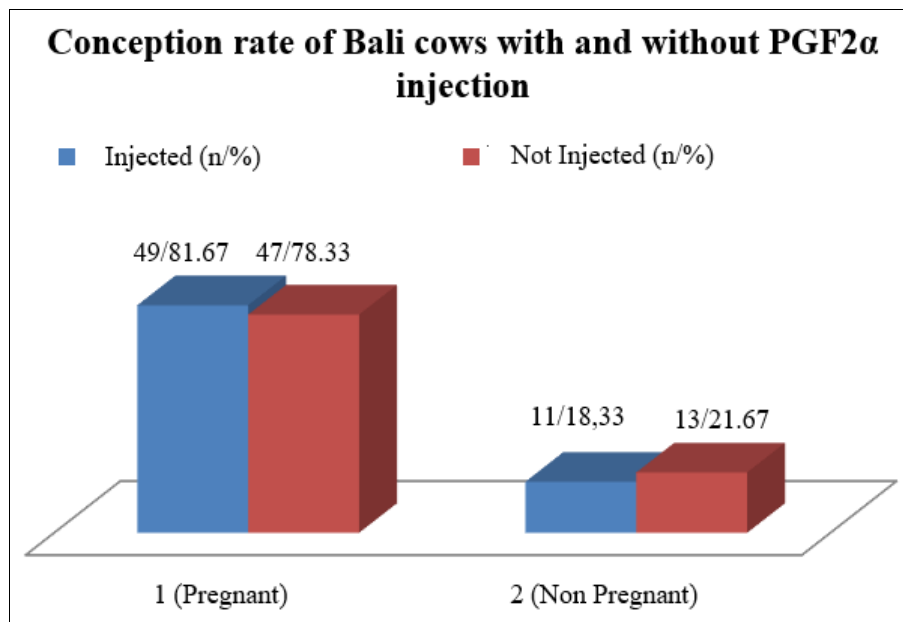


Fig 2: Conception Rate of Bali Cows

In Figure 2, the pregnancy rate of cows injected with the $PGF2\alpha$ hormone did not significantly different ($P>0.05$) to without the injection. A total of 49 injected cows with $PGF2\alpha$ were declared pregnant with a percentage of 81.67, while 47 cows that were not injected were declared pregnant (78.33%).

The $PGF2\alpha$ hormone plays a role in regressing the corpus luteum to shorten the estrus cycle and return the estrus cycle to the follicular phase. Regression of CL accompanied by a decrease in progesterone will provide a response to the hypothalamus which will then stimulate the process of secretion of estrus hormones, namely GnRH, estrogen, FSH

and LH. Milvae [16] stated that the hormone $PGF2\alpha$ will regress the corpus luteum which is characterized by the cessation of progesterone production. Furthermore, the increased estrogen can influence the appearance of heat symptoms such as physical changes in the vulva to become swollen, warm red and slimy. Bernardi *et al.* [23] further explained that cervical mucus plays an important role in the success of conception, the appearance of cervical mucus can be used as a means of detecting estrus to determine the right time for insemination to increasing the percentage of conception. During estrus, steroid hormones from the

ovaries affect the physicochemical conditions of cervical mucus, to facilitate the moving of spermatozoa [22].

Conclusion

The onset of estrus 63.33% occurred at 24-30 hours and only 3.33% appeared at 96 hours after injection of PGF_{2α}, while the quality of estrus and pregnancy rate did not differ between with and without PGF_{2α} injection.

References

- Ananda MK, Putu S, Tjokorda SN. Estimation of Carcass Weight of Male and Female Bali Cattle Based on Body Length and Chest Circumference. *Indonesia Medicus Veterinus*. 2020;9(4):512-521.
- Suartini NK, Trilaksana IGNB, Pemaun TGO. The Levels of Estrogen and the Onset of Estrous after Administration of Buserelin (GnRH Agonist) on Bali Cattle Experiencing Anestrous Postpartum Due to Ovarian Hypofunction. *Jurnal Ilmu dan Kesehatan Hewan*. 2013;1(2):40-44.
- Budiasa MK, Pemaun TGO. Induction of Heat with PGF₂ Alpha and GnRH Injection after Artificial Insemination in Bali Cattle. *Indonesia Medicus Veterinus*. 2019;8(5):565-571.
- Andrefani F, Putranti OD, Hoda A. Effect of Thawing Time on the Quality of Frozen Semen Spermatozoa of Bali Cattle (*Bos sondaicus*) In Agricultural Department of North Maluku. *Journal of Animal Husbandry Science*. 2019;3(2):11-17.
- Herawati T, Anggraeni A, Praharani L, Utami D, Argiris A. Inseminator Role in The Success of Artificial Insemination on Dairy Cattle. *Jurnal Informatika Pertanian*. 2012;21(2):77-82.
- Tophianong TC, Agung B, Erif MN. Review of The Artificial Insemination Result Based on Anestrus Post Insemination in Bali Cattle Herds at The Regency of Sikka, East Nusa Tenggara. *Jurnal Sains Veteriner*. 2014;32(1):46-54.
- Setyawati A. Artificial Insemination in Thick Tailed Sheep with Oestrous Synchronization Trough Prostaglandin Hormone Injection (PGF_{2α}). *Jurnal Penelitian Peternakan Terpadu*. 2020;2(3):123-127.
- Malik A. Effect of injection Prostaglandin F_{2α} on the time required for onset of estrus and duration of estrus in Bali cattle with different of Paritas). *Ziraa'ah Majalah Ilmiah Pertanian*. 2019;44(2):142-146.
- Rambe NA, Siregar TN, Armansyah T, Gholib, Budianto P, Adam M, *et al*. Effectiveness of different commercial prostaglandin hormone administration on the percentage of estrous in cattles in South Labuhanbatu, North Sumatera. *Jurnal Agripet*. 2020;20(2):105-110.
- Malik A, Wahid H, Rosnina Y, Kasim A, Sabri M. Effects of Timed Artificial Insemination Following Estrus Synchronization in Postpartum Beef Cattle. *Veterinary Journal*. 2012;2(1):1-5.
- Suzana R, Udin Z, Hendri. The Use of the Estrus Synchronization Method against Estrus Response of Buffalo (*B. Bubalis carabausis*) in Padang Pariaman. *Jurnal Peternakan Indonesia*. 2020;22(2):176-183.
- Ummaisyah WR, Madyawati SP, Wahjuni RS, Rimayanti R, Wurlina W, Restiadi TI. The effectiveness of GnRH administration to dairy cows with ovarian hypofunction on the onset of estrus and pregnancy rate. *Ovozoa*. 2020;9(3):64-68.
- Fauzi MR, Suyadi, Susilawati R. The Effect of Prostaglandin F_{2α} Alpha (PGF_{2α}) Injection on Onset Estrous and Pregnancy Rate in Brahman Cross (Bx) Heifer. *Jurnal Ilmu-Ilmu Peternakan*. 2017;27(3):39-43.
- Dhayanti NLE, Laksmi DNDI, Sampurna IP. The Emergence of Post-Partum Estrus on Bali Cattle in Some Livestock Groups at the Working Area of Sobangan Animal Health Centre, Badung, Bali. *Indonesia Medicus Veterinus*. 2021;10(4):576-588.
- Pemaun TGO. Concentrations of Prostaglandin F_{2α} in Seminal Vesicle Fluid and Product of Seminal Vesicle Monolayer Cells of Bali Cattle. *Jurnal Veteriner*. 2017;8(4):167-172.
- Milvae RA. Inter-relationships Between Endothelin and Prostaglandin F_{2α} in corpus Luteum Function. *Reviews of Reproduction*. 2000;5:1-5.
- Handayani UF, Hartono M, Siswanto. Response of Onset Estrus and Estrus Duration at the Various Parity of Bali Cattle after Twice Injection of Prostaglandin F_{2α} (PGF_{2α}). *Jurnal Ilmiah Peternakan Terpadu*. 2012;2(1):33-40.
- Budiyanto A, Savitri FK, Fibrianto YH. Study of Estrous Synchronization using PGF_{2α} in Local Goats on Estrous Quality, Progesterone Concentration, and Pregnancy Rate. *Jurnal Sains Veteriner*. 2020;38(3):272-279.
- Ardhani F, Lukman, Firda J. The Role of Farmers and Inseminators on the Success of Artificial Insemination on Cattle at Kota Bangun District. *Jurnal Peternakan Lingkungan Tropis*. 2020;3(1):15-22.
- Abecia JA, Forcada F, Gonzalez-Bulnes A. Pharmacological control of production in sheep and goats. *Veterinary Clinics of North America: Food Animal Practice*. 2011;27(1):67-79.
- Sinda SMW, Hine TM, Nalley WM. Estrus Performance and Artificial Insemination Result of Kacang Doe Induced with Different Prostaglandin F_{2α} Dosages. *Jurnal Nukleus Peternakan*. 2017;4(2):163-172.
- Tsiligianni T, Amiridis GS, Dovolou E, Menegatos I, Chadio S, Rizos D, *et al*. Association Between Physical Properties of Cervical Mucus and Ovulation Rate in Superovulated Cows. *Canadian Journal of Veterinary Research*. 2011;75(4):248-253.
- Bernardi S, Rinaudo A, Marini P. Cervical Mucus Characteristics and Hormonal Status at Insemination of Holstein Cows. *Iranian Journal of Veterinary Research*. 2015;17(1):45-49.