Reproductive Behavior's: Audiovisual detection of oestrus after synchronization using Prostaglandin F2 Alpha (PGF2 α)

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Abstract. Artificial insemination program to increase production is affected by oestrus. Breeders generally identify cows in oestrus based on their behavior. Currently, oestrus can be predicted and scheduled due to PGF2 α synchronization. This study aims to determine the detection of oestrus after PGF2 α synchronization, and more specifically to distinguish audio-visual behavior. The six cows used were synchronized using PGF2 α . Descriptive methods include (mean, standard deviation). Test. Chi-square was used for qualitative data comparison. The observed variables were the onset of oestrus and lust behavior (looking at the audio-visual characteristics, using video and the Audio Spectrum Monitor (ASM) application. The results showed that the response to oestrus appeared 30 hours after synchronization in 5 cows. The visual behavior that appears a lot is Mounting activity, Mucus Exit, Vulva Swelling, Restlessness and Vocalization duration. ASM recordings show the frequency in cows that are in oestrus between 405 Hz - 485 Hz after PGF2 α injection. In conclusion, the audiovisual behavior of cows after synchronization shows that the cows are in a state of oestrus, and are ready for artificial insemination.

Keywords: Audiovisual Behavior, PGF2 α , Oestrus Detection.

1 Introduction

Merauke Regency Government since 2017 until now has implemented government regulations regarding Merauke as a source of local cattle breeds in eastern Indonesia. Of course, the production of cows cannot be separated by the role of technology. According to [1]. Artificial Insemination Technology (AI) is used by cattle breeders to increase the cattle population in Merauke. The type of cow that is widely cultivated by the Merauke community is the PO type [2]. Ongole grade cattle are preferred because they are tolerant to the local climate in Merauke [3]. Reproductive technology (AI) can be successful if breeders know oestrus well and precisely. The signs of oestrus in cows are generally divided into four parts, namely prooestrus, metoestrus, dioestrus, and oestrus. Common signs that appear when a cow is experiencing symptoms of lust include aggressive cattle, frequent voices, and mucus. The main sign of an oestrus female cow if it is climbed by a bull will be silent. Constraints in AI programs often arise, especially in the inaccurate identification of oestrus by breeders, this is a factor in the low success of AI in Merauke.

Breeders in Merauke generally know that the behavior of benthic cows is ready to mate if they secrete mucus. Apart from that, the sound alerts are often the main indicator, but this is not entirely true. Some of the

characteristics that are often found by breeders are conveyed to AI officers, but cows keep asking for mating. This is an important problem in the AI program, which the government must resolve, so that local cattle productivity in Merauke is good. Therefore, technological advances in the field of reproduction are needed, one of which is oestrus synchronization using Prostaglandin F2 Alpha (PGF2 α). This activity has a good impact on breeders, but breeders still have to pay attention to signs of oestrus after synchronization. In order to make it easier for breeders to monitor the detection of lust after synchronization, the officer will provide a control card. In addition, in the current digital era, there are many applications that can be used in the field of animal husbandry, including the decision support application for selecting superior cattle breeds [4]. Research using Hertz (Hz) sound waves to detect cow lust was also carried out by [5, 6]. The purpose of this study in general was to determine the audio-visual behavior of post-synchronized cows using PGF2 α .

2 Methodology

2.1 Research Material

This research was conducted in the District of Semangga Kab. Merauke, the 6 female cows that have been synchronized using PGF2 α by certified officers.

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2.2 Research Methods

Cows are housed in individual pens by breeders who are fed ad libitum forage and drinking water. The injection process of PGF2 α brand Lutalyse made by Pharmacia was carried out by officers using a dose of 20 mg (4 ml) / cow. Observations were started 1 day after injection and every 6 hours observation was made of their voiceless behavior, riding other livestock, being silent when riding, releasing mucus, angrsis. Sound recordings are carried out at the same distance that is 2 meters from livestock. The equipment used in the observation includes video cameras, Audio Spectrum Monitor (ASM) applications via mobile phones. The ASM recording was taken when the cow made a sound duration of 5-7 seconds per cow, the number of sound samples was 9 times per cow. Vocalization observations were carried out for 40 minutes.

2.3 Statistic Analysis

Statistical data processing using SPSS 21.0 software. Descriptive methods include (mean, standard deviation). Test chi-square was used for comparisons of qualitative data. The results were evaluated at the confidence level of $p < 0.05$.

3 Result and Discuccion

3.1 Behavior (visualization) of female cattle proestrus and oestrus

The use of PGF2 α in female cows is generally for the benefit of artificial insemination in cows. The results showed that the signs of lust that appeared a lot were aggressive, mucus discharge and a voice. Table 1.

After PGF2 α injection, behavior such as mounting was seen. An accurate sign that a cow has experienced an oestrus phase is silence when other cattle are riding. This activity can be seen a lot in the morning and late in the afternoon. A cow that stands up to be climbed is the most accurately known sign of oestrus [7].

The duration of vocalization in cattle increased significantly from proestrus to oestrus after PGF2 α injection. This change is certainly an indicator that cows have increased the FSH hormone in the body and have an impact on reproductive physiology. Restlessness in cows is a common sign, restlessness is an early sign of oestrus.

Table 1. Visual oestrus behavior in cows after PGF2 α injection (n = 6).

Visual behavior	Proestrus	oestrus
Slime out	0	2.67 $\pm$ 0.82
Mounting activity	5.1 $\pm$ 3.9	13.83 $\pm$ 3.92
Swelling of the vulva	0.6 $\pm$ 3.92	2.00 $\pm$ 0.63
Restlessness	8 $\pm$ 3.92	21 $\pm$ 3.92
Vocalization duration	3.5 $\pm$ 3.92 ^a	24.6 $\pm$ 3.92 ^b

Info: Observations were made 3 days after PGF2 α injection. Vocalization observations were carried out for 40 minutes per day and per observation period of 10 minutes.

The form of visual changes in the vulva in general is visible swelling on the outside of the vulva, looks red when the vulva is opened, and mucus is transparent. Figure 1. This shows hormonal changes that affect the performance of reproductive organs such as estrogen. According to [8] the physical changes that occur during oestrus are caused by the performance of the hormone estrogen by increasing the sensitivity of the female genital organs which is marked by changes in the vulva and transparent mucus discharge.

Fig. 1. The shape of the vulva of a female cow in the estrous phase (a) clear mucus, (b) swelling of the vulva, (c) reddening of the vulva.

Lysis of the corpus luteum is caused by injection of the hormone Estron due to the action of PGF2 α vasoconstriction, causing blood flow to the corpus luteum to decrease drastically. [9] stated that corpus luteum regression will be followed by a decrease in progesterone concentration. This decrease in progesterone levels will stimulate the anterior pituitary to release FSH and luteinizing hormone (LH). These follicles will produce the hormone estrogen which will manifest the symptoms of oestrus. Different opinions expressed by [10] who stated that the decrease in progesterone concentration due to PGF2 α induction was due to changes in the morphology of the luteal tissue through changes in acetate to cholesterol. This decrease in progesterone levels will stimulate the anterior pituitary to release FSH and LH. These two hormones are responsible for folliculogenesis and ovulation, resulting in growth and maturation of follicles. These follicles eventually produce the hormone estrogen which can manifest estrous symptoms [11].

3.2 Audio behavior (voicing) of female cows

Sounds in livestock are generally the same when heard using the human ear, but this tends to be different when observed using an application system. The sound of cattle provides important information for other cattle. Sound waves can be recorded properly with an application which means the waves (Hz) at a certain size. Figure 2 shows the difference in sound waves during estrous and proestrous cows. Cow vocalization provides meaningful information for other livestock such as pangilan when lust. [12] provide information that individual livestock vocals can be interpreted as a physiological and psychological fusion response,

oestrus is one of the reproductive physiological responses in cattle.

Visualization of sound in the form of Hz waves in Figure 2, it can be seen that the frequency of the sound waves of proestrus cattle is below 200 Hz, while in oestrus cattle it is in the range of 400 - 500 Hz or even more.

Fig. 2. The visualization form of proestrus and oestrus female cows using ASM.

This visualization of markers using ASM has never been done before. However, the results in the field showed that cows with a wave frequency of more than 400 showed dominant lust and were ready for artificial insemination. The blue mark in the Hz wave shown in the visualization means low frequency. Each application can show different results, this is due to differences in operating systems that are run.

Oestrus behavior in cows after PGF2 α injection, has a positive impact on the third day which is marked by visual changes such as mounting activity, aggression and mucus discharge from the vulva. The main sign that it is important to know is that if the cow is ready to be mounted on other livestock then oestrus is occurring. The detection of the sound of cows using ASM with a frequency of 400-485 Hz in this study showed significant results, namely cows experienced oestrus. However, this needs to be investigated further with a larger number of samples for better accuracy.

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