



Quantity and Quality of Oestrus of Kacang Goats Injected with Prostaglandin F2alpha in The Vulva Submucosa on The Coast of Tomini Bay

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ABSTRACT

Tomini Bay is the longest bay in Indonesia, located in the provinces of North Sulawesi, Gorontalo, and Central Sulawesi. The dominant goat species raised by farmers in Tomini Bay is the Kacang goat. This research aims to determine the quantity and quality of estrus of kacang goats based on different parities that were reared traditionally in Tomini Bay. The hormone used were PGF2α lutalyse brand, which injected into the vulvar submucosa in 1 ml. The research location was Bonepantai District, Bone Bolango Regency, Gorontalo Province. The number of selected female goats used was nine head, divided into 3 (three) groups: the heifer treatment group, the group that gave birth once, and the group that gave birth more than once. The oestrus quantity variables observed were the percentage of oestrus, onset of oestrus, and duration. The results of the study showed that administration of the PGF2α hormone in the vulva submucosa of kacang goats during the second injection was able to cause up to 100% lust symptoms. The onset and duration of oestrus in heifers injected with PGF2α were 57.67 hours for 39.33 hours, one birth was 61.33 hours for 34 hours, and one birth was 57.67 hours for 42.33 hours. The behavior shown by Kacang goats after PGF2α injection were mount to other goats and quiet when mounted by males. This study concludes that PGF2α injection into the vulva submucosa causes Kacang goats to be in heat with quite obvious symptoms. PGF2α injection into the submucosa of the vulva can be applied for estrus synchronization at a lower cost and with normal heat effect.

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INTRODUCTION

Kacang goats are native Indonesian goats of the meat-producing type whose populations can be found in almost all regions of Indonesia (Ilham et al, 2016). The body size of Kacang goats is smaller than Peranakan Etawah (PE) goats but has the advantage of being able to produce and reproduce in environments with low feed quality, hot climates and weather (Ilham et al., 2016; Ilham & Mukhtar, 2018). Kacang goats are widely raised by people traditionally in rural areas because they are easier to maintain and do not require high costs (Ilham et al., 2023).

Crossbreeding of Kacang goats with local and exotic goats in various regions in Indonesia has caused their population to decline every year. The population of Indonesian goats in 2022 was 18,560,835, a decrease compared to the previous year of 18,904,347. The population decline also occurred in Gorontalo Province, where in 2022 there were 109,673 and in 2021 there were 107,163 (Badan Pusat Statistik, 2024). Increasing the goat population requires reproductive management in order to create effective and efficient livestock farming. The application of reproductive technology can be an option and a shortcut to accelerate the achievement of improving the genetic quality of livestock.

One of the reproductive technologies that can be used to accelerate the increase in livestock population is estrus or heat synchronization. Heat synchronization is estrus control carried out on a group of female livestock by manipulating hormonal mechanisms, so that the simultaneity of estrus and ovulation can occur on the same day or within 2 or 3 days after injection. The purpose of estrus synchronization is that all livestock given treatment experience estrus simultaneously so that they can be mated and give birth simultaneously (Budiyanto, 2020). Estrous synchronization generally uses PGF2 α intramuscularly but has the disadvantage that the dose used is quite large so that it is inefficient. Twenty-five percent of the recommended dose of PGF2 α , when administered vaginally, was equally as effective as the full recommended dose administered IM (Kirkwood et al., 1996). Administration of PGF2 α submucosa of the vulva can be done with the assumption of a lower dose, the method is easy, and does not require special skills.

The ovulation rate and number of kids per birth of local goats are usually lower during puberty, causing the reproductive efficiency of young goats to be low. The number of ovulations usually increases until the age of 3-4 years, after which it will decrease. Generally, the ovulation rate and number of kids increase with age, although this is not always the case (Ismail, 2009). Age factors are generally included when studying the reproductive performance of goats because there is an increase in fertility with increasing age (Wodzicka-Tomaszewska M, Utama et al., 1991). Estrus is influenced by age, season, lineage, male (Hafez & Hafez, 2000), synchronization method during estrus synchronization (Anisa et al., 2023). Livestock that have never given birth have a longer time to estrus compared to those that have given birth (Hasan et al., 2017).

The purpose of this study was to determine the effect of administering PGF2 α hormone to Kacang goats using the subcutaneous method on the percentage, onset, and duration of estrus. The benefits of this study are as an alternative material in reducing the cost of estrus synchronization when choosing between the intramuscular PGF2 α injection method or the vulva submucosal method.

METHODOLOGY

This research was conducted in Tomini Bay, precisely in Lembah Hijau Village, Bone Pantai District, Bone Bolango Regency, Gorontalo Province. The tools used were cages, shovels, digital watches, livestock ropes, stationery, syringes (dispoit), buckets, digital cameras. The materials used included PGF2 α brand lutalyse, alcohol, female goats, male goats, B-complex vitamin.

This study was grouped into 3 treatments, namely Parity 1 (P1) for female goats/virgin goats that have never given birth, Parity 2 (P2) for female goats that have given

birth once, and Parity 3 (P3) for female goats that have given birth more than once. Injection of PGF2 α by inject into the submucosa of the vulva at a dose of 1 ml/head in all treatments. Each treatment was repeated 3 times, so that a total of 9 goats were used.

The observed variables of the estrus quantity and quality include:

- Percentage of estrus, the number of estrus goats divided by the number of treatment goats, expressed in percent
- Onset of estrus, the speed of onset of estrus and is calculated after the initial injection of PGF2 α until the goats show one of the symptoms of estrus, calculated in hours.
- Duration of estrus, the length of time the symptoms of estrus are visible, calculated in hours from the onset of symptoms of estrus until the symptoms of estrus are no longer visible (no mucus in the vulva, the livestock is not restless, the vulva is not swollen, and does not want to be mounted by the male).
- The quality of estrus, including the vulva being red, swollen, warm and wet/with mucus, as well as behavior, i.e. riding another goat or remaining silent when mounted by a male. Observation of estrus quality for ± 1 hour when feed and drinking water are provided, or outside of that time.

The results of the estrus quantity observations were analyzed descriptively by calculating the average value and percentage. The analyzed data were then discussed descriptively.

The quality of estrus is determined based on the average score obtained on all observed goats. Determination of the estrus quality score is based on the following criteria:

Table 1. Assessment Criteria for the Quality of Estrus in Kacang Goats

Criteria	Score	Description
Changes in Vulva condition	0	Not red, not mucus, not swollen, and not warm.
	1	A little red, a little mucus, a little swollen, and a little warm
	2	Red, produces a lot of mucus, swollen and warm
	3	Very red, profusely oozing mucus, very swollen, and very warm
Behaviour	(+)	Shows symptoms of riding other goats or stays still when mounted by a male or other goat
	(-)	Does not show symptoms of riding other goats or is silent when mounted by a male or other goat

RESULT AND DISCUSSION

Symptoms that appear in female goats in the estrus phase are estrus behavior and indicate that the livestock is ready to be mated. Estrus is a physiological activity in female animals that is marked by the emergence of symptoms and the desire to mate. Female goats that have estrus will show early clinical symptoms such as swelling of the vulva, mucus discharge, aggression, and silence when mounted

The results of the study of the administration of PGF2 α hormone in the three treatments showed a fairly good estrus response in kacang goats (Table 2). All kacang goats observed after the second injection showed estrus symptoms (100%) on the 12th day even though the time of symptom appearance was not the same. The first injection of PGF2 α (I) only showed 55% of goats in estrus. This because not all female goats observed have Corpus Luteum (CL) to be lysed by PGF2 α compared to the second injection (II). The symptoms of estrus that appear after injection are caused by CL lysis by the vasoconstriction of PGF2 α so that blood flow to the corpus luteum decreases drastically (Hasan et al., 2017). The absence of CL in the ovary triggers the hypothalamus-pituitary to release the hormones Follicle Stimulating Hormone (FSH) and Lutenizing Hormone (LH) which stimulate the ovarian follicles to develop into de graaf follicles (Budiyanto, 2020; Ilham et al., 2016). The de graaf follicles will produce fluid containing the hormone estrogen which triggers the onset of symptoms of lust in animals (Thiery, 2009). Goat estrus will normally occur 24 hours to 48

hours after injection of PGF2 α , thus mating can be done 10 to 12 hours after signs of estrus are seen.

Table 2. Percentage of estrus in Kacang goats with injections I and II at 10-day intervals

Treatment	dose of injection	Goat (head)	Percentage of estrus after injection of PGF2 α to	
			I	II
Never Given Birth	1 ml	3	2 (66,6%)	3 (100%)
already gave birth 1 time	1 ml	3	2 (66,6%)	3 (100%)
already gave birth >1 time	1 ml	3	1 (33,3%)	3 (100%)
Average		9	5 (55,5%)	9 (100%)

Estrous onset is the rate of onset of estrus calculated after injection of prostaglandin into livestock until the livestock shows one estrus symptoms. The onset of estrus in the three treatments in this study showed that all livestock showed symptoms of estrus, with a range of 31 hours to 79 hours or an average of 58.8 hours after the initial injection (Table 3). Based on the average, the onset of estrus in kacang goats that had not given birth was 57.67 hours, after giving birth 1 time 61.33 hours, and after giving birth more than 1 time 57.67 hours (Table 3). The onset of estrus in this study was not much different from other studies that estrus synchronization using PGF2 α in kacang goats of different ages occurred at 70.06 hours to 138.42 hours, due to differences in livestock age and individual responses to different PGF2 α performance (Ismail, 2009). Differences in estrus onset between individuals can be caused by differences in hormone preparations used, doses given, observation factor patterns, livestock conditions, feed given (Toelihere, 2003), genetic factors, age, livestock physiology, and environmental conditions (Fauzi et al., 2017).

Table 3. Onset of Estrus after the second injection of PGF2 α at a dose of 1 ml in the vulva submucosa.

Replicated	Onset of Estrus (hours)		
	Never Given Birth	already gave birth 1 time	already gave birth >1 time
1	63	63	63
2	32	57	31
3	78	64	79
Total	173,00	184,00	173,00
Average	57,67\pm23,46	61,33\pm3,79	57,67\pm24,44

The duration of estrus is the time span starting from when the symptoms of estrus appear until the symptoms of estrus end. The duration of estrus occurs for some time since the estrogen hormone reaches its peak (24-48 hours) and the duration can vary between species (Hafez & Hafez, 2000). The average duration of estrus after the second injection in this study was 39.33 hours before giving birth, 34 hours after giving birth once, and 42.33 hours after giving birth>1 (Table 4). The duration of estrus in Kacang goats after PGF2 α injection was 40.40 \pm 2.27 hours and PE goats 46.40 \pm 4.56 (Syafuruddin et al., 2016), in Sapera virgin goats it was 31.21 \pm 5.77 hours, first parity 42.64 \pm 9.80 hours, and parity more than or equal two 44.99 \pm 5.30 hours (Puspita et al., 2023). The duration of estrus in livestock can be influenced by the nutrition consumed by the livestock, the levels of estrogen hormones produced by the ovaries (Ilham et al., 2016; Irmaylin et al., 2011). Lack of nutrition in livestock will result in low estradiol secretion so that the function of all glands in the body will decrease. The gland that plays an important role in causing estrus in livestock is the anterior pituitary gland, and hypofunction of the pituitary gland will be followed by a decrease in the secretion of gonadotropin hormones, namely FSH and LH. A decrease in the

secretion of FSH and LH can cause the formation of de Graaf follicles in the ovaries to be inhibited so that estrogen is not produced.

Table 4. Duration of estrus (hours) of Kacang goats after injection of PGF2 α in the second injection.

Replicated	Onset of Estrus (hours)		
	Never Given Birth	already gave birth 1 time	already gave birth >1 time
1	38	33	24
2	62	35	64
3	18	34	39
Total	118	102	127
Average	39,33 \pm 22,03	34 \pm 1	42,33 \pm 20,20

Estrus Quality

The quality of local goat estrus can be determined by observing changes in the condition of the vulva, i.e. red, swollen, warm vulva, secreting mucus, and behavior of mounting other goats or remaining still when mounted by a male (Siregar, 2009; Wijayanti & Ardigurnita, 2020). Symptoms of estrus shown by kacang goats after PGF2 α hormone injection include swollen vulva, red vulva, warm vulva when touched, and mucus coming out of the vulva. The highest average score for visual changes in the vulva was shown by goats with more than 1 birth (1.92), then never having given birth (1.62), and having given birth once (1.33) (Table 4). The red color and excess mucus in the vulva are caused by the hormone estrogen in the blood. High levels of estrogen in goats during estrus will increase blood flow to the vulva area so that cell activity and temperature increase. The more estrogen hormone secreted, the better the quality of estrus (Pangestuningrum et al., 2021).

Table 5. Score values for visual observation of the vulva of peanut goats after the second injection of PGF2 α

Treatment	Replicated	Vulva				Average	Behaviour
		Colour	Mucous	Form	Temperature		
Never Given Birth	1	2	2	2	2		+
	2	2	2	2	2		+
	3	1	1	1	1		+
	Average	1.67 \pm 0,5	1.67 \pm 0,5	1.67 \pm 0,5	1.67 \pm 0,5	1.67 \pm 0,5	
One Time Giving Birth	1	1	1	1	1		+
	2	2	2	2	2		+
	3	1	1	1	1		+
	Average	1.33 \pm 0,5	1.33 \pm 0,5	1.33 \pm 0,5	1.33 \pm 0,5	1.33 \pm 0,5	
More Than One Birth	1	2	1	2	2		+
	2	2	2	2	2		+
	3	2	2	2	2		+
	Average	2.00 \pm 0	1.67 \pm 0,5	2.00 \pm 0,0	2.00 \pm 0,0	1.92 \pm 0,16	

The results of observations on behavior after the second injection showed that all kacang goats given the PGF2 α hormone showed symptoms of mounting other goats and staying still when mounted by a male. In addition to these symptoms, other symptoms shown were decreased appetite, restlessness, often making distinctive sounds, and often wagging their tails. Kacang goats showed symptoms of lust in the form of frequent bleating, climbing the walls of the cage, being attracted to males, staying still when mounted, and raising their tails when mounted (Budiyanto, 2020).

CONCLUSION

Submucosal injection of PGF2 α into the vulva of kacang goats at the second injection was able to cause estrus symptoms up to 100%. The onset and duration of estrus in virgin goats injected with PGF2 α were 57.67 hours for 39.33 hours, one birth was 61.33 hours for 34 hours, and more than one birth was 57.67 hours for 42.33 hours. PGF2 α injection into the

submucosa causes Kacang goats to display quite obvious signs of estrus. PGF2 α injection into the submucosa of the vulva can be applied during estrus synchronization at a lower cost but able to provide normal estrus effects.

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