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Estrus expression of dairy cows after calving with and without using cooling system

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Abstract. This study aimed to compare the estrus expression of postpartum Friesian Holstein (FH) dairy cows with and without the cooling system in Cendana, Enrekang. A total of 9 postpartum FH dairy cows were used in this study, 3 of them were placed in the cold house and the other 6 cows were placed without a cooling system. The feeding consisted of forage, rice bran, and water, which was free access; ad libitum. The parameters measured in this study were (1) the signs of secondary estrus signs, such as vulva condition, mating behavior, mucus secretions, and (2) the duration of estrus, which was counting from the first estrus to the last observation where the cows were no longer showing the estrus symptoms. These parameters were compared by using the t-test. The results showed that the cervical mucus of dairy cows with the cold house was clearer intensity than those without a cooling system (66.7 vs. 16.7%). The changing behavior of dairy cows with cold houses showed higher intensity than without cold houses (100 vs. 67%). The duration of estrus in dairy cows with cooling had significantly ($P < 0.05$) longer than those without cooling (24.4 ± 1.5 vs. 18.3 ± 2.2 hours). It can be concluded that the signs of secondary estrus for those dairy cows in the cooling system showed a clear appearance than those dairy cows without a cooling system. The duration of estrus with a cooling system was longer than without a cooling system.

1. Introduction

Enrekang Regency is one of the regencies in South Sulawesi Province in Indonesia, which is famous for dairy farming. The dairy cows that are developed in Enrekang Regency are Friesian Holstein (FH). FH comes from European countries that have a temperate climate with a low thermometric temperature range (13–25 °C). Based on these original climatic conditions, FH dairy cows are very sensitive to changes in high temperature. If dairy cows are placed in locations that have high temperatures, they will experience heat stress resulting in decreased productivity [1,2].

Indonesia has a tropical climate, which is a climate due to it is around the equator. In general, the tropics are relatively hot areas with the lowest average annual temperature being 18°C. In this condition, the productivity of cows from hot climates will be lower. A previous study [3] stated that heat stress will prolong



the estrus cycle and shorten the estrus period. The high environmental temperature may directly disrupt embryo development to cause death and change the hormonal status of the cows.

The low success rate of mating in dairy cows, both by insemination and in natural breeding in Indonesia, should be a big concern. The low level of successful mating is the lack of information and knowledge about the expression of estrus in dairy cows. Generally, farmers in smallholder farms only rely on estrus detection to carry out AI [4], farmers are less able to determine the optimal time for mating dairy cows. Heat stress is one of the triggers that affect the decreased expression of estrus in dairy cows. When estrus expression and detection are reduced, this can lead to fewer inseminated cows and incorrect timing of AI [5]. Several strategies and innovations to reduce heat stress are to provide cooling treatment in the form of water spray [6]. To our knowledge, there is still a lack of study in this area on the estrus expression in postpartum dairy cows. Therefore, it is necessary to carry out a study to obtain some information on the expression of estrus in postpartum dairy cows with and without a cooling system.

2. Materials and methods

The materials used in this study were 9 dairy Friesian Holstein (FH) cows postpartum; 3 cows were placed in the house that was used the cooling system and the other 6 cows without using the cooling system. All cows were providing feed in the form of forage, rice bran, and drinking freely access (*ad libitum*). The equipment for the cooling system used was 3 sprinkler sprayers which flow water from the well using a water pump machine, the timer (hour) used was delay by setting the time on 15 minutes and turning it back on after 60 minutes for 10 times during the day and at night. The time setting day was for 15 minutes and it was turned on 5 times, the thermometer was for measuring the temperature. The parameters of this study were (1) secondary signs of estrus, such as the state of the vulva, mating behavior, and mucus secretions. The observation was carried out during estrus and it was observed every 3 hours until it reaches the end of estrus. A score of 1 to 3 determined the comparison of the scores for estrus signs, (2) the duration of estrus was counting from the onset of estrus until the last observation, which no longer shows the symptoms of estrus. The data obtained in the study on the expression of estrus were analyzed based on the frequency, while the duration of estrus was carried out using t-test analysis.

3. Results and discussion

3.1. Signs of secondary estrus in dairy Friesian Holstein cows

The results of the study on the appearance of secondary estrus signs based on the state of the vulva, mucus secretion, and mating behavior in dairy cows with and without cooling are presented in table 1. Based on table 1, signs of secondary estrus in dairy cows with cooling show a clearer performance than dairy cows without cooling. Symptoms of mucus secretion with a clear intensity were shown in dairy cows that were provided the cooling system with a value of 66.7% compared to those without cooling with a value of 16.7%. This is due to the provision of the cooling system can reduce heat stress in dairy cows. Heat stress interferes with endometrial function and estrous secretory activity, which may result in reduced mucus secretion [7]. Behavioral changes in dairy cows that were providing a cooling system showed clearer behavior than those without cooling. This indicates that the signs of estrus in dairy cows that were treated more cooling were able to adapt well. A previous study [8] explained that heat stress causes a decrease in the detection rate of estrus visually, the ability of cows to exhibit natural mating behavior is negatively affected by an increase in environmental temperature, which can cause physical lethargy and reduce the duration and intensity of estrus expression [9].

Table 1. Signs of secondary estrus in dairy cows with and without cooling system.

The signs of secondary estrus		Treatment	
Indication	Intensity	Cooling system (%) (n=3)	Without cooling system (%) (n=6)
Vulva (color, swelling, and wetness)	1 (Unclear)	0	0
	2 (Moderate)	100	100
	3 (Clear)	0	0
Mucus secretions (abundance, color, and consistency)	1 (Unclear)	0	0
	2 (Moderate)	33.3	83.3
	3 (Clear)	66.7	16.7
Behavior change (eat, tail, and restless)	1 (Unclear)	0	33.3
	2 (Moderate)	100	66.7
	3 (Clear)	0	0

3.2. Duration of estrus in dairy Friesian Holstein cows

The duration of estrus in dairy Friesian Holstein cows treated with and without cooling system are presented in table 2.

Table 2. Duration of estrus in dairy Friesian Holstein cows with and without cooling system.

Treatment	Duration of estrus (hours \pm SD)
Cooling system (n=3)	24.4 \pm 1.5
Without cooling system (n=6)	18.3 \pm 2.2

Table 2 shows that the duration of estrus in dairy cows with cooling system has a longer duration compared to dairy cows without cooling system (24.4 \pm 1.5 vs. 18.3 \pm 2.2). This indicates that the housing with cooling system affects the reproductive properties of dairy cows. The duration of estrus helps to predict the exact time of ovulation, and subsequently to help the farmers ensure the correct time for artificial insemination (AI). Temperature affects the function of the endocrine glands. Heat stress has a major effect on the endocrine system of livestock, causing changes in metabolism [10]. Cooling treatment in dairy cattle is able to reduce heat stress so that it shows a longer duration of heat than that of dairy cattle without cooling system. Heat stress can affect the duration of estrus in dairy cows; an increase in temperature results in stress and can shorten the duration of estrus [11]. Heat stress also affects the length of the interval between calving and first AI [12].

4. Conclusions

Based on the results of the study, it can be concluded that the signs of secondary estrus in dairy cows provided by cooling system show a clearer appearance than dairy cows without cooling system. The duration of estrus for dairy cows with cooling system is longer than without cooling. This suggests that the use of cooling system in dairy Friesian Holstein cows in the tropical area would improve reproductive performance.

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