

The Effect of Age of Livestock on the Onset Cycle of the Bali Caws

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ABSTRACT: The aim of this research was to determine The Effect of age of livestock on the onset cycle of the bali caws . This research used 21 heifers selected from 47 bali cattle heifers. The method used in this research is a field experimental method using a completely randomized design (CRD), namely P1, aged 4-7 years, P2, aged 8 - 11 years, P3, aged 12 - 15 years, with the number of livestock at U1, U2, U3 were 16 and 5 respectively before being given treatment, the cows were selected to ensure the cows were not pregnant by carrying out a pregnancy check with rectal palpation. Cattle that are not pregnant are injected with the synthetic PGF2 α hormone 2 ml per head, which contains the active ingredient Cloprostenol 500 μ g. Female cows that had been given PGF2 α were then observed to estrus from the first day to the sixth day. Data on the percentage of estrus, duration of estrus, intensity of estrus, and speed of onset of estrus symptoms were recorded as measured research variables. The data obtained were analyzed using the T test. The results of the analysis showed that age had no significant effect ($P > 0.05$) on the heat cycle of bali cow mothers. The conclusion of this research is that age has no effect on the estrus cycle of bali cattle mothers after being injected with the hormone prostaglandin F2 α (PGF2 α).

KEYWORDS: estrus, bali cow, age PGF2 α

INTRODUCTION

Balinese cattle are one of the regional economic supports for East Nusa Tenggara Province (NTT). Balinese cattle have an important role for the community, namely as a provider of animal protein sources, sources of income, savings and employment opportunities. Balinese cattle are widely developed in NTT. Balinese cattle have advantages compared to other cattle nations, including high pregnancy rates and good environmental adaptation (Handiwirawan & Subandriyo, 2004). The increase in livestock production is determined by several factors, namely livestock population, livestock productivity and reproductive efficiency (Suriyati *et al.*, 2014). Increasing livestock productivity can be achieved through one of the efforts, namely the artificial insemination (IB) program

Artificial insemination (IB) is one of the reproductive technologies that has been and is being used by the government in an effort to increase the cattle population to support national meat self-sufficiency (BBPPK, 2014). Growth has a fast stage and a slow stage. The fast stage occurs before sexual maturity and the slow stage occurs in the initial phase and when the body maturation has been reached (Tillman, 1991). Rapid growth occurs in the period of birth until the age of weaning and puberty, however, after the age of puberty to adulthood, the growth rate gradually decreases and will continue to decline (Tomaszeweska, 1991 in Manurung, 2008). According to Soeharto (2003), providing rations with good quality can increase the clarity of the appearance of estrus. The results of the research of Lestari *et al.* (2009) shows that age affects the intensity of fire, this is because the older the cow ages, the larger the size of the ovaries. The ovaries produce the hormone estrogen which plays an important role in the menstrual cycle.

According to Abidin *et al.* (2012) In the Journal (Appearance of Javanese Cows Based on Poel 1, Poel 2, and Poel 3) the results were obtained, namely the length of the Javanese cow pole 1, poel 2, and poel 3 of 10 hours, 12 hours, and 13.5 hours respectively. The length of the mating of Javanese cows poel 3 is longer than that of poel 1 and poel 2, this shows that the age of the cow affects the length of the mating. In cows, the length of estrus is influenced by the hormone estrogen secreted by the ovaries, so that estrus in older Javanese cattle will last longer because the reproductive organs (ovaries) have grown perfectly. This is in accordance with the theory of Hammond (1992) reporting that the duration of mating in cattle ranges from 6-30 hours with an average of about 17 hours. It was further explained that the period of estrus lasted an average of 19.3 hours in adult cows and 16.1 hours in females. There was no determination of the difference between cattle breeds. Gersimophopa observed estrus in 125 adult female cows and found that the duration of mating ranged from 6-20 hours, an average of 12.5 hours. Trimberger states that the average estrus of an adult cow is 17.8 (range of 2.5-28 hours) and 15.3 hours for heifers. The results of Trimberger's (1943) study showed that the bull was able to start the mast during the day or at night with almost the same time spread. However, animals that experienced estrus in the afternoon were in a state of heat 2-4 hours longer than cows that started to urinate in the morning

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RESEARCH MATERIALS AND METHODS

Place and Time of Research

This research was carried out in Buraen Village, South Amarasi District, Kupang Regency, East Nusa Tenggara Province (NTT). This research was carried out from May 5, 2022 - June 5, 2022.

Research Materials

The cattle used in this study used 21 female Balinese cattle with an age range of 3-15 years which were selected from 48 mothers by perrectal palpation to find out that the mother was not pregnant, with the following information: group 1: age 4-7, group 2: age 8-11, group 3: age 12-15

Research Equipment and Materials

The equipment used in this study is: measuring tape, measuring pipe, 3cc syringe, gloves, water, soap. The ingredient used in this study is the hormone PGF2a with the trademark lutalyse made by pharmacia N.V/S.S. Puurs belgia.

Research Methods

The research method used in this study is a field experiment method using a complete random design research design (RAL), as many as 21 female Balinese cows that have been selected are grouped by age, namely U1: 3-5 years, U2: 8-11 years, U3: 12-15, with the number of cattle in U1, U2, and U3 as many as 14, 5 and 2 heads respectively. Non-pregnant cattle were injected with the synthetic PGF2a hormone (Jurmate®) at 2 mL per head. Intense observation began on the 2nd to fifth day after the PGF2a hormone injection and was carried out 2 times a day, namely morning and evening. Observation of lust was carried out visually by detecting symptoms of lust such as clear mucus coming out from the cervix through the vagina and vulva, cattle looking agitated, often sluggish, trying to ride other cows, the base of the tail raised, appetite decreased, the vulva was swollen, warm, and changed color to a little reddish and quietly riding.

Research Procedure

The livestock used in this study were 21 mother Balinese cows which were selected from 48 productive female cows owned by the community. Selection is carried out on the normality of reproductive organs, especially the ovaries and whether the female is pregnant so as to provide certainty in observing sexual intercourse. All research materials that have passed are divided into 3 age groups and then injected with the hormone PGF2a. Observation of the estrus response was carried out from the first day to the 6th day after PGF2a injection. Data on the percentage of estrus, duration of estrus, intensity of estrus, and the speed of onset of estrus symptoms were recorded as study variables.

Material Preparation

The livestock used in this study were 21 Balinese cows selected from 48 cows. Selection is carried out on the normal or not of the reproductive organs, especially the ovaries and in conditions of not being pregnant. All research materials that have passed the selection are randomized and grouped into 3 groups. Before the estrusions were observed and then injected into the cow mother with PGF2a at a dose of 2 mL/head intramuscularly. The cow mother was then observed for estrus from the first day to the sixth day after PGF2a injection which was carried out 2 times a day, namely in the morning and evening until signs of estrus appeared in the cow mother and artificial insemination (IB) was carried out. The speed of arousal is calculated from the time of the first appearance of arousal while the duration of arousal is calculated from the appearance of signs of arousal to the disappearance of arousal signs. Data on the percentage of estrus, duration of estrus, intensity of estrus, and the speed of onset of estrus symptoms were recorded accurately and completely as study variables.

Research Implementation

1. Selection of the recipient female cow is to ensure the pregnancy status of the livestock. With the requirements as a recipient livestock are: virgin or mother cattle that are in a condition of not pregnant, have normal reproductive organs, normal sexual cycles, good body performance, healthy and good body score (SKT), in one of the ovaries has a functional corpus luteum (CL), have never experienced pregnancy failure more than 2 times.
2. Pregnancy examination (PKB) by rectal palpation method Cattle that are not pregnant generally have uterine that does not differ in size. Among rectal palpation breeders, the procedure is more practical and younger, has high accuracy. The pregnancy examination technique is as follows: examination wearing boots protector, short-sleeved field practice clothes, wearing plastic gloves, the examiner's nails must be cut blunt, flat, slippery and must not wear rings. Perform a right or left hand examination according to custom, be aware of the kick (kick) of the cow's leg which usually occurs before or when the hand is inserted into the rectum, the plastic sheath must be smoothed with soap, the hand is inserted into the rectum in a conical form and continued until it exceeds the reproductive organs. If the feces are abundant then it is necessary to remove them first, feel every change in the reproductive organs.
3. Cattle that are not bunted are divided into two groups; group 1 was injected with the synthetic PGF2a hormone (Juramate®) 2 mL per head containing the active ingredient Cloprostenol 500 µg/mL, while the cows in group 2 did not receive PGF2a injection.

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Before carrying out hormone injections, the officer ensures that the female cow must be in a healthy state, not thin, and the cow in a state of not pregnant, because if the cow is pregnant and the pregnancy is carried out, miscarriage will occur. The cows targeted for this frenzied bluff are examined one by one with great care.

4. The most effective way to detect a cow is to follow the cow when it is grazed. However, there are some cows that have a very short mating cycle, which is 6 hours, so that their mating is difficult to detect if it occurs at night which results in infertility. Observation of estrus is carried out visually by detecting the following symptoms of strus: clear mucus discharge from the cervix that flows through the vagina and vulva, cows seem restless and want to get out of the cage, often squealing, trying to ride other cows, the base of the tail is raised, appetite and drinking decrease, The vuva is swollen, when touched it feels warm, and changes color to a slight reddish.

RESEARCH VARIABLES

The variables measured in this study are as follows:

1. The speed of estrus onset (hours) is: the distance between the time of PGF2a injection and the onset of the appearance of symptoms of arousal. The speed of onset of arousal is the time interval between the time of administration of PGF2a and the onset of arousal symptoms (hours) or the speed of arousal of arousal over the observed time interval from treatment to the onset of etrusus symptoms.

2. The duration of lust (hours) is the time difference from the appearance of the signs of lust to the disappearance of the signs of lust which is expressed in hours. The duration of the cow in a hot climate is shorter or 10-12 hours compared to the cow in a cold climate or 18 hours. A hot climate can affect the length of time due to livestock being stressed so that it interferes with the functioning of the livestock body which results in abnormal organ performance.

3. Intensity of lust is the level of clarity of the appearance of the clear appearance of the church of lust shown by cattle at the time of lust as a result of the treatment with the score. to compare the level of intensity of this lust is determined scores 1 to 3, namely score 1 (unclear lust), score 2 (lustful with moderate intensity) and score 3 (lustful with clear intensity), score 2 (lustful with moderate intensity) and score 3 (lustful with clear intensity) (Putri, 2014). The intensity of lust score of 1 (+) was given as if cattle showed symptoms of mucus discharge were not clear, the condition of the vulva (swollen, wet and red) was not clear, appetite did not seem to decrease and was less restless and there were no visible symptoms of having and being silent when riding by fellow females. A score of 2 (++) is given to cattle that show all symptoms of arousal at the intensity of a score of 1 clearly except for the symptoms of riding another female and being silent when riding another female, and a score of 3 (+++) is given to female cattle that show all symptoms of arousal well.

4. The percentage of estrus (%) is the number of female Balinese cows that show symptoms of arousal after giving PGF2a as the number of cows in the group that received treatment at 100%.

Percentage of estrus (%) = $\frac{\text{Number of cattle that are estrus (tail)}}{\text{Number of synchronized livestock (tails)}} \times 100\%$ Cows that are declared to be in heat if they show signs of lust such as swollen vulva, reddish color, and transparent mucus and cows in a mating ready position. Treatment is 100%.

Data Analysis

The collected data was analyzed by analysis of variance (ANOVA) using SPSS software version 25.

RESULTS AND DISCUSSION

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Onset estrus (the speed of estrus onset in hours), which is the time gap between the end of treatment and the beginning of the appearance of estrus symptoms (Dewi, *et al.*, 2011). Observation of the onset of estrus is carried out by looking at the appearance of estrus symptoms through visual observation of cow behavior (riding another cow, being silent when riding another cow) and vulvar conditions (red, swollen, wet) and transparent mucus discharge through the vulva (Handarini *et al.*, 2017). The onset of estrus is very important to know to determine the right IB timing so that it can support the success of IB after estrus synchronization on a large livestock scale (Solihati, 2008).

Table 1. Average Effect of Livestock Age on Estrus Onset, Estrus Duration, Estrus Intensity.

Parameter	Age of Livestock (Years)			
	4-7	8-11	12-15	P-Value
Onset Estrus (Hours)	79,53±42,62	58,80± 34,94	57,50± 13,43	0,532
Duration of Estrus (Hours)	10,39± 3,59	7,50± 4,30	8,75± 0,35	0,325
Estrus Intensity (Hours)	1,92± 0,99	1,20± 0,83	3,00± 0	0,089

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Information:

- Treatment had an unreal effect ($P > 0.05$) on the onset of estrus in Balinese cattle
- The same lowercase letter in the column shows no real difference ($P > 0.05$)

Based on Table 1, the onset of estrus in Balinese cattle with a livestock age of 4-7 years ranges from 0 to 146.5 hours (average 79.53 hours) longer than Balinese cattle with a livestock age of 8-11 years, which ranges from 0 to 94 hours (average 58.80 hours) and Balinese cattle with a livestock age of 12-15 years ranging from 48 to 67 hours (average 57.50 hours). This study shows that the age of livestock of 12-15 years has a faster estrus speed than the age of livestock 8-11 years and the age of livestock of 4-7 years.

The difference in the occurrence of estrus is caused by the difference in age in cows, where cows that are old and have had children tend to have a more developed reproductive system than cows that are young and have never had children. According to Ismail (2009), the onset of estrus occurs faster in cattle that have given birth more than once compared to cattle that have given birth once or cattle that have never given birth at all. The onset of estrus occurs early in animals that have given birth more than once. Animals that have never given birth are the last animals to show fire. In addition, Siregar *et al.* (1999) also stated that the diversity of the onset of estrus is influenced by the tendency of differences in age and livestock individuals. Hafez (2000) stated that there are several factors that affect the estrus cycle including offspring, age, season and the presence of male livestock.

The rapid onset of estrus in older cows compared to veal cattle can be caused by several factors, one of which is hormonal changes. As they age, hormonal changes occur in cows. Hormones such as estrogen, progesterone, and other hormones can change in levels and response to the reproductive cycle. This can cause older cows to enter the estrus period earlier due to different hormonal balances. In addition, production experience can also be a factor in the rapid onset of estrus. Older cows may have more experience in the reproductive cycle. They have experienced estrus many times in their lives and their bodies may be better prepared to enter the reproductive phase again quickly. There are also environmental factors such as temperature, humidity, and stress levels can also affect the onset of estrus. Older cows may be more accustomed to their environment, which can reduce stress levels and allow them to enter the estrus period sooner.

Furthermore, to find out whether the difference in the onset of estrus in Balinese cattle based on the age of the livestock is significantly different or not, a statistical analysis was carried out using the ANOVA test. The results of statistical analysis with the ANOVA test showed that there was no significant difference between the onset of estrus in Balinese cattle with a livestock age of 4-7 years, a livestock age of 8-11 years, and a livestock age of 12-15 years. This is based on the value obtained, which is 0.532 ($P > 0.05$). The results of Duncan's further test showed that the onset of estrus in Balinese cattle with a livestock age of 4-7 years was not real ($P > 0.05$) with the onset of estrus in Balinese cattle with a livestock age of 8-11 years and a livestock age of 12-15 years. Likewise, the onset of estrus in Balinese cattle with a livestock age of 8-11 years is not real ($P > 0.05$) with the onset of estrus in Balinese cattle with a livestock age of 12-15 years. In other words, the age of livestock has no real effect on the onset of estrus in Balinese cattle.

The results of this study are in line with the results of a study conducted by Ujarwati (2014), where the results of his study showed that there was no relationship or influence of age on the length of estrus in cattle ($P > 0.05$). On the other hand, the results of this study are different from the results of research conducted by Ismail (2009), where the results of his research show that the age difference has a real effect ($P < 0.01$) on the onset of animal estrus. The onset of estrus in livestock over 2 years of age is very pronounced ($P < 0.01$) with livestock between 1-2 years old and farm animals less than 1 year old, while the onset of estrus in farm animals between 1-2 years old is not real ($P > 0.05$) with farm animals less than 1 year old.

The Effect of Livestock Age on the Duration of Balinese Cattle

The duration of estrus is the interval (distance) calculated from the first onset of estrus symptoms to the cessation of estrus symptoms in hours (Priyanto *et al.*, 2023).

Based on Table 1, the duration of estrus in Balinese cattle with a livestock age of 4-7 years ranges from 0 to 17.5 hours with an average of 10.39 hours longer than the age of livestock 8-11 years which ranges from 0 to 11 hours with an average of 7.5 hours and the age of livestock 12-15 years which ranges from 8.5 to 9 hours with an average of 8.75 hours. This study shows that the average duration of livestock of 4-7 years has a longer average duration of estrus than the age of livestock of 8-11 years and the age of livestock of 12-15 years.

The effect of age on the length of estrus in cattle can vary depending on body conditions, hormonal types, and environmental factors. This is as stated by Hastono (2000) that the length of estrus is influenced by age, body condition, and also the type of hormone used for synchronization or induction of estrus. However, generally in cows that are still easy or have never given birth (primipar), their estrus may have a shorter duration because their bodies may not be fully mature and used to their reproductive cycle. Whereas in older cows or have given birth several times (multipar) they may have estrus with a longer duration. This can happen because their bodies have gone through the reproductive process several times and may have a more regular and longer cycle. Puspita *et al.*, (2023) revealed that numerically, the higher the life of livestock animals, which means that they have given birth several times (multipar), will result in a longer estrus time.

Furthermore, to find out whether the difference in the duration of estrus in Balinese cattle based on the age of the cattle is

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significantly different or not, a statistical analysis was carried out using the ANOVA test. The results of statistical analysis with the ANOVA test showed that there was no significant difference between the duration of estrus in Balinese cattle with a livestock age of 4-7 years, a livestock age of 8-11 years, and a livestock age of 12-15 years. This is based on the value obtained, which is 0.325 ($P>0.05$). The results of Duncan's further test showed that the duration of estrus in Balinese cattle with a livestock age of 4-7 years was not significantly different ($P>0.05$) with the duration of estrus in Balinese cattle with a livestock age of 8-11 years and a livestock age of 12-15 years. Likewise, the duration of estrus in Balinese cattle with a livestock age of 8-11 years is not real ($P>0.05$) with the duration of estrus in Balinese cattle with a livestock age of 12-15 years. In other words, the age of livestock has no real effect on the duration of estrus in Balinese cattle.

The cause of the absence of significant differences in the length of estrus in cows, despite the different ages of the livestock, can be due to various factors that include genetics, management, health and nutritional conditions, and reproductive experience. First, genetic factors play an important role because cows with similar genetic backgrounds may exhibit consistent estrus patterns, regardless of age differences. Second, uniform management and a stable environment can result in consistency in the reproductive cycle, which impacts similar estrus duration among cattle groups. Third, optimal health and nutritional conditions in all cows can ensure that they are in good condition to have a normal reproductive cycle, regardless of their age. Finally, the reproductive experience gained from older cows can be an influencing factor, however, if the easier cows get sufficient reproductive experience and are well managed, the difference in the duration of estrus may not be significant.

The results of this study are in line with the results of a study conducted by Ujarwati (2014), where the results of the study show that there is no relationship or influence of age on the length of estrus in cattle ($P>0.05$). The length of estrus in livestock does not depend on the difference in age, whether cattle are 12 months, 20 months, or ≥ 28 months, but descriptively the higher the age, the longer the estrus time.

Effect of Livestock Age on Estrus Intensity

The intensity of estrus refers to how strong or clear the symptoms of estrus are shown by a cow. Observation of estrus intensity was assessed based on a score of (0) showing no symptoms of estrus, a score (1) of unclear or low estrus, a score of (2) of moderate estrus, and a score of (3) of clear or high estrus (Sinda, *et al.*, 2017).

Based on the table above, the intensity of estrus in Balinese cattle with an average age of 12-15 years all had a score of 3 with an average of 3.00, higher than the age of 8-11 years of cattle which ranged from 0 to 2 with an average of 1.20 and the age of cattle of 4-7 years which ranged from 0 to 3 with an average of 1.92. This study shows that the age of livestock of 12-15 years has an average intensity of estrus longer than the age of livestock of 4-7 years and the age of livestock of 8-12 years.

The age of a cow can affect the intensity of its estrus, although this effect can vary depending on other factors such as genetics, management, nutrition, and health. In general, younger cows that have never given birth (primipar), the intensity of estrus may tend to be lower. This is because their bodies are still in the process of adapting to the reproductive cycle and may not be fully mature physically and hormonally. On the other hand, cows that are older or have given birth several times (multipar) tend to have a higher intensity of estrus. Older cattle may have more experience in the reproductive cycle and their bodies are more accustomed to the process. Ismail (2009) stated that cattle that are old or have given birth more than once show a very clear estrus intensity, while young cattle that have only given birth once or have never given birth have a less clear estrus intensity.

Then, to find out whether the difference in estrus intensity in Balinese cattle based on the age of the livestock is significantly different or not, a statistical analysis was carried out using the ANOVA test. The results of statistical analysis with the ANOVA test showed that there was no significant difference between the intensity of estrus in Balinese cattle with a livestock age of 4-7 years, a livestock age of 8-11 years, and a livestock age of 12-15 years. This is based on the P value obtained, which is 0.089 ($P>0.05$). Furthermore, the results of Duncan's further test showed that the intensity of estrus in Balinese cattle with a livestock age of 4-7 years was not real ($P>0.05$) with the intensity of sestrus in Balinese cattle with a livestock age of 8-11 years and a livestock age of 12-15 years. However, the intensity of estrus in Balinese cattle with a livestock age of 8-11 years was significantly different ($p<0.05$) from the duration of estrus in Balinese cattle with a livestock age of 12-15 years. However, overall it can be said that the age of livestock does not have a real effect on the duration of estrus in Balinese cattle.

Although the age of cows can vary, sometimes there is no significant difference in the intensity of estrus between cows of different ages. This can be caused by a number of factors that affect the reproductive cycle and the hormonal response of the cow, which may not always depend on the age of the cow. First, genetic factors can play a big role in determining the intensity of estrus. If cows of different ages come from similar genetic backgrounds, they may have a tendency to point to a consistent estrus canopy, regardless of age differences. Second, uniform management and stable environmental conditions can create similar conditions among the cows. This includes factors such as nutrition, maintenance, and environmental management. If all cows are treated equally, this can lead to a uniform estrus response, regardless of age differences. Furthermore, optimal health conditions in all cows can ensure that they are all in good condition to have a normal reproductive cycle, regardless of their age. Healthy cows tend to show estrus with good intensity. Thus, when all of these factors are uniform among cows of different ages, the difference in estrus intensity may not be so noticeable.

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Results However, the results of this study are different from the results of the research conducted by Ismail (2009), where the results of his study show that the age difference has a real effect ($P < 0.01$) on the intensity of animal estrus.

Percentage of Estrus

The results of this study showed that the percentage of estrus shown by the cows in the study sample reached 90.47% (19 estrus out of 21 heads). The average percentage of estrus obtained in this study is relatively the same as the results obtained by Yusuf and Teolihere (1990) in their research, which is 92.16% and Kune and Solihati (2007) in their research, which is 91.26%. The assessment of estrus response in cattle by the researcher is based on one of the signs of estrus that appears, so the tendency for estrus response rates to be high.

The results showed that cows at the age of 8-11 years and 12-15 years produced a higher percentage of estros, which was 100% each, compared to cows at the age of 4-7 years, which was 85.7% (Tabel 4).

Tabel 2. Rataan pengaruh umur ternak terhadap persentase estrus

Age of livestock	Number of Cows Treatment (tail)	Number of Estrus Cattle (tail)	Estrus (%)
4 - 7 years	14	12	85,7
8 -11 years old	5	5	100,0
12 - 15 years old	2	2	100,0

The low percentage of estrus in cows with a livestock age of 4-7 years is caused by the presence of 2 cows that do not show symptoms of estrus. This shows that the difference in the age of cows has a significant impact on their estrus percentage. Younger cows tend to take longer to reach reproductive readiness, which can result in a lower percentage of estrus at that age. Physical and hormonal growth and development processes play an important role in reproductive readiness, with older cows tending to have more stable hormonal regulation and a more regular estrus cycle. In addition, environmental factors such as nutrition, maintenance management, and ingotle conditions can also affect the reproductive readiness of cows at different ages. Overall, older cows tend to have a higher and more regular percentage of estrus compared to younger cows, but other factors also play an important role in determining the percentage of estrus in cows at different ages.

CONCLUSION

Based on the results of the study, it can be concluded that the age of livestock does not affect the onset of estrus, the duration of estrus, as well as the intensity and percentage of estrus in Balinese cattle.

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