

Uterine Involution and Onset of Estrus in Ongole Grade (PO) Cattle which are Fed Rice Straw and Rice Bran Based Diets Supplementation Lamtoro Leaf Meal*

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Abstract:- Uterine involution and onset of estrus in PO cows fed basal diets of rice straw and rice bran, supplemented with lamtoro leaf meal are interesting reproductive problems to study. Because what every breeder wants is that after parturition occurs, their livestock immediately experience uterine involution followed by estrus so that mating can take place. To address this problem, feed of a certain quality is very necessary. On the other hand, agricultural waste products such as rice straw and rice bran are widely available in the community but have low nutritional content so supplementation with lamtoro leaf meal would be an alternative solution.

The research aims to study the process of uterine involution and estrus onset of PO cows fed basal feed of rice straw and rice bran, supplemented with lamtoro leaf meal. A total of 10 PO cows aged around 4.5 years in late pregnancy status were randomly grouped into two treatments, namely the group that received basal feed of rice straw and rice bran (R_0) and the group that received basal feed of rice straw and rice bran, supplemented with lamtoro leaf meal (R_1). The research used experimental methods and the results were analyzed using one-way classification analysis of variance with the MINITAB 14 application. The results obtained showed that there was a significant difference ($P < 0.05$) in the variables of uterine involution and estrus onset. Meanwhile, the symptoms of estrus, conception rate and pregnancy index were not significant ($P > 0.05$). Dry matter consumption of feed was not significant ($P > 0.05$), but there were significant differences in consumption of crude protein, TDN and crude fiber in the two treatments ($P > 0.05$). It was concluded that supplementation of 50% lamtoro leaf flour in basal feed of rice straw and rice bran was quite effective in the occurrence of uterine involution and onset of estrus in PO cows.

Keywords:- PO cows, uterine involution and onset of estrus, rice straw, Lamtoro leaf meal, rice bran.

I. INTRODUCTION

Understanding uterine involution patterns in cattle is important for increasing reproductive efficiency [1]. Meanwhile [2], stated that reproductive and feed management has an important role in reproductive performance in livestock, including uterine involution and estrus onset. So, in assessing reproductive performance, what must be done is to measure and assess reproductive efficiency.

Livestock reproductive efficiency is achieved only if reproductive management is good [3] and [4]. However, reproductive disorders are usually characterized by low maternal fertility, conception rate, and calving interval/kidding rate which can result in a decline in livestock populations and national meat supplies. For farmers, reproductive disorders in livestock can cause large economic losses. Factors that influence livestock reproductive performance are; (1) inappropriate mating system, (2) low knowledge and skills of breeders in detecting estrus, (3) low quality or inaccurate use of males for natural mating (4) low skills and experience of inseminators (5) inaccurate implementation of AI (6), low knowledge of breeders in the field of reproductive management, (7) the occurrence of reproductive disorders in livestock, and (8) the environment, namely feed management, is less supportive. This includes postpartum maintenance management [5]. Understanding the interrelationship of various factors that influence the reproductive performance and fertility of livestock, efforts are continually being made to research and improve them. The expected impact is to fulfill livestock survival and meet the community's meat needs.

The need for meat as a source of animal protein is very necessary in society. Directorate General of PKH, (2021) cited by [6] illustrates that the total demand for beef from March to May 2021 continues to increase, but so far the existing stock is not sufficient. The need for beef in 2021 is estimated to reach 700,000 tonnes or the equivalent of 3.6 million head of cattle, however domestic beef production is only around 400,000 tonnes per year and is not sufficient for this need. The increase in demand for meat has not been commensurate with population developments in Indonesia, as stated by the Directorate General of Occupation and Civil

Registration or Dukcapil, Ministry of Home Affairs, that the population of Indonesia as of June 2022 or semester I, was recorded at 275,361,267 people. In fact, it is estimated that in 2023 domestic ruminant meat production will be 404 thousand tons, while the demand figure is around 815 thousand tons in one year. To meet this supply shortage, external supplies are needed. The description of the availability of domestic meat compared to the required needs shows the low development of livestock in Indonesia. Due to various problems with low quality meat and not being able to meet national meat needs, the consequence is that the country continues to import meat from abroad. Therefore, it is hoped that there will be a national improvement effort to address the meat shortage. Regarding the various problems facing domestic meat scarcity, improvements in the field of livestock reproduction are an issue that cannot be ignored. This is confirmed by [7] that the success of livestock businesses is closely related to production and reproduction.

There are various livestock reproduction issues that need to be addressed and to address the scarcity of meat, things that must be done include: acceleration of the period of sexual maturity and body maturity, appropriate mating arrangements, pregnancy maintenance and good birth management as well as postpartum maintenance management which allows livestock to experience uterine involution and estrus after parturition so that livestock can be mated again as soon as possible. Among the various reproductive problems faced by livestock, handling postpartum reproduction is an interesting reproductive problem to be studied through various research.

The results of a survey by [8], using 91 breeders as respondents, obtained an average postpartum estrus for Bali cattle of 3.6 ± 1.5 months. In fact, postpartum estrus in cattle is generally around 50 to 60 days [9]. This means that there are problems associated with delayed postpartum estrus that must be addressed both in Bali cattle but also in other livestock including PO cattle. By [5] stated that in order for the reproductive process to take place well, apart from good maintenance management, the availability of sufficient feed, accompanied by good quality, is very necessary. The problem is that the quality and quantity of good feed is also determined by the availability of sufficient capital. Suningsih et al, stated that feed costs can reach 60 – 70% of the total livestock production costs [10]. The high cost of feed is certainly one of the inhibiting factors for the development of livestock businesses. Therefore, efforts to obtain feed that is widely available in the community with quality sufficient to meet needs is an important factor that must be carried out through various research.

Rice straw is one of the agricultural wastes which is quite abundant and has been widely used as ruminant feed but has low nutritional content. Karossi et al. showed the nutritional content of rice straw, namely; Crude Protein 4.5 – 5.5%; Crude Fat 1.4-1.7 %; Crude Fiber 31.5-46.5 %; BETN 27.8-39.9; Ash 19.9-22.9; Calcium 0.18-0.34% and Phosphorus 0.09-0.12%. In order to create a high digestibility value for rice straw, supplementation with various good quality forages is very necessary [11]. Meanwhile in [12], rice straw contains 8.26% crude protein, 31.99% crude fiber,

77.00% NDF, 57.91% ADF, 23.05% cellulose, 19.09% hemicellulose, and 22.93% lignin. %.

Lamtoro (*Leucaena leucocephala*) is a type of forage that has good quality and is easy to maintain. Bamualim stated that 30% lamtoro leaf supplementation could increase dry matter consumption of rice straw by 28% and fattening beef cattle given rice straw, concentrate and lamtoro leaf flour could increase body weight by 0.71 kg/day [13]. Even by [14], that lamtoro leaf flour has nutritional content, namely; dry matter 86%, crude fiber 18%, ash 6.3%, crude protein 23.7%, ether extract 5.8% and BETN 46.2%. On the other hand, rice bran is known as an ingredient that is commonly used to prepare rations for poultry [15]. Polin et al. stated that the crude fiber content in rice bran is 12%, protein is 13% and metabolic energy is 1630 kcal/kg. Based on the nutritional content of lamtoro leaf flour, it is hoped that if supplementation is carried out with rice straw and rice bran it will become a good quality feed ingredient for PO cattle [16].

PO cattle are a type of beef cattle that are quite often found in Indonesia, even in the Central Java region, they are a type of beef cattle that are abundant in number [17]. Therefore, it is hoped that by providing basal feed with rice straw and rice bran, supplementation with lamtoro leaf flour can accelerate uterine involution in PO cows.

II. METHOD

The research was designed using an experimental method for two treatment factors, namely; giving basal feed of rice straw and rice bran (R0) and basal feed of rice straw and bran supplementation with lamtoro (*Penicetum purpureum*) leaf flour (R1). 10 PO cattle in late pregnancy aged around 4.5 years were used as experimental animals, so that each treatment had 5 replications. The research began at parturition by measuring the body weight of PO cattle using a digital scale to determine the need for feed to be given. The ratio of concentrate feed (rice bran or rice bran combined with lamtoro leaf flour) given is 1:1, amounting to 25 gr/kg metabolic body weight (BBM). Meanwhile, rice straw was given ad libitum.

Weighing the remaining feed is carried out every morning at around 06:30 WIB, before providing feed for the day's needs. Next, observations are made on the variables; a) feed consumption; namely calculating the amount of feed consumed by subtracting the feed given from the remainder. Meanwhile, consumption of crude protein, TDN and crude fiber is calculated based on the dry matter of the feed consumed. b) uterine involution; This is done by examining the uterus by palpation per rectally by a veterinarian every two weeks and starting two weeks after parturition. c) onset of estrus; calculated from the time of parturition until the day the animal shows signs of estrus. d) symptoms of estrus; This is done by observing changes in the mother's behavior visually and by using males. This is carried out three times a day, namely morning, afternoon and evening. e) conception rate (CR); The pregnancy percentage was assessed in the second month for PO cows after the first mating. f) pregnancy index/Service per Conception (S/C); carried out by palpation per rectally also two months after the cattle are mated and repeated the following month.

The experiment was designed using a unidirectional Completely Randomized Design (CRD) for the reproductive variable and a Randomized Blocked Design (RAB) for the feed consumption variable. The research results were tabulated and analyzed using one-way and two-way classification analysis of variance with the following mathematical model:

- $Y_{ij} = \mu + \alpha_i + E_{ij}$ for (one way anova) and,
- $Y_{ijk} = \mu + \alpha_i + \beta_j + E_{ijk}$ (two way anova) where;
 Y_{ij} = reproductivity of PO cows
 Y_{ijk} = feed consumption
 μ = general average,
 α_i = effect of treatment i,
 β_j = influence of the jth group,
 E_{ij} = experimental error (random)
 E_{ijk} = experimental error (random)
- Conception Rate = $\frac{\text{Number of Pregnant Females in 1st Mating}}{\text{Number of livestock bred}}$
- S/C = $\frac{\text{Number of Marriages}}{\text{Number of Pregnant Cows}}$

III. DISCUSSION AND RESULT

A. Feed Consumption

Feed is a very important factor for the needs of living creatures. For livestock, feed is useful for growth, production and reproduction. Regarding the field of reproduction, [18], stated that feed is a very influential factor. Lack of dietary protein causes weak estrus, quiet heat, anestrus, and repeated mating. The results of dry matter (DM) feed consumption for 6 months in this study are shown in Figure 1.

The data in Figure 1 shows the average DM consumption (Kg/head/day) between R0 and R1 of 8.67 ± 0.29 and 8.71 ± 0.21 . After analysis, the data did not show a significant difference ($P > 0.05$). These results show that the addition of one part of lamtoro leaf flour to the basal ration of rice straw and rice bran in the R1 ration was not able to have a significant effect on the amount of DM in the ration consumed. However, the amount of BK consumed is sufficient to meet the needs of PO cattle. In [19] stated that PO cattle with a body weight of 274 kg consume DM feed can reach 6.85 kg, or 2.5% of body weight. Meanwhile, regarding time, there was a significant difference ($P < 0.01$). This is very possible because as time goes by the livestock becomes more adapted to the animal feed provided. The graph shows that in the 5th and 6th months, there was a real decrease in R0 ration consumption. This situation occurs because livestock no. 4 and 5 while in the process of giving birth. According to [20], this situation is normal because livestock approaching parturition are characterized by being restless, restless and there is a decrease in appetite.

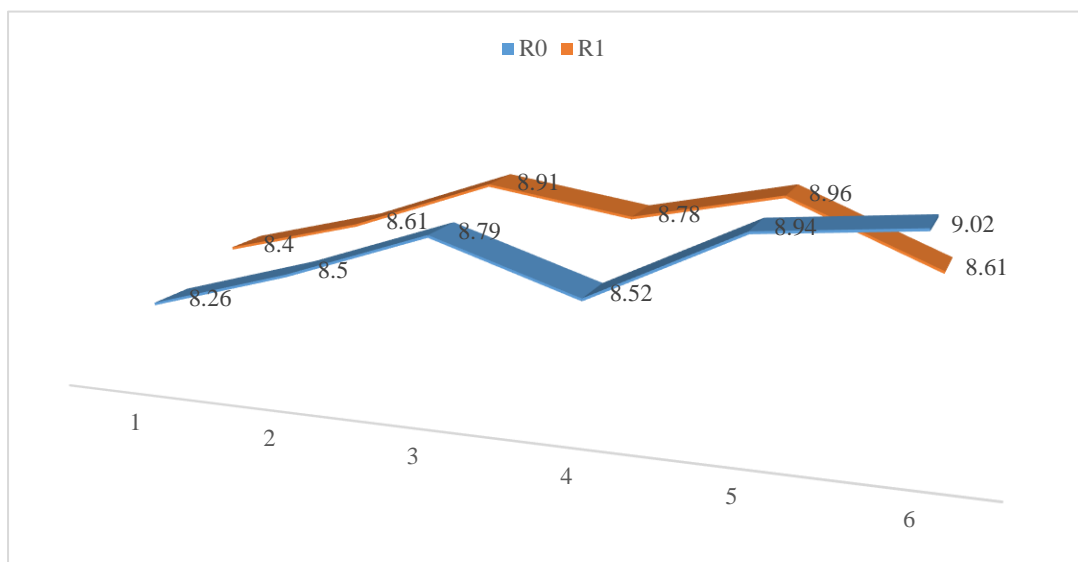


Fig. 1: Distribution of Dry Material Consumption for R0 & R1 Rations During Six Months of Research Activities

B. Uterine Involution;

The activity carried out to determine the uterine involution process is rectal palpation by a veterinarian every 2 weeks after parturition and the results are shown in Figure 2.

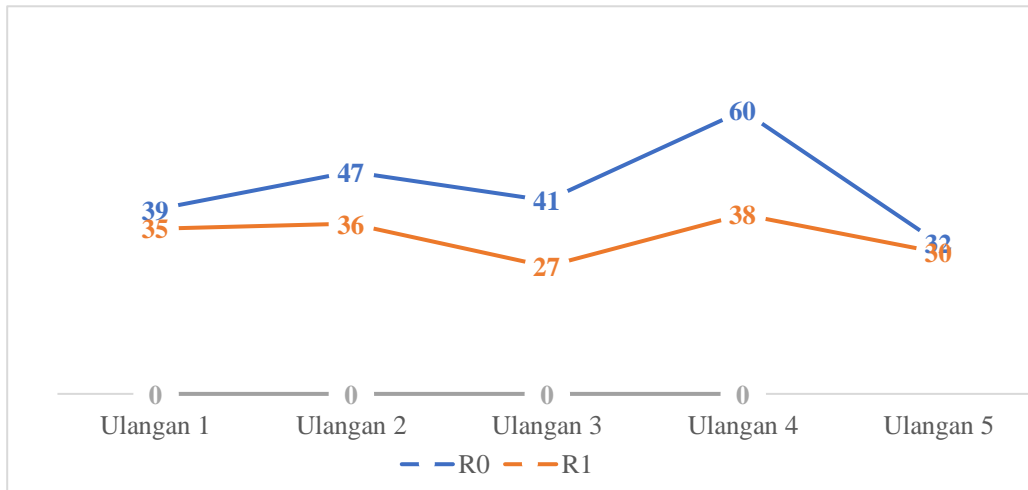


Fig. 2: Data on the length of time uterine involution occurs after parturition (days) in R0 and R1 fed

Note: Data no. 4 and 5 in the Ro ration are not used in the analysis, because animal No. 4 gave birth to twins and animal no. 5 had children who died after parturition.

The data in Figure 2, after being analyzed using one (1) way analysis of variance, shows a significant difference ($P < 0.05$), where the basal feed of rice straw and rice bran supplemented with lamtoro leaf flour (R1) has better quality and has an effect. which is also better against the occurrence of uterine involution. Bambang Sugeng states that the body needs sufficient protein to repair damaged body tissue because if there is not enough protein in the feed, the animal's body cannot make and/or maintain damaged body tissue [21]. Cattle at the time of parturition begin with uterine contractions by the hormone oxytocin and the hormone relaxin to relax the pelvic symphysis. The uterine contractions and relaxation process may cause tissue damage. This means that good quality feed, especially regarding protein levels, is very necessary for this problem and R1 feed has better protein levels. Furthermore, [22] with the results of research on postpartum uterine involution performance in Holland Fries dairy cows, parity II obtained uterine involution figures of 47.56 ± 12.64 days, and parity III

obtained uterine involution data of 48.4 ± 9.93 days. In this case, the research results obtained by Hadisutatno et al. did not use feed treatment and had almost the same results as the R0 treatment, namely 42.33 ± 4.16 days. This situation shows that the process of uterine involution in cattle, especially PO cattle in this study, was greatly influenced by the quality of the feed consumed and supplementation of lamtoro leaf flour into the basal feed of rice straw and rice bran has shown better results. Data from proximate analysis of rice straw, rice bran and lamtoro leaf flour shows that the nutritional content of lamtoro leaf flour, especially crude protein, is 19.47% and is higher than rice bran which is only 13.50% and rice straw is 4.42%.

C. Onset of Estrus

The activity that accompanies uterine involution is the onset of estrus. The results of research regarding the onset of estrus in this study are shown in Figure 3.

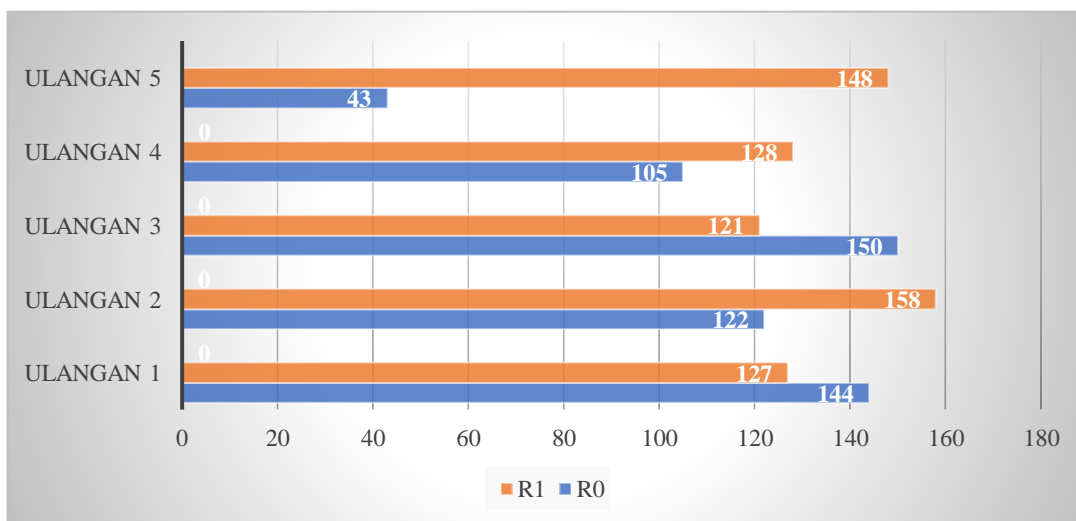


Fig. 3: Onset of Estrus in PO Cows Post Parturition (days)

Note: Data no. 4 and 5 in the Ro ration are not used in the analysis, because animal No. 4 gave birth to twins and animal no. 5 had children who died after birth

The average data on the onset of estrus on the R0 diet was 138.667 ± 14.74 and was not statistically significant with the R1 diet of 136 ± 15.80 ($P > 0.05$). Although visually there is a difference of around 2.27 days. The causal factor is that both cattle that consume R0 rations and cattle that consume R1 rations are both in the weaning process. As long as the cattle are in the weaning phase, the calf's stimulation causes a negative feedback to the pituitary hypothalamus so that the production of gonadotropin hormones, which play an important role in the estrus cycle, is inhibited. According to [23], that breastfeeding calves can suppress postpartum ovarian activity thereby prolonging the anestrus period. Furthermore, regarding the length of the estrus onset period in this study, the figures were 138.67 ± 14.74 for the R0 diet and 136 ± 15.80 for the R1 diet. The factor that may be the cause is that the quality of the feed consumed is still low. This situation was also confirmed by [24], that the delay in estrus after parturition is caused by several factors including environmental factors including feed and cage shape as well as genetic factors, namely the condition of the mother's body.

D. Symptoms of Estrus

Symptoms of estrus are signs or behavior displayed by livestock that will carry out the next reproductive process after uterine involution. The signs in question are lack of appetite, the animal is not calm, often makes distinctive sounds, the tail is wagged continuously, urinates frequently, the vulva is swollen and red, transparent mucus comes out of

the vulva, often rides on friends or stays still when being ridden. On the other hand, the signs or symptoms of estrus as mentioned were not found during this study. But what is visible is that the male is kissing the vulva of the mother who is indicated to be in estrus, the male wants to mount the female with an erection and the male does not want to come out of the mother who is indicated to be in estrus. The same thing happened to all parents in this experiment. The situation that occurred showed that the mothers in this experiment experienced weak estrus or better known as quiet estrus [5]. Salisbury and VanDemark it is stated that beef cows are calmer in estrus than dairy cows [25]. The factor that may be the cause is the low level of the LH hormone before ovulation [26]. The next condition is that a few moments later mating occurs and this is the real characteristic shown by livestock experiencing estrus, namely copulation or mating occurs when the female is willing to accept the male [27].

E. Conception Rate (CR)

In [28], it is stated that the conception rate is the percentage of females who become pregnant after mating or at the first AI. Meanwhile, [29] state that the conception rate is determined based on the results of pregnancy diagnosis by a veterinarian within 40-60 days after insemination. The research results of [30] obtained a conception rate in PO cows of 39.39. However, research data related to conception rates obtained by rectal palpation by a veterinarian is stated in table 1.

Table 1: Percentage of Conception Rates of PO Cow Mothers in Mating I

Tread	number of parents mated	pregnancy 1	Percentage
R ₀	3	3	100
R ₁	5	5	100

The data in table 1 shows that both PO cows that received R0 and R1 treatment obtained a conception rate of 100%. A situation that shows that; 1) The broodstock used in this research are superior and fertile broodstock, 2) Mating takes place right after ovulation. In this case, feed treatment does not play a role in pregnancy rates in PO cows. This situation is stated by [31] that high conception rates only occur if heifers are mated between 2-4 hours after ovulation. Likewise, [20] stated that the mating time for cattle should not be less than 4 hours before ovulation or no more than 6 hours after the end of estrus. Because the lifespan of an ovum is short, namely between 20-24 hours. Mating carried out on PO cattle in this study was carried out when the cattle were ready to accept males. One of the most appropriate times shown by livestock naturally. Different results were obtained by [26] which is 55.56% but [32] that the normal conception rate in cows is 60%. Furthermore, by [28], in the treatment of reproductive performance in PO cows with different mating times obtained the highest CR in group III (79.45%) compared to CR I, II and IV (66.67%; 64.91% and 70.55%), with the birth rate (calving rate) of calves in groups I, II, III and IV being 94.44%; 98.25 % and 97.26 % and 95.16 %.

F. Pregnancy Index/Service per Conception (S/C)

The Pregnancy Index is a measure of livestock fertility in a livestock business. The pregnancy index is often known as service per conception or number of marriages per pregnancy [25]. Toelihere stated that the best pregnancy index for cattle

is 1.6-2.0 [33]. The S/C measurement results in this study obtained the number 1, both in treatment R0 and in treatment R1. A perfect figure, showing that the PO cows in this experiment had a high fertility rate. Where every single marriage produces a 100% pregnancy rate. The contributing factor is of course that both female and male livestock have high fertility rates, especially when mating is carried out at the right time.

The mating of PO cattle in this study was carried out artificially using males and occurred when the female was truly ready to accept the male. These results, when compared with the results of research by Iskandar (2011) regarding the reproductive performance of PO cattle in the lowlands and highlands in Jambi Province, obtained S/C figures for each treatment of 1.5 and 1.3. Meanwhile [26] obtained an S/C figure of 1.4. On the other hand, [31] obtained the results of implementing AI on each PO cow; in 2015 it obtained an S/C figure of 2.36; in 2016 the S/C figure was 2.67; in 2017 the S/C figure was 2.41 and in 2018 the S/C figure was 2.66. Different results were also obtained by [34] in a study entitled Service Per Conception (S/C) and Conception Rate (Cr) in Simmental Crossbreed Cattle at different Parities in Sanankulon District, Blitar Regency, obtained S/C figures for each parity; P1 (1.52 ± 0.70), P2 (1.42 ± 0.64) and P3 (1.5 ± 0.67).

IV. CONCLUSION

Based on various studies related to the research results obtained, it was concluded that:

- Consumption of Dry Feed in the R1 ration does not have a significant effect on the R0 ration ($P > 0.01$).
- Supplementation of lamtoro leaf flour in basal feed of rice straw and rice bran had a significant effect on the uterine involution variable ($P < 0.05$), but not significantly ($P > 0.05$) on the variables of estrus onset, estrus symptoms, conception rate and pregnancy index.

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