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The Correlation Between Plasma Phosphor And Cholesterol On Reproduction Performance Of Holstein-Friesian Crossbred

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ABSTRACT

This study was aimed to identify plasma phosphor and plasma cholesterol and its correlation to reproduction efficiency of Holstein-Friesian Crossbred. The material used in this research was blood sample collected from sixteen heads of cow on second to third lactation in luteal phase. Blood was collected eight hours after feeding time from caudal vein. Reproduction parameters investigated were postpartum breeding; inseminations per conception; and calving interval. Pearson correlation model was used to analyze the data. The average of plasma phosphor and plasma cholesterol concentration were 2.27 ± 0.36 mg/dl and 139.74 ± 25.82 mg/dl respectively. The average of postpartum breeding, calving interval, and inseminations per conception were 133.56 ± 59.34; 410.43 ± 71.01; and 2.00 ± 0.90 respectively. The correlation coefficient of the plasma phosphor on postpartum breeding, inseminations per conception, and calving interval from this study were -0.080; –0.122; and -0.359 respectively. Correlation coefficient of plasma cholesterol on postpartum breeding, inseminations per conception, and calving interval were -0.114; –0.573; and -0.402 respectively. It could be concluded that plasma phosphor correlated negatively to the postpartum breeding and inseminations per conception with the r value of very weak negative correlation while it correlated negatively to the calving interval with the r value of weak negative correlation. The plasma cholesterol had a moderate negative correlation on inseminations per conception and calving interval, and correlated negatively to the postpartum breeding with the r value of very weak negative correlation

Keywords: Calving interval, inseminations per conception, postpartum breeding

1. Introduction

For many years, dairy cattle have been managed and selected for the best performance in worldwide milk production. The main Factor that has responsibility for the good milk production of dairy cattle is reproduction (Bragança & Zangirolamo, 2018; Ceylan et al., 2008; Khan et al., 2016). On another hand, the efficiency of reproduction was affected by specific nutrients from dietary ingredients. Bad nutritional status and low metabolic health influence negatively reproduction in dairy cattle which implicated in milk production (Bisinotto et al., 2012). Unfortunately, Indonesian rural livestock nowadays especially for dairy cattle still exhibits the low productivity because of reproductive alteration. Plasma cholesterol and plasma phosphor in repeat breeder is significantly lower as compared to normal cycle dairy cattle (Prihatno et al., 2013; Rajesh et al., 2015). Since plasma phosphor and plasma cholesterol play in biological role, the low concentration of both of them could alter the reproduction parameter such as postpartum breeding; inseminations per conception; and calving interval (Guzel & Tanriverdi, 2014; Widayati et al., 2019).

Reproduction efficiency parameters considered to evaluate are postpartum breeding, inseminations per conception, and calving interval (Riyanto et al., 2017). Reproduction data should be recorded are postpartum breeding; calving interval; and inseminations per conception (Widayati et al., 2011). Inseminations per conception is a number of services so that the cows get gestated (Fanani et al., 2013). Calving interval is the amount of days between the parturition and the next parturition from the same cow (Do et al., 2013). Postpartum breeding is the amount of days between the parturition and the next breeding (Fanani et al., 2013). (Wettemann et al., 2003) emphasized that nutrition status positively correlated with reproduction. The low nutrient in feed intake or low nutrient level in plasma indicates that the cows deal with reproduction failure. In

this study we would like to find out the correlation between plasma cholesterol and plasma phosphor on reproduction performance represented by postpartum breeding, inseminations per conception, and calving interval.

2. Methods

Sixteen heads of cow on second third lactation in luteal phase were used in this study. The cows were healthy. Reproduction recording including date of breeding, date of gestation, and date of birth, were used for determining postpartum breeding; inseminations per conception; and calving interval. The level plasma cholesterol and plasma phosphor were analyzed by using micro lab 300.

2.1. Blood Sampling

The whole blood of three milliliters were obtained from caudal vein. It was performed eight hours after feeding time and the blood sample was collected to ethylenediamine tetra acetic acid (EDTA tube) tube for calculating plasma cholesterol and plasma phosphor. The tube was transported to the laboratory for further analysis. The tube contained with the whole blood was centrifuged at 3000 rpm for 15 minutes to obtain the plasma. The plasma was stored in freezer at -20°C for analyzing the concentration of cholesterol and phosphor.

2.2. Blood Analyses

Plasma cholesterol and plasma phosphor concentration were measured by using Micro lab 300 spectrophotometer. The plasma cholesterol was determined using the method of cholesterol oxidase-para-amino phenazone (CHOD-PAP) protocol. Plasma phosphor was measured using photometric protocol.

2.3. Reproductive Performance

The inseminations per conception was measured by counting the number of services needed by the cows to get gestated. The postpartum breeding was determined by measuring the number of time (day) from the parturition to the next mating. The calving interval was measured by counting the number time (day) from the calving to the next calving. The observation was performed in the luteal phase

2.4. Statistical Analysis

The Pearson correlation model was used for determining the correlation coefficient between plasma cholesterol, plasma phosphor and the reproduction efficiency. Statistical program for social science (SPSS) version 16 was used to analyze the data in this study.

3. Result and Discussion

3.1. Statistics

The average of plasma cholesterol and plasma phosphor were shown in Table 1, while the data of cows reproduction performance were shown in Table 2.

Table 1. Plasma cholesterol and plasma phosphor level in luteal phase

Parameters	Number	Concentration level (mg/dl)
plasma cholesterol	16	139.74 ± 25.82
plasma phosphor	16	2.27 ± 0.36

Table 2. Postpartum breeding (days); inseminations per conception (times); and calving interval (days) of Holstein-Friesian Crossbred in luteal phase

Reproduction performances	Numbers	Mean
postpartum breeding (day)	16	133.56 ± 59.34
inseminations per conception (times)	16	2.00 ± 0.90
calving interval (day)	16	410.43 ± 71.01

3.2. The correlation between plasma cholesterol dan plasma phosphor to reproduction performance

The correlation coefficient of plasma cholesterol and plasma phosphor to reproduction performance were shown in Table 3

Table 3. Correlation between plasma cholesterol and plasma phosphor to reproduction performance

Blood metabolic parameters	Reproduction performance		
	postpartum breeding (r)	inseminations per conception (r)	calving interval (r)
plasma cholesterol	-0.114	-0.573	-0.402
plasma phosphor	-0.080	-0.122	-0.359

0.001 – 0.200 = Very weak; 0.201 – 0.400 = Weak; 0.401 – 0.600 = Moderate; 0.601 – 0.800 = Strong; 0.801 – 1.000 = Very strong (Santoso, 2006)

According to (Santoso, 2006), this research indicated that the plasma phosphor correlated negatively to the postpartum breeding and inseminations per conception with the r value of very weak negative correlation while it correlated negatively to the calving interval with the r value of weak negative correlation. The plasma Cholesterol had a moderate negative correlation on inseminations per conception and calving interval while it correlated negatively to the postpartum breeding with the r value of very weak negative correlation. This current research explained that the plasma phosphor contributed in low correlation to all reproduction performance parameters. It was different with (Ceylan et al., 2008; Rajesh et al., 2015). The decrease of the plasma phosphor effects on reproduction impairment such as prolong in calving interval embryo death, and repeat breeding (Ceylan et al., 2008). Phosphorus level in blood is very important and it plays a role for transferring biological energy by utilize the adenosine triphosphate. Thus, deficiency of it may lead to the failure of fertilization. Furthermore it may cause early death of embryo implanted in endometrium resulting in low of reproduction performance of cows (Barui et al., 2015). From the current study we detected that low concentration of plasma phosphor played a role in this result. The average of plasma phosphor in this study was 2.27 $\pm$ 0.36 mg/dl, while (Ceylan et al., 2008) was 6.30 $\pm$ 0.23 mg/dl; (Rajesh et al., 2015) was 6.20 $\pm$ 0.40 mg/dl; and (Cetin et al., 2002) was 5.69 $\pm$ 0.12 mg/dl. The level of plasma phosphor in healthy cows ranged from 6,24 mg/dl – 7,40 mg/dl (Regmi & Dhakal, 2020; Widayati et al., 2019). It indicated that the plasma phosphor in this current study was lower than the normal level. We assumed that the low phosphor plasma of all sixteen dairy cows effected on low correlation between plasma phosphor and reproduction performance.

According to Table 1, the level plasma cholesterol in this study indicated that its value was in the normal condition for healthy cows since (Barson et al., 2019; Widayati, 2017) stated that the plasma cholesterol level for the healthy cows ranged from 135,8 mg/dl – 196,06 mg/dl. The plasma cholesterol had a moderate negative correlation to inseminations per conception and calving interval. It was the same argue with (Amle et al., 2014; Prihatno et al., 2013). (Cetin et al., 2002; Guzel & Tanriverdi, 2014) explained that the cows with low level of plasma cholesterol had low reproduction performance. Cholesterol is the precursor of steroid hormone (Bindari et al., 2013) and one of those was estradiol which has an important role in reproduction (Silbernagl & Despopoulus, 2009) Furthermore cholesterol is crucial for biosynthesis of estradiol by granulosa cells under the influence of luteinizing hormone (LH) (Widayati et al., 2018). Meanwhile the current study showed that plasma cholesterol had a very weak negative correlation on postpartum breeding. Postpartum breeding is the amount of time between the parturition and the next insemination (Fanani et al., 2013). From (Fanani et al., 2013) we assumed that there were others factors could influence the PPM beside the concentration of plasma cholesterol itself such as estrous detection, skill of inseminator, time of involution uteri, etc.

4. Conclusion

It could be concluded that plasma phosphor correlated negatively to the postpartum breeding and inseminations per conception with the r value of very weak negative correlation while it correlated negatively to the calving interval with the r value of weak negative correlation. The plasma cholesterol had a moderate negative correlation on inseminations per conception and calving interval, and correlated negatively to the postpartum breeding with the r value of very weak negative correlation.

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