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PERFORMANCE AND REPRODUCTIVE RIPITABILITY VALUE OF HOLSTEIN FRIESIAN DAIRY CATTLE IN SOUTH GARUT FARMERS' COOPERATIVE

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Abstract

This study aims to determine the performance and repeatability values of S/C, DO, and CI in the South Garut Farmers' Cooperative. Reproduction data used were individual reproduction records of 162 Friesian Holstein dairy cows. The results showed that the average reproductive performance for S/C for parity 1 was 2.20 ± 0.797, parity 2 was 2.40 ± 0.974, parity 3 was 2.28 ± 0.947, parity 4 was 2.22 ± 0.965, and the total value of S/C was 2.28 ± 0.921. The DO value for parity 1 was 159.50 ± 80.838, parity 2 was 150.43 ± 73.874, parity 3 was 142.29 ± 56.689 days, parity 4 was 133.79 ± 42.678 days, and the total DO was 146.50 ± 67.267 days. The CI value for parity 1 was 437.91 ± 80.144 days, parity 2 was 430.20 ± 75.211 days, parity 3 was 423.31 ± 57 days, parity 4 was 414.59 ± 42.470 days, and the total CI was 426.5 ± 67.355 days. The repeatability value at KPGS for S/C was 0.17 ± 0.033, DO was 0.1 ± 0.040, and CI was 0.097 ± 0.040. These three reproductive properties show repeatability values in the low category.
Keywords: Performance, FH Dairy Cows Reproduction, Repeatability, KPGS

PERFORMA DAN NILAI RIPITABILITAS REPRODUKSI SAPI PERAH FRIESIAN HOLSTEIN DI KOPERASI PETERNAK GARUT SELATAN

Abstrak

Tujuan dari penelitian ini yaitu untuk mengetahui performa dan nilai ripitabilitas sifat reproduksi yaitu S/C, DO, dan CI di Koperasi Peternak Garut Selatan. Data reproduksi yang digunakan yaitu data catatan reproduksi individu sapi perah Friesian Holstein sebanyak 162 ekor. Hasil menunjukkan bahwa rata-rata performa reproduksi untuk S/C yaitu paritas 1 sebesar 2,20 ± 0,797, paritas 2 yaitu 2,40 ± 0,974, paritas 3 yaitu 2,28 ± 0,947, paritas 4 yaitu 2,22 ± 0,965, sedangkan untuk total nilai S/C yaitu 2,28 ± 0,921; nilai DO yaitu paritas 1 sebesar 159,50 ± 80,838, paritas 2, yaitu 150,43 ± 73,874, paritas 3 yaitu 142,29 ± 56,689 hari, paritas 4, yaitu 133,79 ± 42,678 hari, sedangkan untuk total DO yaitu 146,50 ± 67,267 hari; nilai CI untuk paritas 1 yaitu 437,91 ± 80,144 hari, paritas 2 yaitu 430,20 ± 75,211 hari, paritas 3 yaitu 423,31 ± 57 hari, paritas 4 yaitu 414,59 ± 42,470 hari, sedangkan untuk total CI yaitu 426,5 ± 67,355 hari. Nilai ripitabilitas di KPGS untuk S/C yaitu 0,17±0,033, DO yaitu 0,1±0,040, dan CI yaitu 0,097±0,040. Ketiga sifat reproduksi ini menunjukkan nilai ripitabilitas dengan kategori rendah.
Kata kunci: Performa, Reproduksi Sapi FH, Ripitabilitas, KPGS

INTRODUCTION

Dairy cattle's milk production is closely related to its reproductive performance, making consideration of the reproductive aspects crucial. Reproductive performance reflects the livestock's ability to produce in its lifetime. There are three indicators related to milk production in dairy cows: service per conception (S/C), days open, and calving interval. These three factors can also be indicators of livestock's reproductive efficiency. Evaluating reproductive performance is needed to determine the effectiveness of the selection program. Several factors, including inseminator, feed, and disease, can affect reproductive performance in livestock.

Kusumawati & Leondro, (2014) stated that the reproductive process could be affected by the length of the livestock's first mating age and the provision of quality and inaccurate feed. Livestock that lack proper nutrition are more susceptible to diseases, which in turn affects their reproductive capacities. The main problem disrupting reproductive efficiency is

pregnancy failure in cattle (Mengistu & Wondimagegn, 2018). The reproductive performance must be evaluated so farmers can monitor progress and increase the effectiveness of selection programs.

Understanding the genetic parameters of reproductive performance can increase the selection effectiveness, one of them being evaluating the repeatability values. Warwick *et al.* (1990) said that the reflection of repeated traits during the livestock's life, called the repeatability value, can be used as an estimate of productivity in the future.

South Garut Farmer Cooperative (KPGS) is a business entity in the dairy cattle business. As a cooperative engaged in the dairy sector, it is necessary to evaluate the cows' reproductive performances so that cows with good performance can increase their reproductive performance efficiency. Research on the repeatability value of Holstein Friesian cattle can help selection efforts because it can determine the superiority of a trait being studied. This study aimed to determine the performance and repeatability value of reproductive traits in Friesian Holstein dairy cattle at KPGS so that it can assist in selecting good cattle for breeding.

MATERIALS AND METHODS

Material

This study used data on 162 Friesian Holstein dairy cows with reproductive records in the form of S/C, DO, and CI data at the South Garut Farmers' Cooperative.

Research Methods

The data were analyzed descriptively. Repeatability value was estimated using analysis of one-way pattern variance as a correlation within the class. The statistical model within the analysis was:

$$Y_{ij} = \mu + \alpha_i + \varepsilon_{ij}$$

(Kurnianto, 2009)

Information:

- Y_{ij} : The results of the j^{th} observation on the i^{th} individual
- μ : The population mean
- α_i : Effect of measurement on livestock
- ε_{ij} : Default error

The formula used for calculating repeatability was as follows:

$$r = \frac{\sigma_w^2}{\sigma_w^2 + \sigma_e^2}$$

The formula for estimating standard error of repeatability was as follows:

$$S(r) = \sqrt{\frac{2(1-r)^2[1+(k-1)r]}{k(k-1)(n-1)}}$$

RESULTS AND DISCUSSION

South Garut Breeders Cooperative General Conditions

The Cikajang South Garut Farmers' Cooperative (KPGS) is a pioneer of cooperatives in the dairy cow's milk business within the Garut Regency. This cooperative is located in Cibodas Village, Cikajang District, Garut District, West Java Province. The cooperative's location is highly strategic for smooth transportation flow due to the central district road passing the coop, making it easier for Village Unit Cooperative (KUD) vehicles to enter and leave the area.

Cikajang District has an area of around 13,200.89 ha and is a hilly area with an altitude of 1,250-1,400 meters above sea level. The Cikajang area consists of plantations and rice fields. Most of the area still consisted mainly of forest area, with temperatures of 17-24^{0}C, a humidity of 70-85%, and an average rainfall of 2800 per year. Hence, the Cikajang area is suitable for use as a place to develop dairy cattle. The South Garut Breeders Cooperative currently has ±7,827 members. There were several name changes before becoming KPGS on March 21, 2017 (Hermawan, 2022).

Inseminators

This cooperative is a unit for animal and reproductive health services officers, with one veterinarian and five inseminators. Two inseminators graduated from vocational school, and three were bachelors in animal husbandry. The average age of officers at KPGS was 36 ± 9.17 years, where this age is the productive age, with the oldest age being 53 years and the youngest being 29 years. The KPSG officers' ages were almost the same as those who worked in Kebumen Regency, as studied by Hastuti (2008), where the ages of the inseminators were 25 – 44 years.

The average service years for the health and reproduction unit was 13 ± 5.933 years, with the shortest working period being eight years and the longest being 24 years. These inseminators' service years were longer than those in Pringsewu Regency, based on a study conducted by Haryanto (2015) with 4.4 ± 2.07 years. According to Ukkas *et al.* (2017), length of service influences productivity because it is related to the work experience one has.

The training intensity can also affect the quality of inseminator performance in the field, apart from years of service. The frequency of inseminators participating in the training was 6 times for one officer, 5 times for one officer, and 4 people did it 2 times. The training conducted by these officers was higher than that conducted by officers from Amadia's research (2021), where 5 inseminator officers in Kerinci Regency joined training one time, and 3 officers did it 4 times.

Reproductive Performance of Frisian Holstein Dairy Cattle in KPGS

Service Per Conception

The S/C results obtained in this study can be seen in Table 1. The S/C values in this study were 2.20 ± 0.797 at parity one, 2.40 ± 0.974 at parity two, 2.28 ± 0.947 at parity three, and 2.22 ± 0.965 at parity four, while the average S/C at KPGS was 2.28 ± 0.921. This research was compared with Fauzi's (2019) results on the second lactation, which was 1.6, while for the third lactation, it was 1.8, higher. However, research conducted by Prabowo (2021) in Tegalombo District, Pacitan Regency, East Java Province, has lower results than this study, with 2.10 ± 0.88 S/C. Feradis (2010) stated that 1.6–2.0 is a good S/C value. The S/C value indicates fertility in livestock: a high S/C value indicates low fertility in livestock, and a low S/C value indicates a high fertility rate.

The high S/C results at KPGS were due to the frequent occurrence of repeated AI, in one heat period the cows could be inseminated 2 - 5 times. This result was caused by farmers' impression that as more cows were artificially inseminated, the conception probability would also rise, affecting the value of S/C. Farmers' delay in detecting estrous causes reports to AI officers to be delayed, and thus delayed the cows' insemination. Inseminator officers are also one of the reasons for the high S/C value apart from the farmers. Handling frozen semen is the most important factor in giving artificial insemination. Handling of frozen semen had been carried out according to the procedure, as seen from the way straw was stored using a container containing liquid N_2. The straws were collected two times a week as needed, then the straw for AI would be stored in a thermos.

Weather conditions also affect S/C values because rainfall causes delays in AI services. Rainfall in the Cikajang area is 70 mm/day (Mulyono, 2014). Hafez (1993) also stated that the timeline of insemination at the peak of cows' heat is the most important factor in implementing artificial insemination. One of the obstacles related to reproduction and continuously happening was the minimal quality and quantity of feed given by farmers. Farmers provide feed relying on vegetable waste and harvested field grass, so the feed given is not always consistent in quality and quantity. Farmers also do not differentiate the feed given to each type of livestock, such as lactating cows, pregnant cows, heifers, and calves, resulting in disturbed reproduction, especially in lactating and old pregnant mothers.

Feed that does not meet nutrition for female dairy cattle can also cause ovarian hypofunction, as evidenced by ovarian hypofunction cases in cows. This reproductive disorder is caused by the quality of the feed and the amount of feed that is not fulfilled, and the climate is unsuitable for livestock (Hardjopranjoto, 1995). Cases of reproductive disorders that often occur in KPGS were also cases of endometritis. This reproductive disorder is an infection of the endometrium or endometritis, one of the main causes of repeated mating. Repeated mating was also a common case in KPGS. The consequences of this repeated mating event will result in long days open (DO) and lengthening the calving interval.

Table 1. Reproductive Performance Data at KPGS

Parity	Parameter		
	Service Per Conception **(times)**	***Open Days*** **(days)**	***Calving Interval*** **(days)**
1	2.20 ± 0.797	159.50 ± 80.838	437.91 ± 80.144
2	2.40 ± 0.974	150.43 ± 73.874	430.20 ± 75.211
3	2.28 ± 0.947	142.29 ± 56.689	423.31 ± 57.000
4	2.22 ± 0.965	133.79 ± 42.678	414.59 ± 42.470
Average	2.28 ± 0.921	146.50 ± 67.267	426.50 ± 67.355

Days Open

Based on data analysis in this study regarding days open at each parity shown in Table 1., FH cattle in KPGS had average days open (DO) of 59.50 ± 80.838 days. The average DO in first parturition was 150.43 ± 73.874 days, at second parturition was 142.29 ± 56.689, third parturition was 133.79 ± 42.678 days, and fourth parturition was 146.50 ± 67.267 days. The results of research conducted by Atabany (2011) on dairy cows in Boyolali and Purwokerto, 103 ± 19.92 days and 138.8 ± 7.9 days, were lower than this study.

The length of the DO value in the KPGS did not necessarily indicate that the cows have low fertility but rather because of the farmer's lack of knowledge on detecting the signs of heat. In order to be able to produce milk, farmers deliberately extend the days open period in cows at first lactation. Atabany (2011) also states that the long open days at the start of lactation occur in FH cattle due to their high milk production.

Indicators of reproductive efficiency and early detection of reproductive disturbances can be seen from the days' open period. Silent heat also affects the cow's days open length. Silent heat is caused by feed that does not meet the livestock's nutritional needs. Feed influences the condition of cattle reproduction because it is related to the nutrition of the feed given. Biliarti *et al.* (2010) explained that silent heat is caused by livestock consuming less crude protein. The availability of forage is not always affected by the season. During the agricultural harvest and the rainy season, the forage is abundant, while farmers have difficulty finding forage during the dry season and after the harvest period. The forage also competes with agriculture due to the conversion of forage grasslands into agricultural lands and plantations. As a result of the irregular availability of forage, cattle are often malnourished, characterized by the lean body of the livestock. Endrawati (2010) clarified this by saying that a good and normal reproductive process would be guaranteed if efficient maintenance management and feeding were good.

Calving Interval

The results of research at KPGS regarding CI can be seen in Table 1. CI value at parturition 1 was 437.91 ± 80.144 days; parturition 2 was 430.20 ± 75.211 days; parturition 3 was 423.31 ± 57 days; and parturition 4 was 414.59 ± 42.470 days. The total CI value was 426, 5 ± 67.355 days. Fanani *et al.* (2013) research in Pudak District, Ponorogo Regency, on dairy cows has a lower result with a CI value of 370.8 ± 36.66 days. Moreover, this research result is lower than in Kemiri Village, Jabung District, Malang Regency on dairy cows conducted by Wahyudi *et al.* (2013), with 472.19 ± 156.45 days of calving interval.

Turkylenaz's opinion (2005) stated that days open and pregnancy lead to high CI values, the interval from calving to pregnancy, and the period of pregnancy (Ball & Peters, 2007). A delayed pregnancy of dairy cows will result in a long calving interval and affect the long lactation period. This delay is because the cow will continue to be milked as long as pregnancy has not occurred. Another factor that affects the CI value besides the long DO value is the lack of good maintenance and feed management because rearing is still traditional. According to Iskandar and Fahrizal (2011),

environmental conditions and feeding management affect the length of CI.

The achievement of calving intervals can determine the presence of reproductive disorders in livestock. Hardjopranjoto (1995) stated that a calving interval of more than 400 days in a single parent indicates reproductive disorders. This statement shows that FH cows at KPGS are suspected of having difficulty getting into heat, farmers have difficulty detecting heat, and it is suspected that there was a disturbance in reproductive traits which resulted in an unsatisfactory CI value. The distance between the first estrus and pregnancy, mating failure, and embryo death can be factors causing long calving intervals.

Repeatability of Reproductive Traits

Table 2. Shows the repeatability value of reproductive properties obtained in this study. The S/C was 0.17 ± 0.033, the DO's repeatability value was 0.10 ± 0.40, and CI's repeatability value was 0.10 ± 0.040. Research conducted by Maylinda (2019) research on PFH cattle for the S/C repeatability value was 0.112 ± 0.093. This is higher than the S/C repeatability value estimated in this study. The DO and CI repeatability values in Maylinda's study (2019) were lower: the DO repeatability values were 0.258 ± 0.081, while the CI repeatability values were 0.318 ± 0.076. The repeatability values of these three reproductive traits were included in the low class. This opinion is in accordance with Noor's statement (2008) that the repeatability value will be declared high if it is around (> 0.4), it will be stated as a medium if it is around (0.2-0.4), and it will be declared low if (0,0-0,2).

Erlod and Stansfield (2007) state that the repeatability value of a trait is influenced by the population, the amount of data and the estimation method used. Different locations of observation and individual cows influence genetics and the environment. The repetition of S/C, DO, and CI values in the future will be lower because the repeatability values for these properties are in a low category. Factors that affect the low repeatability value indicate that the variation in size does not come from genetic influences but environmental influences. Various genetic influences and temporary environmental conditions caused this study's repeatability values of S/C, DO, and CI to be low.

Table 2. Repeatability Value of Service Per Conception, Days Open, and Calving Interval at KPGS

Parameter	Repeatability	Category
Service Per Conception	0.170±0.033	Low
Days Open	0.100±0.040	Low
Calving Interval	0.097±0.040	Low

CONCLUSION

1 Reproductive performance in KPGS is not optimal because the average S/C value is still high, 2.28 ± 0.921 times, the long DO mean is 146.50 ± 67.267 days, and the long CI is 426.50. ±67.355 days

2 The repeatability value at KPGS for S/C was 0.17 ± 0.033, DO was 0.1 ± 0.040, and CI was 0.097 ± 0.040. These three reproductive properties show repeatability values in the low category.

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