



The Estrus Character of Successful Artificial Insemination in Holstein Friesian Crossbred Cow

Amir Firdaus¹, Aulia Puspita Anugra Yekti², Achadiah Rachmawati², Nurul Isnaini², and Trinil Susilawati²(✉)

¹ Animal Science Faculty, Brawijaya University, Malang, Indonesia

² Lecturer of Animal Science Faculty, Brawijaya University, Malang, Indonesia
tsusilawati@ub.ac.id

Abstract. Artificial insemination in dairy cows is for improving genetic quality and replacement so that high pregnancy success is needed. This research was conducted on a smallholder farm in the Pujon sub-district, Malang Regency, Indonesia. The materials used were 100 cows, 100 in AI using a single dose of BCS 2.5–4 (with a range of 1–5), had given birth. In carrying out the research, the cows have shown signs of heat were injected with Bio ATP. Prior to AI, the estrus character was observed, which was distinguished by the color of the vulva, which was divided into evenly red, uneven red, and pale. The vulvar temperature was distinguished from $< 38\text{ }^{\circ}\text{C}$ and $> 38\text{ }^{\circ}\text{C}$. Cervical mucus = cervical mucus was abundant and thick, cervical mucus was abundant and watery, cervical mucus was slightly thick and cervical mucus was slightly watery. Swelling of the vulva, consisting of a swollen vulva and a non-swollen vulva. After one cycle, NRR-1 was observed and not in heat, it was considered pregnant after 2 months of pregnancy examination using ultrasound (USG). The results showed that the highest non-return rate and conception rate values in FH crossbreds were in the red vulva color, 33 cows (33%) and 30 heads (20%) were not evenly distributed. Temperature $> 38\text{ }^{\circ}\text{C}$ as many as 62 animals (62%) and 38 animals (38%), in the amount of thick mucus 31 (31%) and 19 individuals (19%), vulvar swelling was swollen 68 (68%) and 43 (43%).

Keywords: Character · Holstein Friesian Crossbred Cow · Pregnancy rate · Artificial Insemination

1 Introduction

Most of the dairy cattle kept in Indonesia are Friesian Holstein (FH) breeds. FH cattle are able to adapt well to subtropical to tropical climatic conditions and from highlands to lowlands, so they are able to grow well in Indonesia. The demand for milk in Indonesia is around 80% still imported [1]. While in subtropical countries such as the UK FH cows are able to achieve milk production in one lactation of 7609–8548 kg [2].

Reproduction in dairy cows is very important and related to their productivity. Reproductive disorders can reduce milk production and reduce productivity in producing children which ultimately increases maintenance costs. The results of a study in India found that reproductive disorders that often occur in dairy cows include AI (repeat breeder) failure, retained placenta, abortion, and vaginal discharge. Early pregnancy so as to reduce AI failure and abortion [3]. The reproductive performance of dairy cows in several regions in Indonesia varies widely and still needs to be improved. Repeat breeding has long been considered one of the important reproductive disorders in cattle. Incidences of repeat breeding in lactating dairy cows varied among regions, environments, and management [4]. The reproductive performances in which has drylands and rainfed agricultural ecosystems were S/C 2.31 ± 0.54 times, DO 161.95 ± 61.99 days, and CI 444.47 ± 61.21 days, and the reproductive performances were S/C 2.11 ± 0.62 times, DO 138.38 ± 47.18 days, and CI 419.86 ± 46.95 days [5].

2 Materials and Methods

This research was conducted in the Pujon sub-district, Malang Regency. The material used is FH crossbreed cattle belonging to KOP SAE Pujon breeders, Malang Regency. With the criteria of having given birth and being normal, BCS > 2.5 (rating range 1–6), Age 3–7 years based on dental poel. 100 PFH cows were used in AI using a single dose. The frozen semen used comes from Singosari BBAI, the AI used is position 4 (corpus uteri), about 8 h after the farmer calls the inseminator, that is, if it shows estrus in the morning then the AI is in the same morning, and the afternoon, while if it shows estrus afternoon, then in AI on the same afternoon and the next morning [6].

2.1 AI Implementation

The AI acceptor was evaluated for BCS > 2.5 , and the reproductive organ condition of the AI acceptor was normal, i.e. had given birth normally. AI cows used a single dose of frozen semen at 8 o'clock.

Research Implementation: Farmers call inseminators, and if they meet the requirements and show signs of estrus, namely the vulva is red, swollen and mucus comes out, in treatment 1 (T0) will be AI after 8 h from the farmer notifying, while in T1 in AI at the 2nd hour and the 8th hour, before being injected with Bio ATP in AI, after one cycle (days 19–21) it was observed whether or not there was estrus, if there was no estrus then it was considered pregnant (NRR-1), After 2 months it was carried out pregnancy examination using Ultrasonography (USG).

2.2 Research Variable Parameters

The AI acceptor was evaluated for BCS > 2.5 , and the reproductive organ condition of the AI acceptor was normal, i.e. had given birth normally. AI cows used a single dose of frozen semen at 8 o'clock.

Vulva color	:	The appearance of the vulva is assessed by a modified score consisting of: evenly red, uneven red, and pale [7].
Vaginal temperature	:	Vaginal temperature before AI was measured using a thermometer, 1. Less than 38°C and 2. Up to 38°C
Cervical mucus	:	1. There is a lot of mucus there is a 2. The little mucus 3. The mucus is dry or none [6].
Swelling vulva	:	Swelling of the vulva was assessed by 1. Vulva is swollen 2. Vulva not swollen [7].

2.3 Variables

1. Non-Return Rate (NRR) includes NRR1 and NRR2

The NRR value was obtained by observing lust on days 19–21 and days 40–42 after AI. If there are no signs of lust, it is assumed that she is pregnant and if there are signs of lust, it is assumed that she is not pregnant, a repeat AI will be carried out [7, 8].

$$\frac{(\text{NRR 1} = \text{Total inseminated cattle} - \text{total re inseminated cattle})}{(\text{Total inseminated cattle})} \times 100\%$$

$$\text{NRR 2} = \frac{(\text{Total inseminatd cattle} - \text{total reinseminated cattle after 2 times lust cycles})}{(\text{Jumlah akseptor di IB})} \times 100\%$$

2. Conception Rate (CR)

The CR value can be obtained by counting cattle that are pregnant in the first AI. Yekti. *et al* (2022) CR is the percentage of pregnant cows in the first AI of the conception rate, with the formula:

$$\text{CR} = \frac{(\text{Total pregnancy cattel from the first insemination})}{(\text{Total inseminated cattle of first services})} \times 100\%$$

3 Results and Discussion

The cattle used in this study had a BCS between 2.5–3.5, a BCS with an average of 2.86 ± 0.12 with a score between 1–5, the BCS indicated an assessment based on their performance and a cow with a BCS of 2.5 was showed good performance, so it was assumed that the nutrition provided was good, in the opinion of [9]. The lack of nutrition and the poor BCS condition can negatively impact cow fertility. The cow reproduction fertility is influenced by the nutrition fed which plays a vital role in the reproduction cycle [10].

Table 1. Non-Return Rate-1 and Conception Rate on Different Vulva Colors

		NRR-1	CR
Vulva color	Head (%)	Head (%)	Head (%)
Evenly red	24	21	14
Uneven red (pink)	46	33	20
Pale	30	25	15
Total	100	79	49

Table 2. Non-Return Rate-1 and Conception Rate at Different Vulva Temperatures

		NRR-1	CR
Vaginal temperature	Head (%)	Head (%)	Head (%)
<38	22	17	11
>38	78	62	38
Total	100	79	49

The material in this study also used productive cows at the age of 4.41 ± 0.22 years, predictions based on the loss of incisor teeth, parity 2.53 ± 0.27 times of parturition, at a young age have good physiological conditions [11].

Based on Table 1, the highest NRR-1 value is in the uneven red color character, which is 33% while the CR is 20%, this uneven red indicates that the estrus phase has been completed, namely entering the met estrus phase [11].

Table 2 shows that the highest pregnancy success rates were at temperatures of more than 38 °C, with an NRR-1 value of 62% and a CR value of 38%. One of the reasons for the failure of fertilization is due to low progressive motility [12]. Stating that the progressive motility of spermatozoa is the most decisive in the fertilization process. Frozen semen allows the storage of semen for a longer time, unfortunately, it will cause damage of sperm that will decrease the motility of sperm [13]. [1] has mentioned that frozen semen had less spermatozoa functionality compared to liquid semen when it is evaluated by sperm motility, thermoresistance test, and hypoosmotic swelling test.

Table 3 shows that the highest success rate for AI was on a small volume of mucus, with an NRR-1 of 38% and a CR of 23%.

Table 4 shows that the most successful AI was in the swollen vulva, which had an NRR-1 value (68%) and a Conception Rate of 43%.

Based on the data above, it shows that there is a decrease in the value of NRR-1 to the Conception Rate, this is caused by the occurrence of early embryonic death in cows or the occurrence of silent heat, namely the absence of calm estrus or it can also be caused by not being identified by the breeder.

Table 3. Non-Return Rate-1 and Conception Rate in Different Conditions of Cervical Mucus

		NRR-1	CR
Condition cervical mucus before first AI	Head (%)	Head (%)	Head (%)
Too much	39	33	21
Little	28	28	23
None	13	8	5
Total	100	79	49

Table 4. Non-Return Rate -1 and Conception Rate in different vulvar swelling

		NRR-1	CR
Vulva swelling	Head (%)	Head (%)	Head (%)
Swelling	86	68	43
No swelling	14	11	6
Total	100	79	49

Adequate nutrition will affect hormonal conditions that play a role in the success of pregnancy. Insufficient progesterone hormone in the early stages of pregnancy can cause embryonic death. Nutrients as well as minerals and vitamins also affect female reproduction and must be given in balanced amounts [14]. Indirectly, nutrients affect the hypothalamus gland in the brain to secrete gonadotropin hormone (GnRH) which in turn stimulates the anterior pituitary to produce FSH and LH, resulting in follicular development which eventually leads to the emergence of estrus and successful pregnancy in cows.

This happens because of several possibilities, namely failure in fertilization, failure of implantation, or premature embryo death. Fertilization failure is caused by low semen quality or poor oocyte quality, or inappropriate detection of estrus and AI timing. Implantation failure and embryo death are caused by unfavorable physiological conditions. A repeat Breeder is a cow that has been bred several times or not successfully AI, caused by mismanagement and good ovary condition [15].

Corpus luteum persistent (CLP) is a state in which the corpus luteum does not regress and remains in the ovary for a long time, the size of the corpus luteum is large and hard [16]. Cows that were AI with single and double doses had ovarian hypofunction, which was 2.44% and 4.76% of the number of repeat breeders. Ovaries appear smooth, there is no protrusion of follicles or corpus luteum. The supporting diagnosis for ovarian hypofunction is ultrasound (Ultrasonography) to see the presence of subordinate follicles with a size of <5 mm [17]. While the case of cystic follicles is absent Follicular cysts,

the diameter of the ovary usually reaches 2.5 in large numbers, the surface is smooth, the walls are thin, and if pressed there is a feeling of fluid [18].

4 Conclusions

The results showed the value of Non-Return Rate and Conception Rate in FH crossbred cattle that were AI used a single dose, the highest was 33 heads (33%) and 30 heads (20%) with a temperature >38% as many as 62 heads (62. %) and 38 individuals (38%), in the amount of thick mucus 31 (31%) and 19 individuals (19%), vulvar swelling was swollen 68 (68%) and 43 (43%).

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