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Reproductive Evaluation of Beef Cattle Inseminated with Frozen Semen of Wagyu Cattle in Situbondo District

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ABSTRACT: Evaluation of the success of Artificial Insemination (AI) aims to determine the value of reproductive efficiency of a livestock group. This study aimed to evaluate the success of AI using frozen semen of Wagyu cattle based on S/C, NRR, CR, CvR, and weaning rate in Situbondo District. The material used was secondary data in the form of AI data from 184 beef cows that have been inseminated with frozen semen of Wagyu cattle in Situbondo District. The method used was quantitative research. The results showed that reproductive evaluation of cows that have been inseminated with frozen semen of Wagyu cattle had S/C value of 2, NRR1 of 64%, NRR2 of 55%, CR of 49%, CvR of 53%, and weaning rate of 44%.

KEYWORDS: Artificial Insemination, Calving Rate, Reproduction Evaluation, Weaning Rate, Wagyu Cattle.

INTRODUCTION

Cattle are one of the livestock commodities that produce meat and fulfill the need for consumption of animal protein from meat in Indonesia. The demand for consumption of animal protein from meat and domestic livestock products is increasing along with the increase in income and growth of the Indonesian people. Efforts to increase beef production and quality to fulfill the need for consumption of animal protein from meat and reduce the value of imports, one of which can be done through Artificial Insemination (AI) to improve the genetic quality and population of cattle.

Artificial insemination has several purposes, including improving the genetic quality of livestock, livestock production, livestock productivity, and livestock population, so that it can help fulfill the consumption of animal protein from meat (Nopianti, Rosadi, and Darmawan, 2022). Artificial insemination is influenced by several factors, including: livestock physiology, human resources (breeders and inseminators), and frozen semen quality. The success of AI is influenced by the quality of frozen semen used, frozen semen storage and frozen semen handling. The quality of frozen semen used in AI is affected by the breed of bull being used. One of the frozen semen used in AI is frozen semen of Wagyu cattle. Wagyu cattle is a breed of cattle originating from Japan. Wagyu beef is characterized by excellent marbling from intramuscular fat and tender meat texture (Ueda, Takashima, Gotou, Sasaki Nakabayashi, Suzuki, Sazaki, Fukuda, Kebede, Kadowaki, Tamura, Nakanishi, and Shiari, 2022).
Situbondo district is one of the centers of beef cattle in East Java where AI using frozen semen of Wagyu cattle is conducted. The implementation of AI using frozen semen of Wagyu cattle needs to be evaluated to determine the success of the program. Evaluation of AI success is conducted to determine the high and low value of livestock reproductive efficiency. Parameters used to evaluate the success of AI are Service per Conception (S/C), Non Return Rate (NRR), Conception Rate (CR), Calving Interval (CI), Calving Rate (CvR), and Weaning rate. Rusdiana and Praharani (2019) stated that S/C, NRR, CR, CI, CvR and weaning rate are parameters to measure reproductive efficiency. Based on research conducted by Setiaji and Oikawa (2020), the S/C value of cows that have been inseminated using Wagyu cattle semen is 1.76, the NRR value is 67% and CI for 393 days. Irikura, Uematsu, Kitahara, Osawa, and Sasaki (2018a) added that the CR value of cows inseminated using Wagyu cattle semen was 47.8%. Gioi, Tiem, Dung, Thien, and Hoang (2023) stated that the CvR value in Wagyu cattle was 81%.

MATERIALS AND METHODS

The materials used in this study were 184 cows that had been inseminated using frozen semen of Wagyu cattle in Situbondo Regency to determine the value of S/C, NRR, CR, CvR, and Weaning Rate. Data on the results of AI with frozen semen of Wagyu cattle were analyzed descriptively quantitatively using Microsoft Excel to determine the average value and then compared with the literature to review and determine the success of AI using frozen semen of Wagyu cattle.

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RESULTS AND DISCUSSION

Evaluation of Artificial Insemination Success based on Service per Conception

S/C value is one of the parameters to measure the success of AI. Service per conception is the number of AI services provided until the livestock become pregnant. The calculation results regarding the S/C value in this study can be seen in Table 1.

Table 1. Service per Conception

	AI numbers			Total of Pregnant Cows	S/C
	1	2	3		
Total of AI Service	184	65	17	127	2

Source: Secondary data processed, 2023.

Table 1 shows that broilers inseminated with frozen semen of Wagyu cattle had an S/C value of 2. This is considered in the good quality category. The S/C value in this study is higher than the study conducted by Setiaji and Oikawa (2020) which showed an S/C value of 1.76 in cows inseminated using frozen semen of Wagyu cattle. The normal S/C value in cattle is 1.6-2, a high S/C value indicates a low level of reproductive efficiency, while the level of reproductive efficiency is high if the S/C value is low. Nopianti et al. (2022) stated that S/C values below 2 indicate that cows can give birth once a year.

The S/C value in this study is thought to be due to the long-term effects of FMD that attacks cattle, thus affecting the reproductive organs of livestock. This is proven by research conducted by Ardhiyanti, Erwanto, and Rahayu (2022) which resulted in an S/C of 2.8 in cattle that had been infected with FMD and an S/C of 1.9 in cattle that were not infected with FMD. Ardhiyanti et al. (2022) also explained that this can occur because FMD can cause disruption of the lambing cycle in cows. The S/C value is also influenced by several factors, including inseminator skills related to the timeliness of AI, AI deposition, and frozen semen thawing (Yulyanto, Susilawati, and Ihsan, 2014). Inseminators in Situbondo District performed AI 8-12 hours after farmers informed them about the appearance of signs of lambing in livestock. Yulyanto et al. (2014) stated that the right time to perform artificial insemination is if the cattle are in heat in the morning, then artificial insemination is carried out in the afternoon, while if the cattle are in heat in the afternoon, then artificial insemination is carried out in the morning of the following day. Artificial insemination is not recommended to be carried out during the day, because cervical mucus in cows thickens during the day which causes the passage of spermatozoa to be hampered. In addition, spermatozoa are very susceptAlle to heat, which will affect the success of AI.

Semen deposition affects the success of AI. Inseminators in Situbondo District apply semen deposition at position 4+ (cornua utery). This is done to increase the chances of successful pregnancy. Based on Susilawati's opinion (2013) semen deposition in position 4+ has a higher AI success value than semen deposition in position 4. Thawing or retrieval of frozen semen to be used in AI also affects the success of AI. Inseminators in Situbondo District perform thawing using water at ambient temperature (26-28°C) for 30-45 seconds. This is in accordance with the opinion of Nisa et al. (2022) which states that thawing using slope water with a temperature of 28°C for 45 seconds produces frozen semen quality that is close to SNI.

Evaluation of Artificial Insemination Success based on Non-Return Rate

Non return rate is one of the assessments of AI success that shows the percentage or number of cattle that do not come back in heat after being inseminated on days 19-21. Non return rate can be used as a reference in livestock fertility and to evaluate reproductive performance briefly without having to wait for livestock to give birth or partus. The NRR value in this study can be seen in Table 2.

Table 2. Percentage of Non-Return Rate

Number of Acceptor	NRR_1 Persentage	NRR_2 Persentage
184	64	55

Source: Secondary data processed, 2023.

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Based on the observation, overall, 184 AI acceptors had a NRR1 value of 64% and NRR2 of 55% (Table 2). Non return rate1 with a value of 64% is included in the good category, while NRR2 with a value of 55% is included in the unfavorable category. The NRR value in this study was lower than the research conducted by Setiaji and Oikawa (2020) which showed the NRR value in cows that had been inseminated with frozen semen of Wagyu cattle of 67% and research by Setiaji and Oikawa (2019) which showed the NRR value of 71%.

The result of NRR is influenced by several factors, including stress, silent heat, early embryonic death, and livestock housing conditions (Wiranto et al., 2020). Yekti et al. (2019) stated that the NRR value is influenced by silent heat, which is signs of heat in cattle that are not detected by farmers. Rosita et al. (2014) stated that one of the factors affecting the success rate of AI is maintenance management, especially housing. Lack of sunlight is one of the obstacles for cows because it can disrupt the hormonal system and trigger the appearance of silent heat. Early embryo death caused by ectoparasites and endoparasites that cause stress to the AI acceptor also affects the success of AI.

Evaluation of Artificial Insemination Success based on Conception Rate

Conception rate is the number of cattle that become pregnant at the first AI. Conception rate is a female cow that is declared pregnant at the first AI based on the results of pregnancy examination on the 60th day after the implementation of AI. The results of the calculation of CR value in this study can be seen in the table below.

Table 3. Percentage of Conception Rate

Number of Acceptors	Number of Livestock Pregnant at First Insemination	CR%
184	127	69%

Source: Secondary data processed, 2023.

Based on the calculation that has been done, the CR value of 69% was obtained in female cows that have been inseminated using frozen semen of Wagyu cattle (Table 3). The CR value obtained from this study is included in the good category. Yekti et al. (2019) stated that the ideal CR value for cows is above 60%. The higher the CR value, the more fertile the cow and the lower the CR value, the lower the fertility level of the livestock. The CR value in this study is higher than the research conducted by Irikura et al. (2018) which produced a CR value of 47.8% in cows inseminated with frozen semen of Wagyu cattle.

Conception rates are influenced by the cattle rearing system and the level of poor detection of AI. The highest conception rate occurs when insemination is done 12-18 hours after going into heat, which means that cows in heat in the afternoon are better inseminated the next morning. Early insemination may cause the spermatozoa to be unable to fertilize the egg because the egg has not yet left the ovum. Late insemination may result in fertilization and the formation of a viable embryo not being possAIle due to old eggs. The pregnancy rate tends to be higher in animals that are inseminated at the optimal time, which is within 12-18 hours after the onset of signs of lambing (Yekti et al., 2019).

Conception rate is also influenced by low feed quality which will cause low fertility and early embryonic death in livestock. Animal feed that does not have sufficient protein content can cause weak signs of heat, early embryonic death and abortion (Susilawati, 2013). Based on interviews with farmers and inseminators in Situbondo District, the majority of farmers in Situbondo District only feed forage, namely elephant grass, dwarf elephant grass, corn stalks, and silage without the addition of concentrate feed. The amount of feed given is sufficient for the daily forage needs of the cow, which is 10% of the cow's weight. This is in accordance with the opinion of Wahyuni and Amin (2020) which states that the amount of forage given to cows is 10% of the cow's body weight. Periambawe, Sutrisna and Liman (2016) also stated that forage feed in cows is given as much as 10% of the cow's weight.

Evaluation of Artificial Insemination Success based on Calving Rate

Calving rate is the percentage of children born alive from insemination in a group of mothers. Artificial insemination can be said to be successful if the cow has successfully given birth to a calf. The value of efficiency in livestock is influenced by CvR (Yulyanto et al., 2014). The CvR value in this study can be seen in the table below.

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Table 4. Percentage of Calving Rate

Number of Acceptors	Number of calves born	CvR%
184	98	53%

Source: Secondary data processed, 2023.

Based on Table 4, it can be seen that the CvR value in the study was 53%, this is included in the poor category. The CvR value in this study is the same as research conducted by Kino et al. (2018) which obtained a CvR value of 53%, while smaller than the research conducted by Gioi et al. (2023) which obtained a CvR value of 81%. Hartati, Luthfi, Khrisna, Sukmasasi, Fitrayady, Widiyawati, and Dikman (2021) stated that cows can be said to have a good reproductive efficiency value if the CvR value reaches 62%.

Factors that affect the low CvR value include poor nutritional conditions resulting in early embryonic death. Farmers in Situbondo Regency only rely on forage without providing additional feed in the form of concentrates. Wiranto et al. (2020) also stated that early embryonic death can occur due to feed deprivation. The S/C value also affects the CvR value. The higher the S/C number, the lower the CvR (Suranjaya, Sarini, Anton and Wiyana, 2019).
The physiological age status of cows affects the percentage of CvR. Female cows as Wagyu cattle frozen semen acceptors in Situbondo Regency have an average age of 5 years, which is a productive age in cows that can reduce the occurrence of pregnancy failure and difficulty giving birth to cows. This is in accordance with the opinion of Masyita, Suada, and Batan (2014) who stated that female cows are ready to become pregnant after two years of age, with a productive period of giving birth to children for seven years.

Evaluation of Artificial Insemination Success based on Weaning Rate

Weaning rate is the percentage of calves that are weaned based on mating results. Weaning rate descrAIes the value of livestock reproductive efficiency in terms of the ease of giving birth, the process of growth and breeding of offspring, and the ability of cows to care for offspring. Weaning rate in this study is calculated based on the number of calves successfully weaned at the age of 3 months which can be seen in Table 5.

Table 5. Percentage of Weaning Rate

Number of Acceptors	Number of Calves Born	Number of Weaned Calves	*Weaning Rate* %
184	98	81	44%

Source: Secondary data processed, 2023.

Based on Table 5, it can be seen that out of 184 acceptors and 98 calves born, 81 (44%) calves were successfully weaned. Weaning rate in this study was categorized as poor. The weaning rate in this study was lower than the weaning rate in a study conducted by Oka, Iwaki, Dohgo, Ohtagaki, Noda, Shiozaki, Endoh and Ozaki (2002) which resulted in a weaning rate of 80%.

Weaning rate is influenced by several factors, one of which is the history of disease in cattle. The majority of cows as AI acceptors of Wagyu cattle frozen semen have been infected with FMD. Wittum and Perino (2022) stated that cows that have been infected with FMD will produce colostrum that contains lower quality and less quantity than healthy cows, which can increase the risk of death of newborn calves that need colostrum with sufficient quality and quantity. Fecteau, Baillargeon, Higgins, Pare and Fortin (2020) are of the same opinion that cows with FMD indications will produce colostrum with high bacterial contamination, so that calves can experience a decrease in survival. Nutritional deficiencies in calves can also increase calf mortality. Urie, Lombard, Shivley, Kopral, Adam, Earleywine, Olson and Garry (2018) stated that in the pre-weaning period, calves that are nutritionally deficient may die as a result.

CONCLUSIONS

Based on the results of the study, it can be concluded that the reproductive evaluation of broiler cows that have been inseminated with frozen semen of Wagyu cattle has S/C value of 2, NRR1 of 64%, NRR2 of 55%, CR of 49%, CvR of 53%, and weaning rate

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of 44%. This indicates that cows inseminated with frozen semen of Wagyu cattle still need some management improvements to increase their reproductive efficiency.

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