

The Study of Body Condition Score and Macro Minerals on Fertile and Repeat Breeding Cattle in Ngaglik Sub-District

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Abstract

Original Research Article

Beef is a source of animal protein in demand by the Indonesians. The development of cattle breeding in Indonesia needs to grow. One factor that causes the stagnation of cattle breeding is reproductive disorders. A reproductive disorder that local farmers in Indonesia often find is repeat breeding. This study aimed to know the Body Condition Score (BCS), Sodium (Na), and Chloride (Cl) between fertile and repeat-breeding cattle. This study used ten Simmental-PO cattle, and the research was conducted in Ngaglik Sub-District, Sleman City, Special Region of Yogyakarta Province. Cattle were divided into two groups, with five cattle in each group. Anamnesis examinations among farmers and reproduction records tests aimed to determine the fertile and repeat breeding cattle. Furthermore, body condition scoring is achieved by examining and palpating the costume and vertebrae. Blood samples were collected to determine the sodium and chlorine levels. Body Condition Score parameters among cattle were analyzed descriptively, and Na and Cl levels were analyzed using an independent T-test. The results of the BCS study on fertile cattle are 3,3 on average, and repeat breeding cattle are 2,5 on average. In addition, the results of the Na study on fertile cattle were 132.7 ± 3.8 , and repeat-breeding cattle were 131.6 ± 2.5 ($P > 0.05$). The results of the Cl study on productive cattle were 91.7 ± 3.0 and repeat-breeding cattle 89.3 ± 4.7 ($P > 0.05$). The conclusion is that BCS is fertile range 2-3 and repeats breeding range 3-4. In conclusion, Na and Cl have no significant differences in productive and repeat-breeding cattle.

Keywords: BCS; fertile; repeat breeding; macro mineral.

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INTRODUCTION

Consumption of food sources of animal protein in sufficient quantities is needed to meet human nutrition (Akhtar *et al.*, 2014). The consumption of animal protein that people are most interested in is chicken and beef. The demand for meat daily consumption is increasing, but the cow population has decreased. In 2018, the population in the Province of the Special Region of Yogyakarta was 313.425 cattle, which fell in 2020 to 309.259 cattle. Several factors affecting the decrease in cattle population include limited grazing land, expensive feeding costs, and reproductive disorders (Indarjulianto *et al.*, 2022). Population decline can be caused by reproductive disorders, namely infectious and non-infectious reproductive disorders diseases (Priyo *et al.*, 2020). Most cases of non-infectious reproductive disorders are repeat breeding. Repeat breeding is defined as cattle that have not conceived after three or more times

of service, have a normal estrous cycle, have normal reproductive organs, have calved at least once before, and are less than ten years old. The prevalence of repeat breeding in beef cattle in some regions of Indonesia is 17.3% - 64% (Asaduzzaman *et al.*, 2017; Kumar and Purohit, 2019; Maulana *et al.*, 2022). Factors that cause the occurrence of repeat breeding are uterine infection, oocyte that cannot ovulate, inappropriate Artificial Insemination (AI) timing, breed, age, parity, and body condition score (BCS) (Asaduzzaman *et al.*, 2017).

Body Condition Score is a method for measuring muscle and fat quality automatically and simply (Alhassan, 2022). The subcutaneous fat percentage indicates the percentage of the whole body, so the depth of subcutaneous fat can be used to predict body weight. This correlates with the nutritional status of the given condition so that it can influence the productivity of cows. Body condition score is also

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related to nutritional intake. Nutrients include protein, cholesterol, and minerals (Heinrichs and Ishler, 2019).

Sodium and chloride levels in the blood affect reproduction in cattle. Na and Cl levels in the blood cause a decrease in the process of recruitment and development of ovarian follicles, thereby increasing infertility (Wang *et al.*, 2015). Commercial feeds may alter placental function in ways that suggest placental failure (Reynolds *et al.*, 2015). Providing high levels of Na and Cl in feed causes an increase in blood pressure and cardiovascular disorders (Farquhar *et al.*, 201; Frisoli *et al.*, 2012). High blood pressure causes blood supply to the vaginal area and clitoris to decrease. Reduced blood flow in this area will thin the vaginal mucosa and smooth muscles in the clitoris so that vaginal moisture will decrease. Furthermore, the vaginal mucosa and clitoris will experience fibrosis (Küttmeç and Yurtsever, 2011). This study wants to know the difference between BCS and minerals, especially sodium and chloride, in fertile and repeat-breeding cattle.

MATERIAL AND METHODS

The research was conducted in a beef cattle farming area in Ngaglik District, Sleman City. The samples used in this study were ten cow PO cross, not pregnant, aged 3-10 years, and records of artificial insemination (AI). Ten PO cross beef cattle that met the qualifications will be divided into two groups. Group 1 consists of 5 PO cross cattle that have repeat breeding signs. After three or more times of service, that has repeat breeding signs, a normal estrous cycle, normal reproductive organs, has calved at least once before, and is less than ten years old. Group 2 consists of 5 PO cross cattle that are fertile. The reproductive status of productive cattle is normal, with normal reproductive organs, a normal reproductive cycle every 21 days, and cattle giving birth to one calf yearly. Anamnesis among farmers and reproduction records examinations were done, followed by physical examinations, especially reproduction, to determine the fertile and repeat breeding cattle (Jumaryoto *et al.*, 2020). All cattle were examined by inspection and palpation of the BCS with the parameters of the ribs, pelvis, and tailbone (Paul *et al.*, 2020). The scale in the BCS is 1-5. Five ml blood samples were collected from the coccygeal vein (Budiyanto *et al.*, 2022) and then examined at the Clinical Pathology Laboratory of the Animal Hospital Faculty of Veterinary Medicine, Gadjah Mada University, to read sodium and chloride. The obtained BCS, sodium, and chloride were then analyzed using the T-test. This study has been approved by the Faculty of Veterinary Medicine ethical clearance committee, Gadjah Mada University, with the number 002/EC-FKH/Int./2022.

RESULT AND DISCUSSION

A general examination was carried out on all cattle samples. This examination includes pulse,

temperature, respiratory rate, and BCS. The pulse is checked from the coccygeal artery, which is palpated along the midline of the ventral surface of the tail, 5 to 10 cm from the tip. The median artery is on the forelimb's medial aspect at the elbow joint's upper. The digital arteries are located on the lateral aspect of the forelimb, caudal to the metacarpus. The femoral artery is located on the medial aspect of the thigh. The average heart rate increased in stressed animals or post-exercise animals. In this condition, the pulse is rechecked after 5 - 10 minutes (Jackson P. & Cockcroft P., 2022). The pulse results in repeat breeding and fertile group were 85,67 and 80 on average. Abdisa (2017) said that 60 – 90 is the normal pulse range in cattle.

Body temperature is measured using a digital thermometer in the rectum. The tip of the thermometer is inserted into the rectum and attached to the rectal wall. The thermometer is left in position for at least 30 seconds; the doctor must ensure the instrument is in contact with the rectal mucosa. The thermometer is cleaned after being removed from the rectum. If the patient's temperature is too low or high, it is rechecked (Jackson P. & Cockcroft P., 2022). The results of the body temperature in the repeat breeding and fertile groups were 38,6°C and 38,8°C. Robertshaw (2004) reports that the body temperature of cattle is 36,7°C – 39,1°C. It meant that both groups were in the normal range of body temperature.

The respiratory rate is calculated after at least 1 minute of animal restraint. Chest and abdominal movements during inspiration and expiration can be used as a reference for measuring respiratory rate. Expiration can be used to measure respiratory rate in areas with cold weather. If the animal is restless, the respiratory rate measurement is carried out briefly for 15 seconds, with the result multiplied by four to get the result in one minute (Jackson P. & Cockcroft P., 2022). The result of the Respiratory rate in repeat breeding and fertile group were 31,6 and 26,6. The normal respiratory rate in cattle is 25 – 30 (Abdisar, 2017). Age, body weight, activity, status of pregnancy, digestive system failure, respiration disease, and stress might affect the respiratory rate change in cattle (Fails A. & Magee C., 2018; Kelly, 1984; Yanuartono *et al.*, 2018).

Respiratory rate is influenced by heat stress and environmental temperature day and night (Suherman *et al.*, 2013), Mycoplasma spp. Infection (Tortorelli *et al.*, 2017), bloat, and toxicity (Yanuartono *et al.*, 2018). Heat stress also affects the pulse and evaporation of water through the skin. Management of keeping cattle in a cage or free-stall system on a roof can reduce the risk of heat stress (Schütz *et al.*, 2010). In this study, none of the samples showed any respiratory tract disorder.

From anamneses and physical examination, there were five fertile cows (group 1) and five with repeat breeding (group 2).

The results of the BCS study on fertile cattle were 3,3 on average and repeat breeding cattle 2,5 on average (Table 1).

Table 1: Data body condition score on fertile and repeat breeding cattle

	Number of cattle	Average BCS
Fertile	5	3,3
Repeat breeding	5	2,5

Ervandi *et al.*, (2020) compared BCS with Service per conception (S/C), and the research results explained that cows with high BCS had low S/C values. This shows that the higher the BCS of cows, the lower the repeat matting percentage. It agrees with Asaduzzaman *et al.*, that repeat breeding prevalence is more prevalent in BCS 1-3. Low-quality feed for a long time will cause a decrease in BCS (Priyo *et al.*, 2020). Cow with low BCS will induce negative energy balance (NEB). Therefore, it can increase repeat breeding risk. Energy is the primary nutrient adult cattle require, and imbalance impacts reproductive activity in cattle. The effects of livestock experiencing NEB are decreased growth and inadequate follicular maturation, estrus symptoms that are not visible, poor oocyte quality decrease, conception rate, and early embryonic death (Nigussie, 2018).

The result of the Na study on fertile cows was 132.7 ± 3.8 and repeat breeding cows 131.6 ± 2.5 ($P > 0.05$), and the Cl study on productive cows was 91.7 ± 3.0 and repeat breeding cows 89.3 ± 4.7 ($P > 0.05$), but there is not significant difference (Table 2).

Table 2: Data macro mineral level on fertile and repeat breeding cattle

	Na	Cl
Fertile	132.7 ± 3.8^a	91.7 ± 3.0^a
Repeat breeding	131.6 ± 2.5^a	89.3 ± 4.7^a

^{a,b}The same row indicates no significant difference ($p \leq 0.05$)

It agrees with Tsami *et al.*, (2020) and Akhtar *et al.*, 2014, that there was no difference between Na and Cl levels in fertile and repeated breeding cattle and buffalo. A lack of nutrients like sodium will cause reproductive disorders (Yasohtai, 2014). Macro minerals like Na, K, and Cl are essential in cattle's bodies' acid-base balance and osmotic pressure (Tsami *et al.*, 2020). Maintaining an acid-base balance in body fluids is critical for homeostasis. An acid-base imbalance can cause several diseases. A lack of electrolyte concentrations can cause reproductive disorders in animals. Fluid electrolytes such as magnesium (Mg^{2+}), chloride (Cl^-), sodium (Na^+), and potassium (K^+) are present in the follicular fluid of cow ovaries. Decreased follicular fluid concentration affects poor oocyte quality, decreased embryo implantation in the endometrium, and

uterine disease (Galeska *et al.*, 2022). An imbalance of the hormone progesterone, oestradiol, and decreased epithelial growth factor in the endometrium will lead to implantation failure, poor oocyte quality, aging, and poor follicular fluid, then called repeated breeding (Yaginuma *et al.*, 2019).

CONCLUSION

This study concludes that a BCS in fertile group was 3,3 on average and repeats breeding group was 2,5 on average. The conclusion is that Na and Cl have no difference in productive and repeat breeding cattle.

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