

THE RELATIONSHIP BETWEEN *BODY CONDITION SCORE* (BCS) AND TESTICULAR SIZE IN BALINESE CATTLE

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Abstract

This study aimed to determine the relationship between Body Condition Score (BCS) and testicular size (length) in male Bali cattle. The research method employed was quantitative correlational using simple linear regression and correlation analysis. The research sample consisted of 8 male Bali bulls aged 2 years old, categorized into variations of BCS groups 2, 3, and 4. Data collection was conducted through visual assessment and palpation to determine the BCS status, alongside macromorphometric measurements of testicular length using a measuring tape. The results showed an average BCS value of $3,000 \pm 0,756$. Based on the BCS grading scale of 2–4, a BCS value of 3 indicates that the Bali bulls were in ideal condition. Meanwhile, the average testicular length obtained was $8,813 \pm 1,033$ cm, reflecting normal and uniform growth of the external reproductive organs for the 2-year-old age group. Based on the simple linear regression analysis, the regression equation was formulated as $Y = 6.188 + 0.875 X$ with a correlation coefficient (r) of 0.640, indicating a direct (positive) relationship with a moderate-to-strong level of closeness. However, the significance test showed that the relationship between the two variables was not significantly different or non-significant ($P > 0.05$) since the calculated r -value (0.640) was smaller than the table r -value (0.707). The study concludes that 2-year-old male Bali bulls exhibit proportional body condition and normal testicular length with a positive-linear relationship, though its statistical effect is non-significant. This proves that the development of testicular size is not solely determined by temporary physical body condition but is strongly influenced by other internal and external factors such as genetics, age, body weight, and environment. Therefore, BCS assessment is suggested only as an initial indicator, while the selection of superior bulls must still be carried out comprehensively by involving other reproductive morphometric parameters.

Keywords: Body Condition Score (BCS), Male Bali Bull, Testicular Length, Linear Regression.

Abstrak

Penelitian ini bertujuan untuk mengetahui hubungan antara *Body Condition Score* (BCS) dengan ukuran (panjang) testis pada ternak sapi bali jantan. Metode penelitian yang digunakan adalah kuantitatif korelasional menggunakan analisis regresi dan korelasi linear sederhana. Sampel penelitian terdiri dari 8 ekor sapi Bali jantan berumur 2 tahun yang dikelompokkan berdasarkan variasi BCS 2, 3, dan 4. Pengumpulan data dilakukan melalui penilaian visual dan perabaan (palpasi) untuk status BCS serta pengukuran makromorfometri panjang testis menggunakan pita ukur. Hasil penelitian menunjukkan nilai rata-rata BCS sebesar $3,000 \pm 0,756$. Berdasarkan skala penilaian BCS 2–4, nilai BCS 3 menunjukkan bahwa ternak sapi Bali

Jantan berada dalam kondisi ideal. Sedangkan ukuran testis (panjang testis), diperoleh nilai rata-rata sebesar $8,813 \pm 1,033$ cm, menunjukkan pertumbuhan organ reproduksi luar yang normal dan seragam untuk kelompok umur 2 tahun. Berdasarkan analisis regresi linear sederhana, diperoleh persamaan regresi $Y = 6,188 + 0,875 X$ dengan nilai koefisien korelasi (r) sebesar 0,640, menunjukkan adanya arah hubungan searah (positif) dengan tingkat keeratan sedang hingga kuat. Namun demikian, uji signifikansi menunjukkan hubungan kedua variabel tersebut tidak berbeda nyata atau tidak signifikan ($P > 0,05$) karena nilai r hitung (0,640) lebih kecil daripada r tabel (0,707). Kesimpulan dari penelitian ini adalah sapi bali jantan umur 2 tahun memiliki kondisi tubuh proporsional dan panjang testis normal dengan arah hubungan positif-linear, tetapi pengaruhnya secara statistik tidak signifikan. Hal ini membuktikan bahwa perkembangan ukuran testis tidak hanya ditentukan oleh kondisi fisik tubuh sesaat, melainkan dipengaruhi kuat oleh faktor internal dan eksternal lain seperti genetik, umur, bobot badan, dan lingkungan. Oleh karena itu, penilaian BCS disarankan hanya sebagai indikator awal, sementara seleksi pejantan unggul harus tetap dilakukan secara komprehensif melibatkan parameter morfometri reproduksi lainnya.

Kata Kunci: *Body Condition Score* (BCS), Sapi Bali Jantan, Panjang Testis, Regresi Linear.

I. INTRODUCTION

Cattle are one of the livestock commodities that have an important role in providing animal protein in the form of meat and making an economic contribution to society. The increase in the population and public awareness of nutritional needs has encouraged an increase in demand for meat products every year. Therefore, increasing livestock productivity, especially reproductive efficiency, is one of the key factors in supporting the sustainability of livestock businesses (Rusdiana, 2019). The success of the cattle business is greatly influenced by reproductive efficiency, both in female and male livestock. Males play an important role because one male can mate with many females in a single reproductive period. Therefore, the quality and reproductive capacity of males are decisive factors in the success of the breeding program and the increase in the livestock population (Wadja *et al.*, 2021).

The testicles are the primary reproductive organs that function to produce spermatozoa through the process of spermatogenesis and produce the hormone testosterone which plays a role in the development of secondary sex traits and libido. Testicular size, which is generally measured through the circumference of the scrotum, length, and volume of the testicles, is often used as an indicator of sperm production capacity in the fertiliser potential of the male. Males with larger testicular size tend to have a greater number of seminiferous tubules, so they have the potential to produce a higher number of spermatozoa. Therefore, testicular size is often used as one of the criteria for selecting superior males. (Fazrien *et al.*, 2020). In addition to the

testicles, there is also an assessment of the body condition of livestock through *the Body Condition Score (BCS)*).

Body Condition Score (BCS) is a system of assessing the condition of livestock bodies based on visual observation and palpation of certain points on the body, using a certain scale with a general score of 1-5. A low score indicates a lean condition with minimal fat reserves, while a high score indicates an obese condition with excess fat reserves. BCS reflects the balance between nutrient intake and energy needs of livestock over a period of time, so it is often used as an indicator of feed management and livestock health (Tailor *et al.*, 2023).

Males with BCS that are too low are at risk of impaired reproductive organ development due to energy deficits, while males with BCS that are too high have the potential to experience decreased reproductive efficiency due to metabolic disorders. Thus optimal BCS is thought to have a positive relationship with the development of the size of the testicles of cattle (El-sherbiny *et al.*, 2023). Based on the above background, it is necessary to conduct a study with the title **"The Relationship Between *Body Condition Score (BCS)* and Testicular Size in Balinese Cattle"**.

II. LITERATURE REVIEW

Balinese cattle are one of Indonesia's native livestock that has genetic, economic, and adaptive values that are very important in the national livestock system. This cow comes from the domestication of wild bulls (*Bos javanicus*) which has been going on for hundreds of years. Phenotypically, Balinese cattle are characterized by brick red in females and dark brown to blackish in adult males, with a black dorsal line (eel line) and white on the legs and buttocks (*white stocking*) (Suputra *et al.*, 2019).

Testicular size is a strong morphometric parameter that reflects spermatogenic capacity and fertility potential in male livestock. *Scrotal circumference*, length and volume of the testicles are positively correlated with sperm production capacity and sperm quality (Sahi *et al.*, 2019). Testicular size is also a physiological indicator of reproductive development, where bulls with larger testicular sizes show higher sperm counts and earlier puberty age (Setiawan *et al.*, 2020).

III. RESEARCH METHODS

The method used in this study is the Quantitative and Correlation method (Regression and Correlation Analysis). To find out if there is a relationship between BCS and testicular size in Balinese cattle. The procedure for conducting research is carried out through:

Preparation of tools and materials

The preparation stage of tools and materials includes tools used in data collection such as cattle and measuring tape.

Determination of Research Cattle

Male Balinese cows were selected based on the BCS group, namely BCS 2, 3 and 4. The sample used in this study was 8 male Balinese cattle with an age of 2 years. Pand livestock body data are determined by visual observation and touch of cow bodies to determine body condition scores based on scores or values from BCS that have been determined with BCS 2, 3 and 4 scales, then the score results are recorded.

Testicular Measurement (Testicular Length)

The length of the testicles is measured from the base to the tip of the testicle using a tape measure. Measurement results are recorded in centimeters (cm)).

Data Logging

All the results of testicular length measurement on the data record sheet that has been prepared. Documentation of research activities was carried out using cameras.

IV. RESEARCH RESULTS

Data Analysis

The results of the study on the average and standard deviation between *Body Condition Score* (BCS) and the testicular size of Balinese cattle can be presented in table 1 below.

Table 1. Average and Standard *Body Condition Score* (BCS) Deviation and Testicular Size Balinese Male Cow

Ukuran	Rataan $\pm$ SD
<i>Body Condition Score</i> (BCS)	3,000 $\pm$ 0,756
Ukuran Testis	8,813 $\pm$ 1,033

Source : Data processed by Researcher (2026)

Based on the results of the study presented in Table 1, the average *Body Condition Score* (BCS) of male Balinese cattle observed was 3,000 $\pm$ 0.756. The average BCS value indicates that in general, the performance of the body condition of the male Balinese cows used in the study is in ideal condition. Based on the BCS assessment scale of 2–4, the BCS value of 3 indicates that the cattle are not too thin and not too fat, where the deposition of fat and muscle in the ribs, spine, and base of the tail area is in ideal condition. The standard deviation value (SD) of 0.756 indicates a relatively low diversity (variability) of body conditions among the samples of Balinese cattle studied. The condition of the body that is in the ideal BCS (scale 3) indicates that

the management of feeding (especially the adequacy of energy and protein) provided has met the basic needs of life (*maintenance*) of livestock, so that the remaining energy can be allocated to support other physiological functions of the body, including the reproductive system.

Meanwhile, the testicular size variable (testicular length) obtained an average value of 8.813 ± 1.033 cm. This average size indicates that the reproductive organs are within the normal range. The standard deviation value of 1.033 cm showed that the variation in testicular length size between male Balinese cattle individuals in this study did not differ much, which means that the development of the reproductive organs of Balinese cattle was at uniform growth. The average testicular size of 8,813 cm at the average condition of BCS 3,000 indicates early that cattle have good reproductive capacity.

The results of the study on the correlation between *Body Condition Score* (BCS) and the testicular size of Balinese cattle can be presented in table 1 below. **Table 2. Correlation (R), R Square, and Regression Equation of Body Condition Score (BCS) with Balinese Cow Testicular Size**

Parameter Relationships	Regression equations	r hitung	R Square
BCS vs Ukuran Testis	$Y = 6,188 + 0,875 X$	0,640	0,410

*Description: Significant $P < 0.05$ *(real difference) and $P > 0.05$ (no real difference)*

Source : Data processed by Researcher (2026)

Based on table 2, simple linear regression analysis, the regression equation $Y = 6.188 + 0.875 X$ was obtained with a correlation coefficient value (r) of 0.640 and R Square of 0.410. This shows that BCS contributes 41.0% to the variation in testicular size of male Balinese cows. The calculated r value (0.640) was smaller than the table r (0.707) at the significance level of $P > 0.05$, so that the relationship between BCS and testicular size was not significantly different. The relationship between these two parameters is strengthened by a correlation coefficient value of 0.640. This value indicates a moderate to strong correlation between external physical appearance (BCS) and testicular length.

The relationship between *Body Condition Score* (BCS) and Testicular Size

The relationship between BCS and testicular length are two parameters that play an important role in the process of forming reproductive tissue and producing reproductive hormones, especially testosterone. Cows with ideal BCS have better testicular development

compared to cows with less than ideal BCS. close relationship in the growth and development of male Balinese cattle.

The length of the testicles reflects the size and development of the testicles. Larger testicles usually contain more seminiferous tubules, which are where spermatozoa formation occurs. Thus, males who have a long testicular circumference generally have a higher sperm production capacity than males with a small testicular length. Because testicular growth goes hand in hand with body growth, an increase in BCS is often followed by an increase in testicular length.

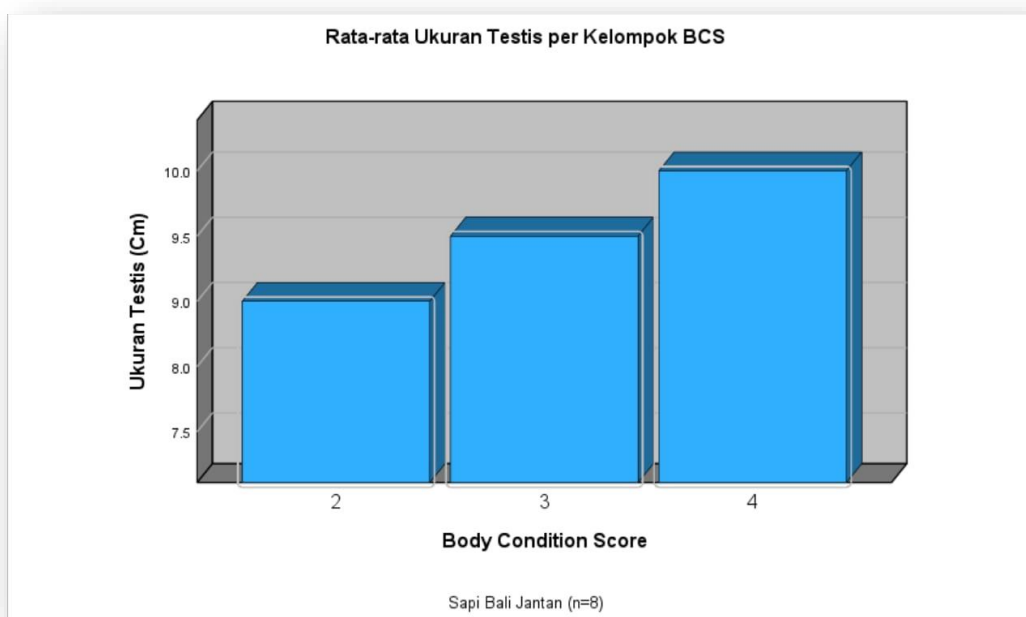


Diagram 1. The relationship between BCS and testicular size
Source : Data processed by Researcher (2026)

From the results of the study, it was obtained that the testicular length of male Balinese cattle was influenced by *the Body Condition Score* (BCS) with a linear regression equation $Y = 6.188 + 0.875 X$. The value of the correlation coefficient (r) of 0.640 showed a positive relationship with a moderate degree of tightness between BCS and testicular length. However, the relationship did not show a statistically significant effect because the calculated r value (0.640) was smaller than the table r (0.707) at the significance level of $P > 0.05$. The value of the determination coefficient ($R Square$) obtained of 0.410 indicates that the BCS variable contributes to the variation in testicular size of male Balinese cattle in this study, while the remaining 59.0% is influenced by other external and internal factors that are not measured, such

as genetic factors (inherited *heritability* of the mother/male), age variation, body weight, and maintenance management aspects.

The results of this study show that there is a tendency to increase testicular length along with increasing BCS values. A good body condition reflects optimal nutritional status, so it can support the growth and development of male reproductive organs. Adequate nutrition plays an important role in the process of testicular development, hormonal activity, and the formation of reproductive cells. According to Barth *et al.*, (2008), good nutritional levels during the growth period can improve the development of reproductive organs and accelerate sexual maturity in cow males. The relationship between BCS and testicular length in this study was not significant, suggesting that testicular development is not only influenced by body conditions. Other factors such as age, weight, genetics, health status, environment, and maintenance management also have a large contribution to the size of the reproductive organs. Nugraha *et al.*, (2021) reported that age and body weight have a closer relationship with reproductive organ development and spermatozoa production in Peranakan Ongole cattle than single body condition factors. BCS can be used as one of the initial indicators in assessing the reproductive readiness of prospective males. Male Balinese cows with ideal body conditions tend to have better reproductive performance than cattle with less than optimal body conditions. However, because BCS's contribution to testicular length is only 41.0% and shows no noticeable effect, BCS cannot be used as the sole basis for male selection. Measurements of other reproductive parameters such as testicular length, scrotal circumference, testicular volume, and semen quality are still needed to obtain a more accurate assessment. The results of this study are in line with Nuhrawi's (2022) research which states that the body condition of Balinese cow males is related to reproductive performance and semen quality, although it does not always show a strong direct relationship with the size of reproductive organs. Therefore, in the Balinese cattle male selection program, a comprehensive approach is needed by considering BCS, age, body weight, scrotal circumference, and other reproductive parameters to increase the success of the breeding program and livestock productivity.

V. CONCLUSION

Based on the results of the research, it can be concluded that

1. There was a very strong positive relationship between BCS and testicular size in male Balinese cattle. The results of the analysis showed that the average value of the *Body Condition Score* (BCS) of the male Balinese cattle observed was $3,000 \pm 0.756$. Based on the BCS assessment scale of 2–4, the BCS value of 3 indicates that the male Balinese cattle

are in ideal condition. Meanwhile, the size of the testicles (testicular length) was obtained with an average value of $8,813 \pm 1,033$ cm. This average size indicates that the reproductive organs are within the normal range.

2. There was a linear positive relationship with a moderate to strong degree of closeness between BCS and the testicular length of male Balinese cattle which was expressed through the regression equation $Y = 6.188 + 0.875 X$ and the correlation coefficient (r) of 0.640. Each increase of one unit of BCS value will be followed by an increase in testicular length by 0.875 cm.
3. The association between BCS and testicular length in this study was not significant, suggesting that testicular development is not only influenced by body conditions. Other factors such as age, weight, genetics, health status, environment, and maintenance management also have a large contribution to the size of the reproductive organs

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