



International Journal of Veterinary Sciences and Animal Husbandry



ISSN: 2456-2912

NAAS Rating (2026): 4.61

VET 2026; 11(1): 159-162

© 2026 VET

www.veterinarypaper.com

Received: 08-10-2025

Accepted: 17-11-2025

Bansode PS

Department of Animal
Husbandry and Dairy Science,
College of Agriculture, Dhule,
Maharashtra, India

Birari DR

Department of Animal Science
and Dairy Science, College of
Agriculture, Malegaon,
Maharashtra, India

Choudhari DM

Animal Husbandry and Dairy
Science, Krishi Vigyan Kendra,
Dhule, Maharashtra, India

Desale RJ

Animal Husbandry and Dairy
Science, College of Agriculture,
Dhule, Maharashtra, India

Korde RS

Department of Animal
Husbandry and Dairy Science,
Post Graduate Institute,
Mahatma Phule Krishi
Vidyapeeth, Rahuri,
Maharashtra, India

Corresponding Author:

Bansode PS

Department of Animal
Husbandry and Dairy Science,
College of Agriculture, Dhule,
Maharashtra, India

Correlation analysis of morphometric traits, body weight, age and body condition score in Surti goats

Bansode PS, Birari DR, Choudhari DM, Desale RJ and Korde RS

DOI: <https://www.doi.org/10.22271/veterinary.2026.v11.i1c.2937>

Abstract

The present investigation was undertaken to study the interrelationships among morphometric traits, body weight, age and body condition score (BCS) in Surti goats. A total of 200 Surti goats of different age groups were evaluated for body length, height at withers, heart girth, paunch girth, body weight and body condition score assessed at lumbar (BCS-L), rib (BCS-R) and sternum (BCS-S) regions. Pearson's correlation coefficients were estimated to determine the strength and direction of associations among the studied traits. The results revealed strong and statistically significant ($p < 0.01$) positive correlations among all linear body measurements, indicating their interdependence. Body weight showed a highly significant correlation with body length ($r = 0.80$) and height at withers ($r = 0.75$), while moderate correlations were observed with heart girth and paunch girth. Age exhibited a strong positive association with all morphometric traits, suggesting proportional growth with advancing age. Body condition score was significantly correlated with both body measurements and body weight, with the highest correlation observed between body weight and BCS-L ($r = 0.92$). Strong inter-correlations were also observed among different BCS assessment sites. These findings indicate that morphometric traits and BCS can serve as reliable, non-invasive indicators for estimating body weight, growth and nutritional status in Surti goats, thereby supporting their use in field-level selection and management practices.

Keywords: Goat, Correlation, Body weight, Body measurement etc

Introduction

Goats play a vital role in the livelihood security of small and marginal farmers due to their adaptability, low input requirements and ability to thrive under diverse agro-climatic conditions. Globally and nationally, goat populations have increased significantly due to their contribution to meat, milk, skin, and fiber production. In India, the 20th Livestock Census (2019) reported a population of 148.88 million goats, a 10.1% increase from 135.7 million recorded in 2012. In addition to this, the goats contribute approximately 35% of total meat production and 3.5% of milk production (Department of Animal Husbandry & Dairying, 2019).

Surti goat, an important indigenous breed of Gujarat, is valued for its adaptability and moderate production potential. In Dhule district of Maharashtra, goat numbers reached 332,041 in 2019, of which only 5.44% (18,089) were pure or graded breeds, while 94.55% (313,952) were non-descript. Within pure breeds, the Surti goat accounted for a relatively higher proportion (27.58%) compared to other breeds (Livestock Census, 2019).

However, challenges such as lack of weighing facilities hinder accurate economic valuation. Body Condition Scoring offers a practical, low-cost method for assessing goat condition, improving feeding strategies, and ensuring fair market pricing. Morphometric measurements and body condition score (BCS) are widely used as indirect tools to assess growth, body weight and nutritional status in goats. Understanding the relationships among these traits is essential for developing simple and reliable prediction models. Therefore, the present study was undertaken to assess the correlation among body measurements, body weight, age and body condition score in Surti goats.

Methodology

The present study was conducted over a period from November 2024 to March 2025. Initial observations were carried out on a pilot basis to familiarize the researchers with the observational methods. The same herds were subsequently revisited to gather data for documentation. This research focused on the selection of the Surti breed of goats. True types of animals were selected as per the description given by NBAGR, Karnal, Haryana. In this study, only adult animals of either sex that were more than one year old were included. Animals that were ill, had physical defects, or were otherwise unsuitable for observation were not utilized, even if they were part of the herd during the observation period. The following morphometric traits were recorded using standard procedures: body length, height at withers, heart girth and paunch girth. Body weight was recorded using a weighing balance. Body condition score was assessed on a five-point scale at three anatomical locations, namely lumbar (BCS-L), rib (BCS-R) and sternum (BCS-S). Pearson's correlation coefficients were computed to determine the relationships among body measurements, body weight, age and BCS. Statistical significance was tested at $p < 0.05$ and $p < 0.01$ levels.

Result and Discussion

1. The correlation between the body measurements

It is observed from Table 1 values, a notable correlation ($p < 0.01$) was between body length and height ($r = 0.76$), as well as with paunch girth ($r = 0.45$) and heart girth ($r = 0.52$). Additionally, a significant correlation ($p < 0.01$) was identified between height and heart girth ($r = 0.53$) and paunch girth ($r = 0.55$). Furthermore, a strong correlation ($p < 0.01$) was established between heart girth ($r = 0.87$) and paunch girth. Each physical measurement exhibited a robust and positively significant relationship with all other measurements ($p < 0.01$).

This indicated that the other body measuring parameters are linearly impacted when one parameter changes.

The consistently significant ($p < 0.01$) and positive relationships among all traits confirm that the morphometric parameters are interdependent. When one parameter increases (e.g., heart girth), others such as body length, height, or paunch girth also tend to increase. This supports the idea that linear body traits can serve as reliable predictors of body weight and physical development. These findings are consistent with previous studies by Thiruvankadan (2005) [12] and Shegaw Ambe *et al.*, (2022) [3], who reported the predictive and interconnected nature of these traits in goat production.

2. The correlation between body weight and the body measurements

Table 2 values clearly demonstrate a positive and statistically significant ($p < 0.01$) correlation between body weight and the body measurements.

From the table values the Body weight was found to have a highly significant ($p < 0.01$) connection with body length ($r = 0.80$), height at withers ($r = 0.75$) while heart girth shows moderate correlation ($r = 0.50$) and paunch girth shows moderate to low correlation ($r = 0.48$). Similar results to those of the present study were reported by Alade *et al.*, (2008) [2], who identified a significant ($p < 0.01$) correlation between body weight and body length in females, as well as an extremely significant ($p < 0.01$) correlation between body weight and heart girth in males. Ahmad *et al.*, (2013) [1] and Mule *et al.*, (2014) [8] also found a highly significant ($p < 0.01$) relationship between body weight and heart circumference, height, and body length, which aligns with the

results of the current investigation. Tella (2022) [13] observed that live weight was positively and significantly ($p \leq 0.05$) correlated with most body parameters in both male and female WAD goats at the age of zero teeth. The highest correlation values were noted for heart girth (0.89), foreleg length (0.87), rump height (0.79), and wither height (0.74) in males, while in females, the highest value was recorded for body length (0.81); heart girth and foreleg length had values of (0.81) and (0.76), respectively. This is consistent with the findings of the current study.

3. The correlation of age and the body measurements

The correlation between the age and body measurements is computed in the Table 4.2.3. From the results a substantial and statistically significant correlation ($p < 0.01$) was observed between age and various morphometric traits in goats. Specifically, body length showed a strong positive correlation with age ($r = 0.74$), followed by body height ($r = 0.69$), heart girth ($r = 0.54$), and paunch girth ($r = 0.49$). It is a positive and statistically significant ($p < 0.01$) correlation between age and the body measurements. Moreover, results indicated that as goats age, their linear body dimensions increase in a largely proportional manner. The strength of these correlations put forward that age is a reliable predictor of physical development and structural growth in goats.

This pattern of result is in line with previous research by Thiruvankadan (2005) [12] and Ambe *et al.*, (2022) [3], who reported that morphometric traits particularly heart girth and body length correlate significantly with age and are useful for predicting body weight and assessing growth stages in indigenous and crossbred goats. Therefore, these morphometric traits might be effectively used for age-based selection, nutritional assessment, and growth monitoring in goat husbandry practices.

4. The correlation between the body measurements and body condition Scores

Table 4 values clearly indicates a positive and statistically significant ($p < 0.01$) correlation between body condition scores (BCS) and various morphometric traits in goats. From the values of the Body length, which showed a strong correlation with BCS-L ($r = 0.76$), BCS-R ($r = 0.68$), and BCS-S ($r = 0.69$), which indicating that, as goats accumulate fat and improve in condition, their longitudinal growth tends to reflect this positively.

Body height also showed significant correlations with BCS-L ($r = 0.72$), BCS-R ($r = 0.67$), and BCS-S ($r = 0.68$). This result indicated that the taller goats are generally in better body condition, likely reflecting better skeletal development and nutritional status. Similarly, paunch girth was moderately associated with BCS-L ($r = 0.43$), BCS-R ($r = 0.46$), and BCS-S ($r = 0.53$), while heart girth showed meaningful correlations with BCS-L ($r = 0.48$), BCS-R ($r = 0.45$), and BCS-S ($r = 0.52$). These findings highlighted that, all linear body measurements are strongly and positively related to BCS, reinforcing the idea that goats in better condition are not only heavier but also larger in structural traits. This finding supported by Khan *et al.*, (2020) and Malaviya *et al.*, (2022) [5, 6], who emphasized the effectiveness of BCS as a non-invasive indicator for evaluating growth and fat reserves.

5. The correlation between the body weight of animals and their BCS

The correlation between the body weight and body condition scores is tabulated in the Table.5. A significant positive correlation ($p < 0.01$) was observed between the body weight of the animal and BCS-L ($r = 0.92$), BCS-R ($r = 0.89$), as well

as BCS-S ($r = 0.88$). It clearly demonstrates a positive and statistically significant ($p < 0.01$) correlation between body weight of animals and their body condition score in goats. Each of these correlations was positive in nature. The research conducted by T. Sezenler *et al.* (2011) [11] revealed a significant relationship between body weight and body condition score, aligning with the results of the present investigation, whereas Nsoso *et al.*, (2003) [10] found no significant correlation.

6. The correlation between the age of the animals and their body condition score

The correlation between the age and body condition scores is presented in the Table 6. Body Condition Score (BCS) reflects the level of fat reserves in an animal and is primarily influenced by its nutritional status and the efficiency with which it converts nutrients into body mass. While BCS can vary significantly across individuals might be due to metabolic and environmental factors, age is one potential contributor. In the present study, a significant positive correlation was observed between the age of the animals and their body condition scores. Specifically, age was strongly correlated with BCS-L ($r = 0.91$), BCS-R ($r = 0.83$), and BCS-S ($r = 0.85$), all statistically significant at the $P < 0.01$ level. These findings shown that as Surti goats mature, their BCS tends to improve, possibly due to better nutrient utilization efficiency or prolonged exposure to favourable feeding regimes. However, since BCS can be affected by physiological factors like gestation, lactation, or body maintenance needs, it is advisable to compare BCS values within specific age categories to account for natural variability.

Similar findings have been reported by Malaviya *et al.*, (2022) [6], who noted that BCS in goats tends to increase with age under stable nutritional conditions.

7. The correlation among the body condition scores

The correlation body condition scores is presented in the Table 7. It is hypothesized that the relationship among different Body Condition Scores (BCS) would be absolute. This result contrasts with the findings of Delfa *et al.*, who documented a correlation of greater magnitude between BCS-S and BCS-L ($r = 0.98$). The analysis revealed a significant correlation ($p < 0.01$) between BCS-L and BCS-R ($r = 0.84$), BCS-L and BCS-S ($r = 0.84$), and BCS-R and BCS-S ($r = 0.83$), indicating a strong positive association among the various BCS variables.

Table 1: The correlation between the body measurements

Sr.No	Groups	Body Length	Height at wither	Heart Girth	Paunch Girth
1	Body Length	1			
2	Height at wither	0.76**	1		
3	Heart Girth	0.45**	0.53**	1	
4	Paunch Girth	0.52**	0.55**	0.87**	1

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 2: The correlation between body weight with the body measurements

Groups	Body Length	Height at wither	Heart Girth	Paunch Girth
Body Weight (kg)	0.80**	0.75**	0.50**	0.48**

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 3: The correlation between age with the body measurements

Groups	Body Length	Height at wither	Heart Girth	Paunch Girth
Age (yr)	0.74**	0.69**	0.54**	0.49**

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 4: The correlation between the body measurements and body condition Scores

Groups	Body Length	Height at wither	Heart Girth	Paunch Girth
B.C.S - L	0.76**	0.72**	0.48**	0.43**
B.C.S - R	0.68**	0.67**	0.45**	0.46**
B.C.S - S	0.69**	0.68**	0.52**	0.53**

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 5: The correlation between the weight with their body condition score

Groups	B.C.S - L	B.C.S - R	B.C.S - S
Body Weight(kg)	0.92**	0.89**	0.88**

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 6: The correlation between the age with their body condition score

Groups	B.C.S - L	B.C.S - R	B.C.S - S
Age (yr)	0.91**	0.83**	0.85**

Note: ** = $p < 0.01$, * = $p < 0.05$

Table 7: The correlation among the body condition scores

Variables	BCS-L	BCS-R	BCS-S
BCS-L	1.00	0.84**	0.84**
BCS-R	0.84**	1.00	0.83**
BCS-S	0.84**	0.83**	1.00

Note: ** = $p < 0.01$, * = $p < 0.05$

Conflict of Interest

Not available.

Financial Support

Not available.

References

- Ahmad F, Patel BHM, Rijasnaz VV. Relationship of body weight with linear body measurements in Rohilkhand local goat. Indian Journal of Animal Research. 2013;47(6):521-526.
- Alade NK, Raji AO, Atiku MA. Determination of appropriate model for the estimation of body weight in goats. Journal of Agricultural and Biological Science. 2008;3(4):52-57.
- Ambel S, Bayou E. Live body weight prediction from linear body measurement in indigenous goat of south western Ethiopia. Journal of Fisheries and Livestock Production. 2022;10(6):1-5.
- Department of Animal Husbandry and Dairying. 20th livestock census. New Delhi: Government of India; 2019.
- Khan MKI, Hashem MA, Akhter S, Hossain MM, Sultana S. Morphometric characterization and body condition scoring of indigenous goats in Bangladesh. Journal of Advanced Veterinary and Animal Research. 2020;7(3):561-567.
- Malaviya DJ, Bansode P, Patel R. Evaluation of body condition score in relation to physiological stages in goats. Indian Journal of Animal Research. 2022;56(5):678-683.
- Malaviya DJ, Maheta PJ, Damor AB. A study on the determination of body condition score and somatic cell count in Surti goats. The Pharma Innovation Journal. 2022;11(12):825-827.
- Mule MR, Barbind RP, Korake RL. Relationship of body weight with linear body measurement in Osmanabadi goats. Indian Journal of Animal Research. 2014;48(2):155-158.

9. National Bureau of Animal Genetic Resources (NBAGR). Breed descriptor: Surti goat. Karnal, Haryana: ICAR-NBAGR; n.d.
10. Nsoso SJ, Aganga AA, Moganestsi BP, Tshweyane SO. Body weight, body condition score and heart girth in indigenous Tswana goats during the dry and wet seasons in southeast Botswana. *Livestock Research for Rural Development*. 2003;15(4):1-7.
11. Sezenler T, Yildirim M, Ceyhan A. Relationships between live weight and body measurements in Karya sheep. *Asian Journal of Animal and Veterinary Advances*. 2011;6(1):120-128.
12. Thiruvankadan AK. Determination of best-fitted regression model for estimation of body weight in Kanni Adu kids under farmer's management system. *Livestock Research for Rural Development*. 2005;17(7):1-9.
13. Tella A. Correlation of live body weight with linear body measurements in male and female West African Dwarf goats at zero teeth age. *Ghana Journal of Agricultural Science*. 2023;58(1):49-59.

How to Cite This Article

Bansode PS, Birari DR, Choudhari DM, Desale RJ, Korde RS. Correlation Analysis of Morphometric Traits, Body Weight, Age and Body Condition Score in *Surti* Goats. *International Journal of Veterinary Sciences and Animal Husbandry*. 2026; 11(1): 159-162.

Creative Commons (CC) License

This is an open-access journal, and articles are distributed under the terms of the Creative Commons Attribution-Non Commercial-Share Alike 4.0 International (CC BY-NC-SA 4.0) License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.