



Research Article

CORRELATION AND SIMPLE REGRESSION EQUATIONS FOR DETERMINATION OF BODY WEIGHTS IN GROWING SAHIWAL CALVES

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Abstract- The aim of the study was to predict the correlation of body weights with different body measurements and to derive simple regression equations for estimation of live weight in Sahiwal cattle. Total 194 purebred growing Sahiwal cattle of both the sexes was taken for study and was divided into six age groups (0-6, 6-12, 12-18, 18-24 and 24-36 months). Animals were weighed on a mechanical scale and their heart girth (HG), body length (BL), height at wither (HAW), chest depth (CD) and head to shoulder length (SH) were measured. All the phenotypic correlations among body weight and different body measurements were positive and heart girth (HG) shown highest correlation with live body weight than other body measurements. Study revealed that when HG can be used as a single variable to evaluate body weights more accurately up to age of 36 months in Sahiwal calves.

Keywords- Body weight, Sahiwal calves, body measurements, prediction equation, correlation.

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Introduction

Livestock continue to be the prime livelihood of the vast majority of the rural households along with agriculture. Livestock keeping has been the major source of supplementary income for rural households next to agriculture. Cattle are the most popular species among all livestock in India. Sahiwal is an important milch breed of cattle of Indian subcontinent. In our country all the indigenous cattle belong to zebu (humped type) cattle (*Bos indicus*). Sahiwal cattle are well reputed for ticks resistant, heat tolerant and high production ability under harsh environment. Body weights of growing cattle is important factor associated with several management practices viz., on the basis of their birth weight, daily analysis of their nutritional needs, to observe growth, calculating of breeding age and marketing weight, to evaluate weight gain of calves and on the basis of their body conformation selection of culled calves [9]. Facilities of platform scales are not available in many farms in our country. Hence, the body weights of cattle at different ages have to be predicted with reasonably accuracy by taking various body measurements [2].

Material and Method

The present investigation was conducted in the herd of purebred Sahiwal cows maintained at Bull Mother Experimental Farm (BMEF) of the College of Veterinary Science & Animal Husbandry, Anjora, Durg and Government Cattle Breeding Farm (CBF), Anjora, Durg. Total 194 growing male and female animals up to three years of age of both sexes were considered under this study and divided into five different age groups of 0-6, 6-12, 12-18, 18-24 and 24-36 months. The animals were kept under loose housing system. In both the farms standard feeding and management practices were followed. Animals have free access to fresh drinking water. Animals received routine inspection and vaccination for herd health maintenance. Along with body weight (BW) five morphometric body

measurements i.e., body length (BL), heart girth (HG), height at withers (HAW), head to shoulder length (HS) and chest depth (CD) were recorded in all the experimental animals. All linear body measurements were taken when animal is standing quiet properly after measuring the body weight of the animal. All body measurements were determined by using a large calliper specially developed for the purpose. The distance was measured into centimeter.

Body weight (kg) was recorded early in the morning using electronic weighing balance which range is (0-1000 kg.). Body length was measured from point of the shoulder to the point of the tuber ischii or pin bone of animal, the heart girth of cattle was measured at the circumference immediately behind the fore limbs and parallel to the body axis the heart girth was measured by flexible measuring tape as described [4], height at withers was measured as vertical distance from the point of withers to the floor measured with a stick-rule as described [3]. Head to Shoulder length was measured from point of poll to shoulder and chest depth was measured from sternum area immediately caudal to the fore limbs to top of thoracic vertebra area.

Statistical analysis

To see the effect of body weights and body measurements, two way analysis of variance was conducted as per the method described [7]. The stepwise regression method was used to determine the best fitted regression equation in all groups of growing Sahiwal animals. Coefficients of determination values (R^2) were used to compare the efficiency of the best fitted regression equations.

Result and Discussion

The results of present study are showed in [Table-1] and [Table-2]. In the study we observed that all the Phenotypic correlations between the body weights and five body measurements in Sahiwal calves up to 3 years were positive and highly

significant ($P < 0.01$). In the present research highest (0.929**), (0.953**), (0.856**), (0.869**) and positive correlation was observed between HG and BW at different age groups of 6-12, 12-18, 18-24 and 24-36 months in growing Sahiwal calves except from 0-6 months where HG has phenotypic correlation of (0.839) next to BL (0.890). [1] have also reported highest correlation coefficient between the heart girth and body weights of Frisian crossbreed. [5, 6, 8] also reported similar findings.

Table-1 The correlation coefficients between body measurements and weights for Sahiwal cattle in different age groups

Body Measurements	0-6 months	6-12 months	12-18 months	18-24 months	24-36 months
Body length	0.890**	0.539**	0.819**	0.670**	0.654**
Heart girth	0.839**	0.929**	0.953**	0.856**	0.869**
Height at Withers	0.771**	0.648**	0.683**	0.744**	0.699**
Head to shoulder length	0.777**	0.656**	0.544**	0.657**	0.668**
Chest depth	0.437**	0.479**	0.721**	0.796**	0.415

*Significant at $P < 0.05$, ** Significant at $P < 0.01$

Table-2 Simple Regression equations for predicting body weights from different body measurements at various age groups in Sahiwal calves

Age group	Variables	Regression Equation	R ²
0-6 months	BL	$Y = -97.11 + 2.16BL$	0.79
6-12 months	HG	$Y = -100.15 + 2.05HG$	0.86
12-18 months	HG	$Y = -86.60 + 1.87HG$	0.73
18-24 months	HG	$Y = -244.29 + 3.19HG$	0.73
24-36 months	HG	$Y = -415.49 + 4.65HG$	0.76

The summary of the best fitted linear regression analyses for Sahiwal calves up to the age of 3 years were shown in [Table-2]. Simple linear regression model was used to construct a prediction equation based on single body measurements. Among all the correlation between body weight and linear measurements in age groups 0 to 36 months age were found to be high and significant ($p < 0.01$) except in the 0-6 months of age where the highest R² value was observed in regression equations using body length (BL). Finding of the present study was supported [6]. Based on simple regression model live body weight changes with linear body measurements of heart girth were predictable with R² value ranging out 0.73 to 0.83. The R² values showed that 73 to 83 percent of every one kilogram change in live weight was caused by heart girth. The relatively high value of coefficient of correlation between live body weight and heart girth assumed it to be more significant indicators of live body weight in Sahiwal calves.

Conclusion

The relatively high value of coefficient of correlation between live body weight and heart girth assumed it to be more significant indicators of live body weight in Sahiwal calves up to 36 months. Also Heart girth was found to be the best known single trait body weight predictor with highest value of R² in most of the regression equations.

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Author Contributions

Study conception, collection of data, analysis and interpretation of data: Vandana Bhagat, Research design and interpretation of data: Vikas Khune, Drafting of manuscript: Vandana Bhagat, Manju Roy and Sambhuti Shakar Sahu and Critical revision: Vikas Khune.

Abbreviations

BMEF- Bull Mother Experimental Farm, CBF- Cattle Breeding Farm, BL- Body Length, BW- Body Weight, CD- Chest Depth, HG- Heart Girth, HAW-Height at wither, HS- Head to shoulder length, R²- Coefficients of determination value, SE- Standard error

Conflict of Interest: None declared

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