Journal of Animal Research: v.6 n.2, p. 161-163. April 2016

DOI: 10.5958/2277-940X.2015.00187.4

Linear Regression Equations for Estimation of Body Weights in Sahiwal Calves

Vandana Bhagat[1], Vikas Khune[1], S.K. Chourasia[1], M.K. Gendley[2]* and K. Mukherjee[3]

[1]Livestock Production Management Department, College of Veterinary Science and Animal Husbandry, Anjora, Durg, Chhattisgarh, INDIA

[2]Department of Animal Nutrition, College of Veterinary Science and Animal Husbandry, Anjora, Durg, Chhattisgarh, INDIA

[3]Department Animal Genetics & Breeding, College of Veterinary Science and Animal Husbandry, Anjora, Durg, Chhattisgarh, INDIA

[*]Corresponding author: MK Gendley: Email:drgmanoj.ann@gmail.com

Received: 02 February, 2016 **Accepted:** 25 February, 2016

ABSTRACT

The study was conducted on 194 purebred Sahiwal calves of both the sexes and different age groups (0-6, 6-12, 12-18, 18-24 and 24-36 months) to find out the correlation coefficients between body weights and different body measurements and to develop linear regression equations for prediction of body weights of the various age groups. Among the body measurements, heart girth shown highly significant and highest correlation coefficients with body weights. It was concluded that the linear regression equations incorporating heart girth alone could be used to predict body weights of growing Sahiwal cattle.

Keywords: Body measurements, weights, linear regression equations, Sahiwal cattle

Determination of live body weights of growing cattle is important for various management practices viz., calculation of amount of milk to be offered to calves, for day to day assessment of their nutritional needs, to monitor growth, determine breeding age, estimate weight gain of calves and selection of culled calves according to their body conformation (Tuzemen *et al.* 1995). Although body weights can be precisely determined by using weighing platform scales, but unfortunately, this facilityis not available in most of the farm of rural and urban area of country.

The body weights of cattle at different ages can be predicted with reasonably accuracy by taking various body measurements (Ensminger, 1991). The scanty information is available on prediction of body weight from various body measurements and their relationship in Indian cattle. Therefore, present study was undertaken to investigate relationships between body weights and body measurements taken at various ages and to develop linear regression equations for prediction of body weights of growing Sahiwal cattle at different ages.

MATERIALS AND METHODS

The data regarding body weights and body measurements were obtained from growing Sahiwal cattle herds reared in the Bull Mother Experimental Farm and Cattle Breeding Farm at Anjora, Durg. The male and female animals were classified into five different age groups of 0-6, 6-12, 12-18, 18-24 and 24-36 months.

Live body weight (BW) was measured using electronic weighing machine scale in kilograms. The body measurements i.e. body length (BL) from point of shoulder to point oftuber ischia or pin bone, height at wither (HAW) from base of hoof to the highest point of wither, and chest depth (CD) from sternum area immediately caudal to fore limbs to top of thoracic vertebra area were measured by using aspecially designed graduated plastic stick fitted on tripod on base and a sliding stick on the top in centimeters. Heart girth (HG) i.e. the circumference of thoracic cavity immediately behind the fore limbs and head to shoulder length (HS) from point of poll to shoulder were determined by using atape measure. Simple correlation coefficients were calculated to ascertain interrelationships among body weights and body measurements for each age and

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	
	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male
Body length	0.810**	0.935**	0.691**	0.339	0.795**	0.465*	0.599**	0.661*	0.731*	0.890**
Heart girth	0.596**	0.976**	0.973**	0.875**	0.944**	0.741**	0.796**	0.932**	0.890**	0.845*
Height at Wither	0.804**	0.800**	0.752**	0.533**	0.713**	0.321	0.651**	0.786**	0.781*	0.451
Head to shoulder length	0.559**	0.888**	0.773**	0.537	0.565**	0.303	0.665**	0.646**	0.839**	0.152
Chest depth	0.293	0.801**	0.627**	0.340	0.777**	0.031	0.708**	0.918**	0.617	0.123

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

Table 2. Linear Regression equations for body weights at various age groups in female Sahiwal calves

Age group (Months)	Variables	Female calves		Variables	Female calves	
		Regression Equation	R^2		Regression Equation	R^2
0-6	BL	Y= -80.65+1.91 BL	0.67	HG	Y= -76.90+1.54 HG	0.95
6-12	HG	Y= -92.75+1.98 HG	0.95	HG	Y= -117.28+2.19 HG	0.76
12-18	HG	Y= -149.77+2.38 HG	0.89	HG	Y= -14.05+1.29 HG	0.55
18-24	HG	Y= -249.27+3.25 HG	0.63	HG	Y= -364.31+4.01 HG	0.87
24-36	HG	Y= -519.08+5.46 HG	0.79	BL	Y= -306.61+4.48 BL	0.79

sex group (Snedecor and Cochran, 1994). Additionally, the stepwise regression method was used to determine the best fitted regression equation for all groups of growing Sahiwal animals. Coefficients of determination values (R^2) were used to compare the efficiency of the best fitted regression equations.

RESULTS AND DISCUSSION

Correlations between body weight and body measurements for female and male calves of different age groups are presented in Table 1. The highest relationship was observed between body weight and heart girth in both the sexes of allage groups except female and male calves of 0-6 and 24-36 months, where highest correlation coefficient was observed betweenbody weight and body length.The observation of present findings are in accordance with report of severalearlier researchers worked on different breeds and observed highest correlation between body weight and heart girth (Ozluturk *et al.* 2006; Tuzemen *et al.* 1995; Abdelhadi and Babiker, 2009; Tariq *et al.* 2013; Siddiqui *et al.* 2015; Musa *et al.* 2011).

Best fitted regression equation for each age and sex groups was determined based on the magnitudeof determination coefficients (R^2) and are presented in Tables 2. According to theresults obtained from the stepwise regression analysis, the highest R^2 value was obtained when theheart girth alone included into the regression models except 0-6 months female and 24-36 months males where highest R^2 value was observed in regression equations using body length (BL). Findings of the study were supported by Siddiqui *et al*. 2015, Katongole *et al.* 2013, Tuzeman *et al*. 1995, Putra *et al.* 2010, El-Hedainy *et al*. 2013 and, Paul and Das 2012. The weights predicted precisely by using heart girth alone and the relevance of heart girth might be due to its major contribution for increasing R^2 values.

CONCLUSION

The prediction of body weight would be accomplished

with relativeaccuracy by using heart girth in absence of weighingfacilities in the farms and prediction equations developed could be explored to determine body weights rapidly and precisely.

REFERENCES

Abdelhadi, O.M.A. and Babiker, S.A. 2009. Prediction of Zebu cattle live weight using live animal measurements. *Livest. Res. Rural Dev.,* **21**: 133.

EL-Hedainy, Dalia, K.A., Latif, M.G.A and Mahdy, A.E. 2013. Prediction of body weight of Friesian crossbred and buffalo calves during fattening using live body measurements. *Alex. J. Agric. Res.,* **58**(2): 159-163.

Ensminger, M.E. 1991. *The Stockman's Handbook*. Seventh Ed., Prentice Hall. USA.

Katongole, C.B., Mpairwe, D. Bareeba, F.B., Mukasa-Mugerwa, E. and Ebong, C. 2013. Predicting body weight from heart girth, height at withers and body condition score in *Bosindicus* cattle bulls of Uganda. *Livest. Res. Rural Dev.,* **25**(3). http://www.lrrd.org/lrrd25/3/ kato25046.htm.

Musa, A.M., Elamin, K.M., Mohammed, S.A. and Abdalla, H.O. 2011. Morphometric traits as indicators for body weight in Sudanes Kenana cattle. *J. Anim. Feed Res.,* **1**(5): 218-222.

Ozluturk, A., Kopuzlus, A., Guler O. and Yanar, M. 2006. Determination of linear regression of estimation of body weights of eastern Anatolian red cattle. *Ataurk Univ. Ziraat Fak. Derg*., **37**(2): 169-175.

Paul, S.S. and Das, K.S. 2012. Prediction of body weight from linear body measurements in Nili-Ravi buffalo calves. *J. Buffalo Sci.*, **1**: 32-34.

Putra, W.P.B., Hartatik, T., Sumadi, and Sauma, H. 2010. Accuracy of heart girth for predicting live weight of Aceh cattle. *J. Ilmu-Ilmu Peternakan.,* **24**(3): 4553.

Siddiqui, M.U., Lateef, M., Bashir, M.K., Bilal, M.Q., Muhammad, G., Mustafa, M.I. and Rehman, S.U. 2015. Estimation of live weight using different body measurements in Sahiwal cattle. *Pak. J. Life Soc. Sci.,* **20**(10): 30.

Snedecor, G.W. and Cochran, W.G. 1994. *Statistical Methods*. Eighth edition, Iowa State University Press, Iowa, USA.

Tariq, M., Younas, M., Khan, A.B. and Schlecht, E. 2013. Body measurements and body conditionscoring as basis for estimation of live weightin Nili-Ravi buffaloes. *Pakistan Vet. J.*, **33**: 325-329.

Tuzemen, N., Yanar, M., Akbulut, O., Ugur, F. and Aydin, R. 1995. Prediction of body weights from body measurements in Holstein-Friesian calves. *Atatürk Ü. Zir. Fak. Der.,* **26** (2): 245-252.