

Determination Of Regression Model For Prediction Of Body Weight In Local Goats Of Mandya District In Karnataka

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*Abstract: A systematic study was undertaken on 2896 local goats reared by 482 farmers in Mandya district of Karnataka to formulate correlation coefficients and to develop prediction equation for adult body weight. All correlation coefficients among body weight and body measurements in Mandya local goats were positive and highly significant. Body weight was positively and highly significantly correlated with all the four body measurements viz., height at withers (0.80), body length (0.96), chest girth (0.94) and paunch girth (0.94). The coefficients of determination of the fitted multiple regression equation for prediction of body weight of adult goats ranged from 69.34 to 71.16 per cent. The best fitted multiple regression equation was found to be $Y = -13.28 + 0.4278 **X1 - 0.5181**X2 + 0.6591**X3$ with maximum R2 value of 71.16% where CG (X3) had significant influence and contribution for predicting live weight of adult goat. The results of multiple regression analysis indicated that height at withers (X1) in combination with body length (X2) and chest girth (X3) would result in significant improvements in accuracy of predictions.*

Keywords: Mandya local goat, body measurement, prediction of body weight.

I. INTRODUCTION

Mandya local goats in Mandya district of Karnataka are mainly reared for their valuable meat and skin. The market value of the animal is depended on live weight of the animal, it is required to know the exact live weight of the animal. Proper measurement of live weight is difficult in the villages due to lack of weighing scales and weighing of animals using balance is not practicable under field conditions. Formula for predicting body weights from different body measurements have been developed by several authors in many breeds of Indian goats (Prasad *et al.*, 1981 and Raja *et al.*, 2013). Hence this study was under taken to determine the best fitted regression model for prediction of live weight of Mandya local goats under field conditions for estimation of body weight.

II. MATERIALS AND METHODS

Body measurements of 2986 local adult goats over the age of 1.5 years which includes height at withers, body length, chest girth and body weight was collected from seven taluks of Mandya district of Karnataka maintained by local farmers with free range and tethering system of management. The actual body weight (kg) and other body measurements (cm) were recorded. For recording body measurements the animals were placed squarely on forelegs on even surface before they had any access to food and water in the morning when measurements were taken with the help of a tape graduated in cm. the body weight measurements was however recorded with a direct recording dial type weighing balance. The least squares means and standard error of body weight and body measurements were computed by adopting Harvey's least

square method of fitting constants using the mixed least squares and maximum likelihood computer program (Harvey, 1987). The simple correlation were computed to find out the correlation among body weights and body measurements by using mixed model least squares and maximum likelihood computer programme of SAS 9.3 (SAS Institute Inc., Cary, NC, USA). The significance of the correlation was tested by 't' test procedure. To predict the body weights from biometrical measurements, multiple regression method was used on data of twelve month and adult goats. Also, simple linear regression was carried out to predict body weight using only chest girth (x1), Body length (x2) and Height at withers (x3).

$$Y = a + b_1x_1 + b_2x_2 + b_3x_3,$$

Where, Y = Predicted body weight, A = Intercept, x1 = Height/ chest girth, x2 = Body length, x3 = Height at withers, b1, b2 and b3 are the partial regression coefficients of body weight on x1, x2 and x3 respectively.

The coefficient of determination (R2) was calculated for each equation and significance of partial regression coefficients were tested by 't' test of significance as per Snedecor and Cochran (1989).

III. RESULTS AND DISCUSSION

Table.1 shows the overall value of the body weight and body measurement of adult local goat of Mandya district. The least square mean for adult body weight was 27.20±0.05 kg. The least square mean for height at withers was found to be 68.93±0.05 cm which is in agreement with the report of Banait *et al.* (2002) in Barbari, Shettar (2011) in Bidri goat of Karnataka and verma *et al.* (2015) in Ganjam goat breeds. Body length in adult goats was measured to be 63.24±0.05 cm which was in close conformity with the reports of Raghavan *et al.* (2004) in Malabari and Azharuddin (2011) in Nandidurga goat breeds. The chest girth in adult goat was measured to be 67.10±0.06 cm it is found to be in close proximity to value reported by Banait *et al.* (2002) in Sirohi and Verma *et al.* (2015) in Ganjam goat breeds.

Parameters	Overall
Body weight	27.20±0.05 (2986)
Height at Wither	68.93±0.05 (2986)
Body length	63.24±0.05 (2986)
Chest girth	67.10±0.06 (2986)
Paunch girth	73.80±0.07 (2986)

Table 1: Least square means for body weight (kg) and body measurement (cm) of Adult goats

All correlation coefficients among body weight and body measurements in Mandya local goat showed positive and highly significant associations in general (Table.2). Positive and highly significant (p≤0.01) correlation of body weight with the four body measurements namely Height at withers (0.80), body length (0.77) and chest girth (0.82) were recorded. This report substantiates the observation of Prasad *et*

al. (1981) in Black Bengal and Rani *et al.* (2010) in Malabari goat breeds. The positive and highly significant correlations was obtained between body weight and body measurements indicating the possibility of these traits being controlled by same set of genes functioning in the same directions, and using the body measurements to predict the bodyweight which would be useful in the field.

	Height at Wither	Body length	Paunch girth	Chest girth	Body wt.
Height at wither	-	0.96**	0.9**	0.9**	0.8**
Body length	-	-	0.9**	0.9**	0.7**
Pouch girth	-	-	-	0.9**	0.8**
Chest girth	-	-	-	-	0.8**

**Significant at P≤0.01

Table 2: Correlation coefficients between body weight and body measurement in goats

Table 3 gives the multiple regression equation developed for adult body weight along with the coefficient of determination. Multiple regression equations were developed for predicting body weight of adult goat from respective body measurements using chest girth, body length and height at withers as independent variables (X1, X2 and X3) and body weight (BW) as dependent variable (Y) as shown in table.3. The coefficient of determination of the fitted multiple regression equation for prediction of body weights of adult goats ranged from 69.34 to 71.16 per cent. The equation CG (X1) had significant influence and contribution for predicting live weight of adult goat. This observation was in agreement with the inferences of Thiruvenkadan (2005), Raja *et al.* (2013) and Thiruvenkadan and Panneerselvam (2009) in different breeds of goats.

Age	R ² (%)
Adult	
Y = -14.26 + 0.6236**X ₃	69.34
Y = -17.79 + 0.1724**X ₁ + 0.4989**X ₃	69.72
Y = -13.28 + 0.4278 **X ₁ - 0.5181**X ₂ + 0.6591**X ₃	71.16

X₁ = height at wither, X₂ = Body length, X₃= Chest girth

Table 3: Multiple regression equation for predicting adult and twelve month body weights in goats

In the present study the results of multiple regression analysis indicated that HW (X1) in combination with BL (X2) and CG (X3) would result in significant improvement in accuracy of predictions. Also, the best equations for predicting body weight were obtained when all three body measurements were considered in the equation be Y = -13.28 + 0.4278 **X1 - 0.5181**X2 + 0.6591**X3 with maximum R2 value of 71.16%, indicating BL and HW also contributed for prediction of BW (Y) along with CG. The accuracy of functions used to predict live weight or growth characteristics from body measurements on live animals contributes immensely to goat production. The ability of producer and buyers of meat animal to relate live animal measurements to growth characteristics is essential for optimum production and value based trading system. Selection for higher chest girth will lead to improvement in body measurements and body weights. Prediction equation indicated that chest girth in combination

with other body measurements would significantly improve the accuracy of prediction of adult body weight.

REFERENCES

- [1] Azharuddin. (2011). Characterization of nandidurga breed of goat. M.v.sc thesis, Karnataka Veterinary Animal and Fisheries Sciences University, Bidar.
- [2] Banait, H. B., Ali, S. Z. and kuralkar, S. V. (2002). Variation in body conformation traits in different breeds of goats. *Indian vet. J.*, 79, 591-594.
- [3] Harvey, W. R. (1987). Least squares analysis of data with unequal subclass numbers, ARS, USDA.
- [4] Prasad, B., Singh, C. S. and Mishra, H. R. (1981). Note on the biometrics of Black Bengal Goats. *Indian j. Anim. Sci.*, 51, 796-799
- [5] Raja, T. V., Venkatachalapathy, R. T., Kannan, A. and Bindu, K. A. (2013). Determination of best-fitted regression model for prediction of body weight in Attappady Black Goats. *Global journal of animal breeding and genetics*, 1(1), 20-25
- [6] Raghavan, K. C., Raja, T. V. and Sasikanth. (2004, 5-6 April). Malabari goats. *In: Proceedings of the seminar on goat genome, CIRG, Makhdoom*. Pp:101-104.
- [7] Rani, A. K., Raghavan, K. C. and Mercy, K. A. (2010). Prediction of body weight of malabari goats from body measurements under field conditions. *Indian vet. J.*, 41, 21-27.
- [8] SAS 9.3. 2011. SAS institute Inc., Cary, NC, USA.
- [9] Shettar, V.B. 2011. Genetic characterization of Bidri Goats. Ph.d. Thesis, Karnataka Veterinary Animal And Fisheries Sciences University, Bidar.
- [10] Snedecor, G. W. and Cochran, W. G. (8th Ed.). (1989). *Statistical Methods*. Iowa state university press, Ames, Iowa. Pp 503.
- [11] Thiruvenkadan, A. K. (2005). 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*, 17(1), 1- 10.
- [12] Thiruvenkadan, A. K. and Panneerselvam, S. (2009). Body weight and its association with body measurements in Kanni Adu Goats. *Indian vet. J.*, 86, 487-490.
- [13] Verma, N.K., Priyanka Mishra, Aggarwal, R.A.K., Dixit, S. P., Dangi, P. S. and Dash, S. K. (2015). Characterization, performance and genetic diversity among goats of Odisha. *Indian j. Anim. Sci.*, 85 (2):165-171.