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ZOOMETRICAL MEASUREMENTS OF BODY PARTS AND THEIR RELATIONSHIP WITH LIVE WEIGHT IN BUNAJI COWS IN ZARIA NIGERIA

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ABSTRACT
A total of 105 measurements for each of body weight (BW), height at withers (HW), body length (BL) and chest girth (CG) were taken in five consecutive months for 21 Bunaji cows in Zaria-Nigeria. These parameters were analysed for any relationship between them. BW was positively correlated with other body parts measured. Predictive equations for body weight were developed using HW, BL and CG as dependent variables. BW can be estimated by use of simple and multiple regression analysis. This procedure is therefore recommended under the field conditions of traditional herdsman ship where weighing bridges are not available or affordable.

KEY WORDS: Bunaji, Body weight, Body dimensions, Relationship.

INTRODUCTION

The Bunaji cattle are the most populous and most widely distributed breed in Nigeria. Apart from a few institutional and private farms, a vast majority of this breed are under the transhumance system of the Fulani cattle rearers. The Fulani cattle rearers of Nigeria usually carry out direct marketing of live animals through the traditional haggling method. Ladan et al 2009 reported that while the objective marketing of live animals is an established tradition in the developed world due to the ease of acquiring and setting up weigh instruments, the subjective prizing of meat animals is common place in the developing world. This procedure, apart from being time consuming and energy sapping often lead to dissatisfaction on the part of many buyers as most marketers abnormally increase the prize of live animals during festive periods. Over the years this situation has continued due to the lack of technical know-how in acquiring and setting up weighing instruments by the traditional cattle rearers. Moreso, the entire process of weighing live animals is viewed as been cumbersome by these traditional handlers. Apart from the objective marketing of meat animals, a reliable method of estimating BW of cattle under field conditions is important in assessing the nutritional requirements, growth rate and drug doses of the animal.

Several research findings have shown that linear body measurements are closely related to live weights in poultry (Akanno et al., 2002, Ibe, 1989 & 1990), goats/sheep (James *et al.,* 2007, Ladan, *et al*., 2009), pigs (Machebe and Ezekwe, 2008) and rabbits (Okoro et al., 2008). Such zoometrical measurements of body parts can be used to predict live weight at relatively lower costs with a high relative accuracy and consistency. Body dimensions describe an animal more completely than conventional methods of weighing and grading (Kempster, et al. 1982). The importance of conformation as an indicator of commercial value is based on the assumption that carcasses with better conformation have advantages in terms of lean meat content, proportion of higher priced cuts and possibly greater muscles size (Kempster, *et al.,* 1982; Khogali, 1999).

The necessity of such alternative methods for predicting the live weight of cattle under the transhumance pastoral system in Nigeria can therefore not be overemphasized. The current study was undertaken to investigate the relationship between BW and linear body measurements in Bunaji cows as a step towards employing same in body weight estimation for purposes of selection, improvement and marketing of live cattle in Nigeria.

Materials and Methods

A total of twenty one Bunaji cows at the Animal farm of Ahamadu Bello University Zaria under semi-intensive management were used for this study. The altitude, coordinates, temperature and rainfall pattern of Zaria have been reported elsewhere (Akpa *et al.,* 2002). The experimental animals were identified by ear tagging. They were released for grazing between 8.00am and 4.00pm local time. Animals were confined to the crush during measurements. CG, BL, and HW were measured in centimeters as described by Ladan *et al.,* 2009. BW was taken in kilogram using a standard weigh bridge. All measurements were subjected to the correlation and regression procedures of SPSS (2001) using the model:

$$Y_{ij} = a + b_i x_i + e_{ij}$$

Where:

Y_{ij} = Body weight (dependent variable)

a = Intercept

b_i = Partial regression coefficient of the dependent variable.

x_i = i^{th} independent variable

e_{ij} = Random error

RESULTS AND DISCUSSION

The range and mean for body weight and linear body measurements are presented in Table 1.

TABLE 1: Range and Mean of body weight and linear measurements of body parts

Variable	N	Range	Mean
BW (kg)	105	160-345	247.33
CG (cm)	105	128-165	149.9
HW (cm)	105	112-135	124.9
BL (cm)	105	95-150	111.1

N= Number of measurements

The coefficients of correlation between the variables are presented in Table 2.

TABLE 2: Pearson's correlation coefficient of body weight and body dimensions in the Bunaji cows

Variable	BW	CG	HW	BL
BL(X_1)	0.51	0.60	0.49	-
HW(X_2)	0.63	0.58	-	
CG(X_3)	0.82	-		
BW	-			

Table 3 presents the regression equations and coefficient of determination for body weight prediction using linear body measurements

TABLE 3: Regression equations and coefficient of determination for body weight prediction using linear body measurements

Variable(s)	Regression equation	R^2
BL(X_1)	$Y = -220.24 + 4.32X_1$	0.61
HW(X_2)	$Y = -959.02 + 9.22X_2$	0.69
CG(X_3)	$Y = -595 + 5.65X_3$	0.88
WH & CG	$Y = -70.210 + 0.721X_2 + 0.653X_3$	0.52
BL, WH & CG	$Y = -727.80 + 2.24X_1 + 2.98X_2 + 2.55X_3$	0.54

Y = Predicted body weight (kg)
X_1 = Body length (cm)
X_2 = Height at withers (cm)
X_3 = Chest girth (cm)

Mean values for body parts measured (cm) and body weight (kg) were respectively 149.9, 124.9, 111.1 and 247.33 for CG, HW, BL and BW. There was a positive correlation between BW and body linear measurements (CG, HW and BL). Coefficient of correlation between BW and linear measurement of body parts ranged from 0.51 (BW/BL) to 0.82 (BW/CG). The result here indicates that an increase in body weight results in a proportionate increase in the body parts measured. The coefficients of determination were respectively 0.61, 0.68 and 0.88 for BL, HW and CG. Thus, any of the body dimensions measured may be used to predict BW using body weight as the dependent variable in a linear equation. However, in using a single index predictor rather than multiple regressions, CG is a more reliable index in estimating BW as the stepwise regression method does not result in any significant advantage over the use of CG as a single index estimator. This is suggestive that tissue measurements are better predictors of body weight than skeletal measurements. Ladan et al. (2009) documented a similar relationship for Yankassa ewes under traditional management in North Central Nigeria.

CONCLUSION

The results of this study indicates that in Bunaji cows, there is a positive relationship between BW, CG, HW and BL. BW can be predicted from zoometric measurements of body parts (CG, HW, and BL). The use of CG in a linear regression model is recommended as a single index predictor of BW in Bunaji cows.

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