ESTIMATION OF LIVE BODY WEIGHT FROM CHEST GIRTH MEASUREMENT AND BODY CONDITION SCORES IN SAVANNAH BROWN GOATS IN ZARIA

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ABSTRACT

The study was conducted at Kongila sheep and goat market, Zaria, Nigeria in order to develop predictive equations for the determination of live body weight from chest girth and body condition scores in Savannah Brown goats. Data were collected randomly on 49 goats, aged between 1 to 3 years; 42 males and 7 females. The overall mean values (males and females) for body weight, chest girth and body condition scores were 14.86 ± 0.64 kg, 59.61 ± 0.86 cm and 2.78 ± 0.08, respectively. Body weight was significantly ($P < 0.05$) and positively correlated with chest girth ($r = 0.795$) and body condition scores ($r = 0.579$), indicating a relationship between these variables. Live body weights were regressed on chest girth and body condition scores, which appeared to be significantly good, especially with the chest girth. The high and positive correlations between body weight and chest girth, established in this study provide information that may be useful in the early selection of Savannah Brown goats for genetic improvement schemes. In conclusion, there were direct relationships between body weight, chest girth and body condition scores in Savannah Brown goats.

INTRODUCTION

Farmers do not routinely weigh their animals to assess the need of providing supplementation. Weighing as a method of assessing the condition of animals is labour intensive and costly for the farmers in the rural areas ((Nsoso *et al.* 2003). The knowledge of an animal's live weight, especially in extensive production systems, is very important both in market and breeding aspects. Such fundamental information is often unavailable to limited resource producers, working with animals under field conditions due to unavailability of portable weighing scales. Therefore, decision-making and husbandry techniques like animal medication are based on questionable subjective estimation of body weight (Raji *et al.* 2008). There is the need for a fast, cheap and easy to use method available for small-scale resource poor farmers. The aim of the study was to determine the live body weight of animals from easily measurable parameters such as chest girth and body condition scores.

MATERIALS AND METHODS

This study was carried out at a Sheep and Goat market in Kongila, along Kano road, Sabon-gari, Zaria, Nigeria, located on latitude 11°2′N, longitude 7°33′E and on altitude of 610 m above sea level. Zaria is within the Northern Guinea Savannah zone of Nigeria, and has a sub-humid tropical climate. The investigation involved 49 Savannah Brown goats of both sexes, consisting of seven females and 42 males, aged between 1 to 3½ years. The goats were raised under semi-intensive and extensive management systems. They were transported to Kongila Sheep and Goat market, Zaria, for sale from different locations within Sabon-gari Local Government Area of Kaduna State, Nigeria. Body weight was measured using a commercial weighing scale (Hana®, Made in China), as described by Hassan and Ciroma (1991). Chest girth measurement was determined as the circumference of the chest, using the tailor's tape measure as described by Herrera *et al.* (1996). Body condition scores were evaluated as described by Aumount *et al.* (1994) and Thompson and Meyer (2002), using the 5- point scale; ranging from 1 = very thin; 2 = thin; 3 = good condition; 4 = fat; and 5 = obese. The animals were visually assessed followed by palpation of the rib cage, lumbar vertebral area between the back of the ribs and the front of the pelvic bones. The data collected were classified on the basis of sex; that is, males and females and then overall. Mean ± SEM were calculated for the body weight, chest girth and body condition scores. The relationships between body weight, chest girth and body condition scores were determined by Pearson's correlation analysis. Simple and step-wise multiple regression analyses were fitted to calculate the prediction equations for body weight from the body measurement variables as reported by Heinrichs *et al.* (2007). Values of $P < 0.05$ were considered significant.

RESULTS AND DISCUSSION

A descriptive statistics of body weight, chest girth and body condition scores in Savannah Brown goats is shown in Table 1. Mean values for body weight were 18.57 ± 2.18 kg, 14.0 ± 0.60 kg and 14.86 ± 0.64 kg for females, males and overall (males and females), respectively. Mean values for chest girth were 66.10 ± 2.10 cm, 58.50 ± 0.85 cm and 59.61 ± 0.86 cm for females, males and overall, respectively. Body condition scores were 3.0 ± 0.22, 2.7 ± 0.08 and 2.78 ± 0.08 for females, males and overall, respectively. Table 2 shows that a highly significant ($P < 0.05$) correlation coefficient ($r = 0.795$) was obtained between body weight and chest girth; and body weight and body condition scores ($r = 0.579$), indicating strong relationship or degree, of association between the variables. Nsoso *et al.* (2003) reported similar correlation coefficients ($r = 0.60$) between body weight and body condition scores in Tswana goats; and Cam *et al.* (2010) obtained similar correlation coefficient between body weight and chest girth ($r = 0.846$) in Karayaka sheep in Turkey. Significant ($P < 0.05$) differences were found between male and female goats with regards to body weight and chest girth. Female goats were found to be heavier ($P < 0.05$) and bigger in terms of chest girth than their male goats in the present study. This is in contrast to the findings of Khan *et al.* (2006), who showed that males were heavier ($P < 0.05$) and bigger ($P < 0.05$) in terms of chest girth. Season may greatly affect the performance of the animals with regards to zootechnical parameters of body weight, body condition scores and chest girth in goats, as similar incidence has been reported (Nsoso *et al.*, 2003). According to Nsoso *et al.* (2003), the body condition scores in goats during wet seasons are significantly higher than those of the dry season. Cisse *et al.* (2002) also showed that goats lose body condition in the dry season and gain it during the wet season. Luginbuhl *et al.* (2002) and Rae (2002) demonstrated that the body condition scores may be used as a management tool in farm animals, since it is very sensitive to seasonal changes. The results of the present study indicate that the goats had thin to slightly above average score, using the 5-point scale of Thompson and Meyer (2002). According to the authors, such body condition scores are generally ideal for production. Hence, farmers should be assured that their use as a management tool will lead to more productive goats, which are neither fat (Body Condition Score of 4- 5) nor emaciated or very thin (Body Condition Score of 1). Both situations often lead to loss in production (Nsoso *et al.*, 2003). The prediction equations for live body weight based on chest girth and body condition scores are illustrated in Table 3, which are significantly good predictive equations, being close to the original data obtained in the present study. Nsoso *et al.* (2003) reported similar good prediction equations for live weight based on chest girth. This general finding is consistent with those of Mayaka *et al.* (1995), Benyi (1997) and Badi *et al.* (2002), who reported predominantly high correlation coefficient of determination ($r = 0.80$ to 0.99) in different breeds of goats. In agreement with the authors, estimating body weight from heart (chest) girth is appropriate and practical in rural areas, where resources are poor and weighing scale is lacking. Therefore, it may be used as a selection criterion to improve meat production. Live body weights and body measurements, such as chest girth, taken on live animals may be used extensively both in experimental work and in selection practice. Further investigations are required to determine the relationships between body weight, chest girth and body condition scores in the breed and other breeds of goats in different ecological zones of the country, involving higher number of animals.

Conclusions

In conclusion, there were positive and significant correlations between live body weights, chest girth and body condition scores in Savannah Brown goats. The live body weight was more correlated with the chest girth than body condition scores, and the chest girth is, apparently, the best parameter for use in predicting live body weight in Savannah Brown goats.

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Table 1: Body Weight, Chest Girth and Body Condition Scores of Savannah Brown Goats measured in Zaria (Mean ± SEM, n = 49)

Sex	Body weight	Chest girth	Body condition
Females (n = 7)	18.57 ± 2.18 kg	66.10 ± 2.10 cm	3.0 ± 0.22
Males (n = 42)	14.0 ± 0.60 kg	58.50 ± 0.85 cm	2.70 ± 0.08
Overall mean ± SEM (n = 49)	14.86 ± .64 kg	59.61 ± 0.86 cm	2.78 ± 0.08

SEM = Standard Error of the Mean, n = Population Size

Table 2: Relationships between Body weight, Chest Girth and Body Condition Scores

Correlated parametres	Males(M) (n = 42)	Females (F) (n = 7)	Overall (M+F) (n = 49)
Body weight and chest girth	0.793**	0.846**	0.795**
Body weight and body condition scores	0.554*	0.711**	0.579*
Chest girth and body condition scores	0.461^{NS}	0.529*	0.470^{NS}

** = P < 0.05; ** = P < 0.01; ^{NS} = Non-significant (P < 0.05) correlation*

Table 3: Regression Equations for Body Weight from Chest Girth and Body Condition Scores

Correlated Parametres	Regression Equations
Body Weight and Body Condition Scores	
Females (n = 7)	BW = -2.43 = 7 BCS
Males (n = 42)	BW = 2.85 + 4.12 BCS
Overall (n = 49)	BW = 1.68 + 4.74 BCS
Body Weight and Chest Girth	
Females (n = 7)	BW = -39.64 = 0.88 CG
Males (n = 42)	BW = -19.88 + 0.58 CG
Overall (n = 49)	BW = -20.19 + 0.59 CG

BW = Body weight (kg); CG = Chest girth (cm); BCS = Body condition scores (1-5)