Journal of Animal and Veterinary Advances 5 (11): 891-893, 2006

Relationship of Liveweight and Linear Body Measurement in Two Breeds of Goat of Northern Nigeria

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Abstract: The study was conducted to determine the relation ship between body weights and linear body measurement so as to enable us develop an accurate prediction equation from linear measurements.. The data used for this study is made up of 163 records sets of records on body weights and linear body measurements (body length, height-at-withers and heart girth) obtained from the University of Maiduguri Teaching and Research Farm. The average body weights were 10.0±0.73 and 7.7±0.42 kg for male and female Red Sokoto goats, respectively. The equivalent values for the White Borno goats were 11.70±0.73 and 8.79±0.32. Within each breed, sex has significant effect on the live body weights and all other body linear body measurement taken. Higher correlation coefficients with body weights were obtained for the females compared to the males the r^2 being 0.73 and 0.93 for male and female chest girth, 0.71 and 0.87 for male and female height at wither and for body length male and female, 0.72 and 0.88, respectively.

Key words: Goats, body weights, wither, girth, body length

INTRODUCTION

Among all livestock kept in Nigeria, goat is the most numerous. The estimate of goat population in Nigeria as at 1986 is 27.6 million[1]. Goats are primarily reared for its meat. About 17% of meat consumption in Nigeria is obtained from goat by[2]. Among the available breed of goat in northern Nigeria, the most widely distributed are the Red Sokoto and White Borno. In order to develop a very good model for the genetic improvement of goat, it is important to measure the trait of interest with some high level of accuracy. Since goats are mostly kept for their meat, the most important trait of interest for genetic improvement is the live body weight. Proper measure of this trait on-farm and on-station is often very difficult. This is because of unavailability of weighing scale in the rural areas where most of the animals are found. The ability to estimate as accurate as possible liveweight from simple linear body measurement will go a lot way in solving this problem.

A few works has been reported on the estimation of body weight of goats from linear body measurement[3-7].

This study was carried out so as to determine the strength of relationship between live body weight and linear body measurement

MATERIALS AND METHODS

The data used for this study is made up of 163 records obtained from the University of Maiduguri Teaching and Research Farm. The animals were managed semi intensively. They were housed in compartmentalized houses especially in the night. They were released early at about 0800 h daily for grazing and they remain outside the house until 1600 h.

Records kept on the farm include monthly weight and corresponding body measurements. Reproduction and health care records were also kept.

Overall, 163 sets of measurement were taken for the four traits considered in this study.

- Body weight taken using Salter Hanging Spring type scale and measured to the nearest 0.5 kg
- Body length was measured as the distance from the external occipital protuberance to the base of the tail cm.
- Height at withers was measured as the distance from the surface of a platform to the withers in cm.
- Chest girth was measured by taken the circumference of the chest in cm

Data analysis: The data accumulate for this study were classified into sex and breed. The period of data collection was also classified into four 3-month periods representing early rain, late rain, early dry and late dry season. The least square means for live body weight (BWT) and linear body measurement (Body length, BL; Height at withers HW and Height girth, HG) were computed.

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Using SAS software[8], analysis of variance was carried out to determine possible sex, breed and seasonal effect on the trait under consideration. Because of the expected sexual dimorphism that is known to exist in goat, the relationship between liveweight and linear measurement were carried out separately for each sex using simple Pearson correlation method.

RESULTS AND DISCUSSION

The least square means and their associated standard errors are indicated in Table 1. Within each breed, the measurements were significantly higher in male than in female. This is expected as goat has been shown to exhibit sexual dimorphism in body weight right from birth.

The values obtained for body weight in this study was generally lower than those obtained by Moruppa and Ngere[4] and Hassan and Ciroma [7]. However the result obtained in this study as regards the differences between the male and female measurements are similar to those reported by Ngere[3,9] on red Sokoto and other breeds of goat in Nigeria.

Table 2 showed the least square means with associated standard error of all traits for each of the breeds while Table 3 shows the least square means ± standard error for body weight and linear body measurement as affected by sex

Except for liveweight which was significantly lower in Red Sokoto than the White Borno goats, there were no significant breed differences in the linear body measurement. It could, however, be noted that although the difference were not statistically significant, generally the linear measurement for White Borno Goat were slightly or marginally higher than Red Sokoto in the flock under study.

The correlation coefficient indicating the relationship between the liveweight and linear body measurements are shown in Table 4. For both sexes, Chest girth has the highest correlation coefficient which is highly significant. The other two traits with very high correlation coefficient which also were also very significant also showed an indication of good association with body weight.

The indication of these high correlation coefficients is that any of these three traits could be measured easily to give an indication of body weight. The accuracy of estimation could however be improved when the three traits are combined in a multiple regression. Moruppa and Ngere[4] and Osinowo *et al.*[6] reported similar trend in Red Sokoto goat.

Table 1: Least square means ± standard error for body weight and linear body measurement as affected by breed and sex

		Traits			
Breed	Sex	LBW, kg	CG, cm	HW, cm	BL, cm
Red-Sokoto	Male	10.02±0.73^{a}	43.33±1.86^{a}	44.13±1.91^{a}	45.80±1.77^{a}
	Female	7.70±0.42^{b}	37.53±3.22^{b}	37.75±3.30^{b}	41.66±3.07^{b}
White-Borno	Male	11.70±0.73^{a}	48.99±1.41^{a}	49.81±1.45^{a}	51.07±1.35^{a}
	Female	8.79±0.32^{b}	38.32±3.22^{b}	38.08±3.30^{b}	42.31±3.07^{b}

Means carrying same superscript within a column are not significantly different ($p<0.05$), LBW=Live body weight; CG=Chest girth; HW=Height at withers; BL = Body length

Table 2: Least square means ± standard error for body weight and linear body measurement as affected by breed

	Breed		
Trait	Red Sokoto	White Borno	Significance
LBW, kg	8.86±0.42^{a}	10.24±0.040^{b}	0.02
CG, cm	40.44±1.86	43.65±1.76	NS
HW, cm	40.94±1.91	43.94±1.80	NS
BL, cm	43.73±1.77	46.69±1.80	NS

NS = Not significant

Table 3: Least square means ± standard error for body weight and linear body measurement as affected by sex

	Sex		
Trait	Male	Female	Significance
LBW, kg	10.88±0.26^{a}	8.24±0.52^{b}	**
CG, cm	46.29±1.16^{a}	37.25±2.28^{b}	**
HW, cm	47.11±1.19^{a}	37.92±2.34^{b}	**
BL, cm	48.56±1.11^{a}	41.99±2.17^{b}	**

** $p<0.01$

Table 4: Relationship between Live weight and body measurement in combined breeds by sex of goats (r_p, Pearson correlation coefficient)

	Sex	
Trait	Male, n = 131	Female n = 131
CG	0.73**	0.93**
HW	0.71**	0.87**
BL	0.72**	0.88**

** $p<0.0001$

The highest correlation coefficient reported in this study is similar to Hassan and Ciroma[7] in Red Sokoto goats reared semi intensively in Kano, Nigeria. Chest girth also showed the highest correlation coefficient with body weight in India[10-12]

Higher correlation coefficients with body weights were obtained for the females compared to the males. This is an indication that on the basis of linear body measurement, the body weight could be predicted more accurately in the female than in the male. This is at variance with Hassan and Ciroma[7] who reported contrary situation.

The results of this analysis have shown that although any of the 3 traits measured could predict body weight accurately, chest girth measurement would be the best estimate of body weight in both sexes. To obtain a more accurate estimate of body weight, the 3 traits should

be combined in a regression analysis. It is also shown that with higher correlation coefficient for female, body weight would be more accurately estimated using the linear body measurement in female than in males with lower correlation coefficients.

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