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Studies on Body Weight and Linear Body Measurements of Castrates and Non-Castrate Savannah Brown Goats

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ABSTRACT

Studies on body weight and linear body measurements of castrate and non-castrate savannah brown goats were carried out using ten goats consisting of two treatments (T_1 and T_2). T_1 represents castrates and T_2 represents non-castrates. Results indicated no significant ($p>0.05$) difference between the weight gain of castrates and non-castrates. Similarly it was observed from this study that castration had no significant effect as non-castrates obtained higher values in height at wither, fore leg length, horn length, poll distance, face length and horn base conference compared with those castrated. Additionally, there was no significant difference between the two treatments in terms of body length, chest girth, hind leg length, ear length, neck length and neck circumference. Of the body linear measurements measured, chest girth and Horn base circumference were the related traits to the body weight and the correlation between these traits were ($r = 0.677$) and ($r = 0.605$), respectively. The highest correlation co-efficient value was found between chest girth and body weight followed by Horn base circumference and body weight. It was therefore concluded that the two traits above could be used to predict body weight of castrated savannah brown goats. Chest girth measurement would be the best to estimate the body weight of these breed of animal.

Key words: Body weight, castration, linear body measurement, savannah brown goats

INTRODUCTION

Goat rearing has taken a lead role in the sustainable rural development programmes in developing countries (Rastogi *et al*., 2006). Goat contributes about 24% of Nigeria meat supply (Oni, 2002) and one of the cheapest sources of animal protein because of its high fertility rate and quick maturity traits (Jansen and Burg, 2004).

Apart from providing meat, goat also plays a vital role by providing milk, fiber, hair, manure and a major source of income especially for rural people. Additionally, goats are useful in carrying out functions such as been slaughtered for funeral and marriage ceremonies and as a source of income and security for the resource poor farmers (Nsoso *et al*., 2004). Castration is one of the livestock enterprise production tools. Castration of male kids hitherto not required for reproduction is beneficial for meat quality improvement (Devendra, 1990; Kaberia *et al*., 2003; Jansen and Burg, 2004) and this lead to increase in the carcass weight; hence it is beneficial in the production of goat meat (Chevon) (Akinyosoye, 1976; Kyomo, 1978). Among the available breeds of goat in Northern Nigeria, the most numerous and widely distributed are the savannah brown.

Increasing meat yield from this breed of animal requires the development of a very good model for its genetic improvement. The trait of interest in this regard is the body weight. Proper measure of this trait on farm and on station is often very difficult. This is as a result of unavailability of weighing scale especially in the rural areas where most of the animals are located (Adeyinka and Mohammed, 2006a). It is virtually not possible to get correct measurement of this vital trait (Adeyinka and Mohammed, 2006a).

The possibility of obtaining accurate measurements of this trait from simple body linear measurement parameters using easily obtainable and cheaply available metric tape rule (Adeyinka and Mohammed, 2006b) and body weight gain therefore arises (Singh and Misha, 2004).

It has been documented that body weight and linear body measurements of meat animal has been relevant in estimating body size and shape (Kabir *et al*., 2006; Ogah *et al*., 2009; Lariviere *et al*., 2009; Cam *et al*., 2010a; Onyimonyi *et al*., 2010; Lavvaf *et al*., 2012; Ojedapo *et al*., 2012). Body linear measurements in addition to body weight measurements are better tools to describe an individual or a population as opposed to the weighing and grading methods (Hill, 1990). Therefore the objective of the present study was to determine the effect of castration on body weight and linear body measurements of savannah brown goats.

MATERIALS AND METHODS

Study area: The study was conducted at the Teaching and Research Farm of the School of Agriculture and Agricultural Technology, Minna (9° 41' N, 6°31' E 400 m above sea level).

Source and management of animals: The animals used for the experiment were obtained from Pandogari town in Niger State of Nigeria. On arrival the animals were housed in individual pens. They were then dewormed, administered with antibiotics and treated against ecto-parasites. The goats were fed on forage (Gamba grasses) and concentrate (cereal bran). Water was also provided *ad libitum*.

Experimental design and castration of animals: Ten savannah brown male goats were randomly assigned to 2 treatments with 5 goats per treatment and one goat per replicate. T_1 consisted of castrates and T_2 non-castrates. Closed method of castration was employed using a pair of Burdizzo castrator.

Data collection and analyses: Initial body weight of each animal was recorded on arrival and subsequently weekly throughout the duration of the study. Body weight, body length, height at wither, chest girt, fore leg length, hind leg length, ear length, poll distance, neck length, neck circumference, face length, tail length and horn base circumference were recorded at weekly interval. The body weight was taken using a weighing scale while body linear measurements were done using a measuring tape. The data were analyzed using t test. Correlation analysis was also performed to compare the relationship among the measured parameters. Significance was based on 5% probability level. Data analysis was accomplished using statistical analysis system (SAS, 2008).

RESULTS AND DISCUSSION

Effect of castration on body weight of Savannah brown goats: Result indicated that there was no significant ($p>0.05$) difference between the weight gain of castrates and non-castrates. However, non-castrates were heavier (9.6 kg) than their castrate (9.5 kg) counterparts (Table 1).

Table 1: Effect of castration and non-castration on the body weight and linear body measurements of castrates and non-castrates Savannah brown goats

Parameters	T_1	T_2	p-value
Body weight (kg)	9.5	9.6	NS
Body length (cm)	64.9	65.1	NS
Height at wither (cm)	46.4	48.3	**
Chest girth (cm)	51.8	52.4	NS
Fore leg length (cm)	27.8	29.8	**
Hind leg length (cm)	31.9	32.4	NS
Ear length (cm)	10.6	10.4	NS
Horn length (cm)	4.4	6.6	**
Poll distance (cm)	8.3	10.1	***
Neck length (cm)	10.8	11.2	NS
Neck circumference (cm)	21.3	21.4	NS
Face length (cm)	14.8	16.5	**
Tail length (cm)	9.7	9.1	*
Horn base circumference (cm)	5.8	7.6	**

NS: Not significant, *Significant at $p<0.05$, **Significant at $p<0.01$, T_1 : Castrated Savannah brown goats, T_2: Non-castrated Savannah brown goats

This is in agreement with the findings of Tsado and Adama (2003) who reported that single non-castrates performed better than single castrates and twins. Similarly, the findings of Solomon *et al.* (1991) corroborate the result that castration had no significant effect on body weight. This could be attributable to the male secondary sexual characteristics which are not reflected in castrates. On the contrary, Tsado *et al.* (2009) reported that the effect of castration was manifested as castrates obtained higher values in chest girth, fore leg length, poll distance, face length and hind length except for tail length than non-castrates.

Effect of castration and non-castration on the linear body measurements: The study revealed that the test animals differed significantly ($p<0.05$) in their body measurements. Generally, non-castrated goats performed better than those castrated. Height at wither of 46.4 cm and 48. 3 cm was observed in the castrate and non-castrate animals, respectively. Fore legs were also significantly longer in non castrate (29.8 cm) compared to the castrate (27.8 cm). Additionally, horn was substantially longer in non castrates (6.6 cm) compared with the castrates (4.4 cm). Also, poll distance (10.1 cm), face length (16.5 cm) and horn base circumference (7.6 cm) values were higher in non-castrates than the castrates (5.8 cm). However, tails were significantly longer in the castrates (9.7 cm) as opposed to the non-castrates (9.1 cm). Tsado *et al.* (2009) in their study with savannah brown goats reported that castrates obtained higher values for fore leg length (38.85 cm) than the non-castrates (36.16 cm), in poll distance (5.78 cm) and heights at wither (38.95 cm) respectively compared to non-castrates.

This is in contrast with the findings where higher values were observed for non-castrates for fore leg length than the castrates and in poll distance than the castrates and as well as in height at wither than the castrate. It was further observed that castrates and non-castrates did not differ appreciably with respect to body length, chest girth, hind leg length and neck length. In the castrates there was a significant positive relationship between neck length and height at wither ($r = 0.750$); horn base circumference and height at wither ($r = 0.621$); horn base circumference and chest girth ($r = 0.621$) body weight and chest girth ($r = 0.677$); hind leg length and fore leg length

(0.560); tail length and horn length (r = 0.830); horn base circumference and neck length (0.897); body weight and horn base circumference (r = 0.605) and between neck length and horn length (r = 0.619) between pole distance and ear length (r = 0.586) (Table 2).

Conversely, significant negative association occurred between the ear length and height at wither (r = -0.774); and between poll distance and chest girth (r = -0.646). In non castrate animals, substantial positive relationship was found between the height at wither and tail length (r = 0.883), neck length (r = 0.648) and horn base circumference (r = 0,623). Similarly, significant positive association was observed between the horn length and poll distance (r = 0.602), tail length (r = 0.636) and horn base circumference (r = 0.733); hind leg length and ear length (r = 0.844); neck circumference and neck length (r = 0.825) and between horn base circumference and tail length (r = 0.665) (Table 3). In contrast, significant negative relationship was observed between the

Table 2: Correlation matrix of body weight and linear body measurements in castrate animals

	BL	HAW	CG	FLL	HLL	EL	HL	PD	NL	NC	FL	TL	HBC	BW
BL														
HAW	-0.092													
CG	0.074	0.530												
FLL	0.559	-0.098	0.094											
HLL	-0.212	0.129	-0.093	0.560										
EL	0.459	-0.774	-0.302	0.460	0.067									
HL	-0.160	0.132	0.073	0.266	0.472	0.111								
PD	0.506	-0.349	-0.646*	0.345	0.184	0.586*	0.146							
NL	-0.174	0.750**	0.505	0.013	0.182	-0.432	0.619*	-0.318						
NC	-0.288	0.463	0.482	-0.158	-0.033	-0.396	-0.026	0.016	-0.298					
FL	0.471	0.121	0.128	0.148	-0.341	0.033	-0.396	-0.026	0.016	-0.298				
TL	-0.290	0.065	0.037	0.112	0.502	0.049	0.830**	0.047	0.350	0.173	-0.470			
HBC	-0.281	0.621*	0.0621*	0.034	0.170	-0.418	0.543	-0.508	0.897**	0.668*	-0.150	0.258		
BW	-0.063	0.508	0.677*	0.016	0.023	-0.200	-0.028	-0.512	0.532	0.285	0.081	-0.098	0.605*	

BL: Body length, HAW: Height at wither, CG: Chest girth, FLL: Fore leg length, HLL: Hind leg length, EL: Ear length, HL: Horn length, PD: Poll distance, NL: Neck length, NC: Neck circumference, FL: Face length, TL: Tail length, HBC: Horn base circumference, BW: Body weight, **Significant at p=0.01, *Significant at p = 0.05

Table 3: Correlation matrix of body weight and linear body measurements in non castrate animal

	BL	HAW	CG	FLL	HLL	EL	HL	PD	NL	NC	FL	TL	HBC	BW
BL														
HAW	-0.334													
CG	0.207	0.322												
FLL	-0.394	0.331	-0.158											
HLL	0.431	-0.601*	0.040	0.429										
EL	0.502	-0.584*	0.156	-0.289	0.844**									
HL	-0.306	0.539	-0.197	0.284	-0.900**	-0.830**								
PD	-0.721	0.422	-0.330	0.661	-0.772**	-0.648*	0.602*							
NL	-0.095	0.648*	0.082	-0.151	-0.560	-0.492	0.594	0.300						
NC	-0.341	0.393	-0.070	-0.331	-0.426	-0.507	0.426	0.206	0.825**					
FL	0.169	0.055	-0.479	0.376	-0.307	-0.175	0.300	0.457	0.226	-0.106				
TL	-0.169	0.883**	0.134	0.499	-0.716**	-0.551	0.636*	0.563	0.623	0.208	0.386			
HBC	-0.434	0.623*	-0.329	0.496	-0.774**	-0.813**	0.733**	0.719	0.584	0.511	0.532	0.665*		
BW	0.289	0.169	0.502	0.021	-0.480	-0.256	0.342	0.172	0.236	-0.108	0.255	0.343	0.064	

BL: Body length, HAW: Height at wither, CG: Chest girth, FLL: fore leg length, HLL: Hind leg length, EL: Ear length, HL: Horn length, PD: Poll distance, NL: Neck length, NC: Neck circumference, FL: Face length, TL: Tail length, HBC: Horn base circumference, BW: Body weight, **Significant at p=0.01, *Significant at p = 0.05

height at wither and hind leg length (-0. 0.601) and ear length (-0.584); between hind leg length and horn length (r = -0.9000), poll distance (r = -0.772), tail length (r = -0.716) and horn base conference (r = -0.774). Similarly, significant negative correlation occurred between ear length and horn length (r = -0.830), poll distance (r = -0.648) and horn base circumference (r = -0.813) (Table 3).

The correlation between body weight and other body measurement parameters in castrate animals was significant ($p<0.05$) in chest girth and horn base circumference. The correlation coefficient between body weight and chest girth was the highest and significant (r = 0.677) followed by horn base circumference (r = 0.605) (Table 2). A relatively higher relationship between body weight and chest girth may be influence by muscles and bones in chest girth area and body weight in comparison to height and length. High correlation between body weight and chest girth has also been reported by Mukherjee *et al.* (1981, 1986), Singh *et al.* (1987) in black Bengal goats; Hassan and Ciroma (1992) in Red Sokoto goats; Chineke and Fasae (1995) in Yankasa sheep; Adeyinka and Mohammed (2006b) in Red Sokoto and white Borno goats, Ojedapo *et al.* (2007) in WAD goats and Cam *et al.* (2010b) in Karayaka sheep, Cam *et al.* (2010b) in Turkish Hair goats (Kilkeci) Onyimonyi *et al.* (2010) in growing pig, Lavvaf *et al.* (2012) in Afshari and Zandi rams and Ojedapo *et al.* (2012) in two commercial layer strain chickens.

There was no significant association correlation between body weight and other body measurement parameters in non- castrate animals (Table 3) these may be due to the sexual instinct of the non castrate animals.

CONCLUSION AND RECOMMENDATION

From the results of this study it was established that castration had no significant effects on body weight and some of the body measurement parameters measured. of the body linear measurement parameters measured chest girth and horn base circumference had positive relationship with body weight. It was therefore concluded that these two traits could be used to predict body weight of castrated savannah brown goats. It was therefore recommended that chest girth measurement would be the best to estimate the body weight of these breed of animals.

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