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AGE RELATED CORRELATION AMONG MORPHOMETRIC TRAITS OF SOME NIGERIAN GOATS

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Abstract

In an effort to further augment available literatures on correlated analysis of morphometric traits, a study was carried out using equal number from different breeds across age groups to evaluate the effect of age on correlated analysis of body morphometric traits in some Nigerian goats. Equal numbers of breed (Red Sokoto, Sahel and WAD), sex (Male and Female) and Age (<1year old, 1-2 years old and 2-3 years old) from Sokoto, Borno and Ogun state were sampled. A total of 900 goats were used for the study. Morphometric measures studied were BW: Body weight; HL: Horn Length; EL: Ear Length; SW: Shoulder width; NC: Neck circumference; BL: Body Length; WH: Wither Height; HG: Heart Girth; PG: Pouch Girth and TL: Tail Length respectively. Obtained data were subjected to correlation analysis based on age within breeds. Correlated relationships among morphometric measurements also varied with age in the general population and within breeds, but coefficients were generally low to moderate (-0.01 – 0.58) with the exception of the relationship between HG and PG which were generally high (0.77-0.99). BW was both positively and negatively correlated with other measurements due to the effect of age.

KeyWords: *Age, correlation, Morphometric traits, goats*

INTRODUCTION

Indigenous sheep and goat breeds contribute over 98% of the total small ruminant population in Africa (Oni, 2002). These animals serve as 'bank' for the small farmer, a hedge against economic instability and hard times, and a source of year round employment. They are also an important and secure form of investment as they can be bought following good crop performance and sold following crop failures. They provide practical means of using vast areas of natural grasslands in regions where crop production is impracticable. The indigenous breeds found in Nigeria are, Red Sokoto, Sahel, and West African Dwarf (WAD) goat (Adu and Ngere, 1979). These differ considerably in size, coat colour, horn length, etc. Their broad genetic variability enables them to survive under stressful environmental condition including high disease incidence, poor nutrition which may increase animal susceptibility to disease, high temperature, and traditional husbandry system. The first step in the characterization of local genetic resources is based on the knowledge of variation in the morphological traits (Delgado et al., 2001).

The first step in the characterization of local genetic resources is based on the knowledge of variation in the morphological traits (Delgado et al., 2001). Given that the majority of the genes influencing the configuration of an animal are of common action and not local, the formation of one part is found narrowly correlated with the formation of the other (Lerner and Donald, 1996). The objective of this study therefore is to determine the correlated relationships among morphometric traits of some indigenous Nigerian goats.

MATERIALS AND METHODS

The study was carried out in Borno, Sokoto and Ogun States. These states were selected because they are locations having pure or close to pure breeds of the goats. Haematological studies and analysis was carried out in the Animal Breeding and Genetics laboratory of Animal Science Department, Faculty of Agriculture, University of Ibadan, Oyo State

Experimental Animals and Management.

Animals used for this study were sampled in the abattoir, of Borno, Sokoto and Ogun states when brought for slaughter either by the owner or by the slaughter man. It is believed that all animals find their way into the abattoir from villages and local markets, where they are kept in small numbers by local farmers; they are raised under

the extensive system of management.

Sampling Size and Sampling Structure

A total of nine hundred (900) goats comprising of three hundred Sahel goats from Borno state, three hundred Red Sokoto goats from Sokoto state and three hundred West African Dwarf goats from Ogun state were used for the study. Each breed consisted of three hundred goats each, made up of fifty males and fifty females distributed in the following age groups <1, 1-2 and 2-3 years. These were evaluated for morphological, morphometric and biochemical polymorphism characteristics

Age Determination

The pairs of permanent incisors in the dentition of the goat were used to determine age.

Metric Variables

Weights of the animals were taken using a spring balance and Walk-in weighing scale. Flexible measuring tape was used to take the body measurement. During body measurement, animals were made to stand upright and restrained by two assistants in such a way that their heads, necks, and chest were stretched almost in a straight line. Each measurement was taken at least three times and the mean recorded to the nearest centimeter or kilogram.

Morphometric Measurements

Reference marks used for body measurement according to the method of Searle et al., (1989 a,b), Herrera et al., 1996, Riva et al., (2004) Figueiredo, (1983) and Salako et al., (2007) were :

- Wither Height (WH): Vertical distance from ground to the point of withers measured vertically from the ridge between the shoulder bones to the fore hoof.
- Body Length (BL): Distance between points of shoulder to point of hip i.e the distance from the first thoracic vertebrae to base of tail. This is also described as the distance between in the most cranial palpable spinosus process of thoracic vertebrae and either sciatic tubers or distance between the tops of the pelvic bone.
- Shoulder width (SW): Measured as the horizontal distance between the two shoulders or distance between the lateral tuberisities of the humeri which is also described as the widest point over the intraspinus muscle.
- Tail Length (TL): Measured from the base of the tail to the tip (Coccygeal vertebrae)
- Neck Circumference (NC): Taken as the circumference of the neck at the midpoint.
- Heart Girth (HG): Measured as the circumference of the body at the narrowest point just behind the shoulder perpendicular to the circumference of the body, just in front of the hind leg perpendicular to the body axis.
- Horn Length (HL): Measured as he average of the lengths of the two horns taken from the base to the tip. Average was used in order to make allowance for unexplained inequalities in horn length.
- Age (A): the pair of permanent incisors in the dentition of the goat under examination was used to determine age. According to Sastry and Thomas (1976)
- Scrotal Circumference (SC): Measured as the circumference of the scrotum taken at the mid-point.
- Ear Length (EL): Measured as the distance from the base to the Zygomatic arch of the ear.

Correlation Analysis

The degrees of association between all pairs of metric variables were computed for all the animals within each breed within age groups using CORR procedure of the SAS (1990) statistical package. This was done to evaluate changing magnitude of association among variables.

RESULTS

Table 1 presents the correlation matrix between morphometric traits in Nigerian goats across the three age groups.

HL was positively and significantly ($p<0.01$) correlated with EL, SW, NC, BL, WH, TL and BW but negatively correlated with HG and PG for goats < 1 year old, it had high, positive and significant correlation with all this characteristics but was lowly correlated with HG and PG at age 1-2 years. At age 2 – 3 years, HL was negatively correlated with HG and PG, had low but positive relationship with NC, while been significantly and positively correlated with all other traits. BW was only significantly ($p<0.01$) and negatively correlated with HG and PG at age 1- 2 years, while it was positively correlated with all other traits at the other ages both significantly ($p<0.05$, $p<0.01$) and non-significantly ($p>0.05$).

At age < 1 year, there was positive and significant relationship between EL, SW and TL, but EL was non-significant associated with NC, BL and WH and negatively correlated with HG and PG. It was however significantly and positively correlated with all traits except NC at 1-2 years. EL maintained this trend at age 2-3 years with the exceptions of positive and significant relation with NC and negative but significant relationship with HG and PG. SW had positive correlation with all characteristics but was only significantly so with TL and BW at age <1 year old, while it was significantly and positively related to BL, WH, TL and BW and significantly

Table 1: Correlated Relationship Btween Morphometric Traits of Nigerian Goats

	HL	EL	SW	NC	BL	WH	HG	PG	TL	BL
< 1 years										
EL	0.49**									
SW	0.36**	0.39**								
NC	0.29**	0.08	0.05							
BL	0.16**	0.09	0.03	0.37**						
WH	0.18**	0.08	0	0.35**	0.58**					
HG	-0.08	-0.09	0.02	-0.06	0.12*	0.15**				
PG	-0.07	-0.08	0.03	-0.08	0.09	0.13*	0.99**			
TL	0.33**	0.30**	0.24**	0.06	0.06	0.27**	0.04	0.06		
BW	0.32**	0.27**	0.37**	0.09	0.11*	0.17**	0.07	0.08	0.19**	
1 - 2 Years										
EL	0.40**									
SW	0.40**	0.26**								
NC	0.11*	0.01	0.02							
BL	0.39**	0.41**	0.31**	0.16**						
WH	0.48**	0.43**	0.37**	0.17**	0.57**					
HG	0.05	0.20**	-0.13*	-0.05	0.02	0.06				
PG	0.07	0.21**	-0.09	-0.04	0.02	0.09	0.97**			
TL	0.30**	0.24**	0.27**	0.13*	0.17**	0.33**	0.03	0.06		
BW	0.19**	0.14*	0.31**	0.03	0.37**	0.22**	-0.18**	-0.19**	0.11*	
2 – 3 Years										
EL	0.37**									
SW	0.45**	0.37**								
NC	0.1	0.23**	-0.04							
BL	0.39**	0.39**	0.57**	0.15**						
WH	0.52**	0.47**	0.66**	0.02	0.52**					
HG	-0.04	-0.15*	-0.21**	0.21**	-0.08	-0.26**				
PG	-0.07	-0.08	-0.14*	0.16**	-0.08	-0.14*	0.77**			
TL	0.14*	0.25**	0.19**	0.1	0.17**	0.17**	-0.11*	-0.1		
BW	0.40**	0.18**	0.40**	0.1	0.31**	0.50**	0.12*	0.08	0.04	

Keys: BW: Body weight; HL: Horn Length; EL: Ear Length; SW: Shoulder width; NC: Neck circumference; BL: Body Length; WH: Wither Height; HG: Heart Girth; PG: Pouch Girth and TL: Tail Length **p< 0.01 *p< 0.05

and negatively related to HG at 1-2 years. It was however, negatively correlated with NC howbeit not significantly, significantly and negatively correlated with HG and PG while been highly correlated with all other traits in the positive direction at age 2-3 years. NC showed positive and significant correlation with BL and WH at ages < 1 year and 1-2 years, and a low but positive relationship with WH at 2-3 years. It was also negatively correlated with HG and PG at the first two ages but had a positive and significant relationship with HG and PG at the last age bracket. BL had high, significant and positive relationship with WH. TL and BW at ages 1-2 and 2-3years with a low and negative relationship with HG and PG only at 2-3 years. WH was positively and highly correlated with HG, PG, TL and BW at < 1year, was low and positive with HG and PG at 1-2 years and had significant and negative relationship at 2-3 years with HG and PG. HG had very high, positive and significant relationship with PG at all ages; negatively and significantly correlated with BW at 1-2 years, but positively at 2-3 years. It was only negatively and significantly related with TL at age 2-3years. PG was significantly and negatively correlated with BW at 1-2 years only while TL had positive and significant relationship with BW at the first two age brackets.

Table 2 presents the correlated matrix in the Red Sokoto goats.In this breed, BW was significantly ($p<0.05$, 0.01) and positively correlated with HL and WH at < 1 year, HL, NC, BL and WH at 1-2 years and HL, SW and NC at 2-3 years. With all other characteristics it was either positively or negatively correlated but with no significance.

HL showed significant positive relationship with EL, NC, BL, WH, TL and BW at < 1 year; with NC, BL, WH and BW at 1-2 years and with EL, NC, BL, TL and BW at 2-3 years. It revealed negatively but non-significant relationship with HG and PG at 1-2 years only. EL had positive and significant relationship with WH and TL; HG and PG and NC, WH and TL across the ages. It was significantly ($p<0.05$) and negatively correlated with HG and PG at < 1 year and with WH at 1-2 years. SW showed positive and significant relationship with BL, WH, HG and PG; negative and significant correlation with NC, WH and TL for the first two ages and was positive and significant with BL while being negative with HG and PG at 2-3years. BL was positively and significantly correlated with WH, HG and PG; WH, TL and BW; and TL respectively. It was only negatively and significantly

Table 2: Correlated Relationship Between Morphormetric Traits Within Age Categories in Red Sokoto Goat

	HL	EL	SW	NC	BL	WH	HG	PG	TL	BW
<1 year										
EL	0.19**									
SW	-0.11*	0.01								
NC	0.27**	0.07	-0.08							
BL	0.12*	0.07	0.29**	0.04						
WH	0.14*	0.16**	0.16**	0.04	0.14*					
HG	0.04	-0.15*	0.37**	-0.09	0.19**	0.03				
PG	0.04	-0.15*	0.36**	-0.09	0.19**	0.03	1.00**			
TL	0.32**	0.34**	-0.02	-0.06	-0.01	0.31**	-0.03	-0.02		
BW	0.16*	0.09	0.10*	0.01	0.05	0.25**	0.09	0.09	-0.01	
1-2 years										
EL	0.05									
SW	-0.06	-0.05								
NC	0.24**	-0.08	-0.12*							
BL	0.32**	0.01	0.01	0.18**						
WH	0.29**	-0.14*	-0.21**	0.21**	0.57*					
HG	-0.03	0.23**	0.00	-0.13*	0.06	-0.01				
PG	-0.03	0.22**	0.01	-0.13*	0.07	-0.02	0.99**			
TL	0.10*	-0.04	-0.13*	0.11*	0.12*	0.14*	-0.05	-0.04		
BW	0.19**	-0.05	-0.06	0.12*	0.38**	0.47**	-0.03	-0.05	0.08	
2-3 years										
EL	0.29**									
SW	0.06	-0.07								
NC	0.12*	0.21**	0.07							
BL	0.23**	0.10*	0.37**	0.09						
WH	0.03	0.18**	0.04	0.24**	0.04					
HG	0.05	-0.08	-0.18**	0.16**	-0.12*	-0.05				
PG	0.02	-0.09	-0.16**	0.14*	-0.12*	-0.05	0.99**			
TL	0.30**	0.21**	0.09	0.15*	0.15*	-0.06	0.03	0.01		
BW	0.19**	-0.01	0.11*	0.23**	-0.04	0.07	0.09	0.09	0.06	

correlated with HG and PG at 2-3 years. WH was positive and significant in its relation with TL and BW at the first two ages only while HG and PG retained almost perfect and positive significant relationship across all ages.

Correlation matrix of morphometric traits across all ages in the Sahel is presented in Table 3. BW was positively and significantly ($p<0.05$, 0.01) correlated with HL, EL, SW, NC, BL and WH (< 1 year); HL, EL, BL, WH, HG, PG and TL (1-2 years) and WH, HG and PG (2-3 years), while it had significant and negative relationship with EL and BL at 2-3 years in this breed. HL was positively and significantly correlated with SW, NC, BL, WH, TL and BW (< 1 year); EL, SW, BL, WH and BW (1-2 years) and SW and HG at 2-3 years while negative and significant relationship was indicated with EL, NC and BL at this age. EL had positive and significant association with SW, NC, BL, WH, TL and BW (< 1 year); SW, BL, WH, HG, PG, TL and BW (1-2 years) and SW, NC, BL and TL at 2-3 years. It was significantly and negatively associated with BW only at 2-3 years. SW and NC revealed significant and negative relationship with HG and PG only at < 1 year, while all other associations were positive and significant. SW was positively and significantly correlated with BL, WH and TL (1-2 years), BL and HG (2-3 years) while NC was so associated with BL and WH (1-2 years) and BL, PG and TL (2-3 years). BL was positively and significantly correlated with WH, TL and BW (<1 year); WH, HG, PG and BW (1-2 years) but negatively and significantly correlated with WH, PG, TL and BW at 2-3 years. WH showed significant and positive relations with TL and BW (<1 year); BW (1-2 years) and HG, PG and BW at 2-3 years. HG also showed this trend with PG in all ages and with BW in the last two ages. PG was positively and significantly correlated with BW at 1-2 years and with TL and BW at 2-3 years while TL was so with BW at 1-2 years only.

Correlation matrix of morphometric traits across all ages in the WAD is presented in Table 4. BW had negative and significant ($p<0.05$, 0.01) correlation with HL (< 1 year); HG and PG (1-2 years) and NC and TL (2-3 years). It showed significant and positive relationship with SW and BL; HL, SW, BL and TL; and BL and HG respectively. HL showed significant and positive association with EL, NC, BL and WH (<1 year); EL, BL, WH and TL (1-2 years) and El, NC and WH (2-3 years) conversely with HG and PG at 2-3 years. EL was significantly related to BL and WH (<1year and 1-2 years) with TL at 1-2 years and with NC and TL at 2-3 years positively. It was only conversely so with SW at 1-2 years. SW showed positive and significant association with TL in the first age group, HG, PG and TL in the third age group but negative and significant relationship with

Table 3: Correlated Relationship Between Morphometric Traits within Age Categories in Sahel Goat

	HL	EL	SW	NC	BL	WH	HG	PG	TL	BW
<1 year										
EL	0.51**									
SW	0.77**	0.41**								
NC	0.60**	0.33**	0.66**							
BL	0.49**	0.37**	0.51**	0.73**						
WH	0.48**	0.28**	0.56**	0.68**	0.83**					
HG	-0.18**	0.02	-0.10*	-0.11*	-0.01	-0.04				
PG	-0.22**	0.00	-0.14*	-0.18**	-0.07	-0.09	0.96**			
TL	0.38**	0.25**	0.41**	0.33**	0.28**	0.36**	-0.05	-0.06		
BW	0.36**	0.13*	0.41**	0.44**	0.38**	0.36**	-0.04	-0.08	0.08	
1-2 years										
EL	0.35**									
SW	0.24**	0.26**								
NC	-0.02	-0.06	-0.02							
BL	0.33**	0.69**	0.45**	0.21**						
WH	0.25**	0.44**	0.49**	0.16**	0.71**					
HG	0.04	0.23**	0.06	-0.24**	0.13*	0.00				
PG	0.05	0.23**	0.07	-0.23**	0.14*	0.05	0.93**			
TL	0.09	0.13*	0.17**	-0.11*	0.08	0.03	0.03	0.01		
BW	0.12*	0.35**	0.00	0.08	0.39**	0.25**	0.33**	0.32**	0.11*	
2-3 years										
EL	-0.10*									
SW	0.22**	0.16**								
NC	-0.14*	0.46**	0.09							
BL	-0.26**	0.31**	0.23**	0.34**						
WH	0.10*	0.00	-0.06	-0.06	-0.23**					
HG	0.13*	-0.07	0.17**	-0.07	-0.06	0.25**				
PG	-0.01	-0.01	-0.02	0.10*	-0.17**	0.19**	0.62**			
TL	-0.07	0.20**	-0.04	0.27**	0.15*	0.05	0.08	0.15*		
BW	0.08	-0.20**	0.04	0.01	-0.21**	0.44**	0.24**	0.11*	-0.07	

BL, WH, HG and PG (1-2 years) and NC and BL at 2-3 years. NC was only significantly related with WH at < 1 year, with BL and TL at 1-2 years and WH at 2-3 years in the positive direction. Conversely, it had significantly negative relationship with PG at 2-3 years. BL was significantly and positively correlated with WH at the first two ages and negatively at the third age group. Also WH showed similar positive trend with TL at the first two age groups, while HG showed negative and significant relationship with TL at 1-2 years, it remained consistently high and positive with PG at all ages. PG was significantly and negatively correlated with TL at ages 1-2 and 2-3 years respectively.

DISCUSSION

Observed positive correlation between HL and BW pooled for all breeds and for the Red Sokoto and Sahel across all the ages may be unconnected with the fact that horn growth is age dependent and has been employed as a determinant for age in ruminants. Paucity of literature that correlates HL with other morphometric traits does not furnish basis for comparison, it must be noted that the association was only negative in the WAD at <1 year. This may point to the suitability of using HL at various ages across breeds to predict BW patterns. Observed positive significant and non-significant association between BW and all linear traits pooled for all breeds at <1 and 2-3 years was in consonance with the findings of Semakula et al. (2010) for East African goat breeds in Uganda. The significant but negative correlations with HG and PG at 1-2 years were however at variance with these authors' findings at this age as they reported coefficients of 0.28 and 0.80 as against -0.18 and -0.19 obtained in the present study. Observed ranges (0.03 – 0.50) of positive coefficients of association in this study pooled for all breeds between BW and morphometric traits were comparatively lower than (0.12-0.93) reported (Cam et al., 2010 and Semakula et al., 2010).

Body weight is an important attribute in animal production as it forms the basis for not only assessing growth and feed efficiency but also in making economic and management decisions (Assan, 2013). Since market forces and decision making for purchase of goats in the Nigerian economy is based on the BW of the animal, therefore focus is primarily on the association between BW and other morphological traits, all other variations within this linear traits in coefficient value, direction and level of significance only serve to reinforce positive or negative impact on body weight, however Pearson correlation is not a thorough tool for predicting body weight. That morphometric measurement varies positively with age of the animals and the correlations of

Table 4: Corelated Relationsip Between Morphometric Traits within Age Categories in Wad Goat

	HL	EL	SW	NC	BL	WH	HG	PG	TL	BW
<1 year										
EL	0.32**									
SW	-0.12*	0.00								
NC	0.31**	0.09	0.07							
BL	0.26**	0.20**	0.07	0.06						
WH	0.29**	0.24**	-0.01	0.22**	0.23**					
HG	-0.04	0.02	0.02	-0.01	-0.01	0.09				
PG	-0.04	0.02	0.01	-0.02	-0.02	0.06	1.00**			
TL	0.05	-0.04	0.14*	0.07	-0.1	0.22**	-0.01	-0.02		
BW	-0.12*	0.06	0.16**	0.02	0.22**	0.03	0.07	0.07	0.01	
1-2 years										
EL	0.33**									
SW	-0.05	-0.26**								
NC	0.00	0.05	0.19**							
BL	0.28**	0.44**	-0.11*	0.12*						
WH	0.36**	0.54**	-0.11*	0.07	0.40**					
HG	0.00	0.00	-0.32**	0.00	0.00	0.00				
PG	-0.02	0.00	-0.28**	-0.01	-0.03	0.00	0.98**			
TL	0.19**	0.16*	0.1	0.27**	0.09	0.26**	-0.15*	-0.11*		
BW	0.15*	0.07	0.26**	0.03	0.18**	0.03	-0.41**	-0.44**	0.18**	
2-3 years										
EL	0.36**									
SW	-0.05	-0.04								
NC	0.44**	0.12*	-0.28**							
BL	0.03	0.06	-0.14*	0.01						
WH	0.20**	0.09	-0.06	0.34**	0.10					
HG	-0.27**	0.00	0.18**	-0.08	-0.01	-0.16**				
PG	-0.26**	0.02	0.12*	-0.17**	-0.11*	0.01	0.58**			
TL	0.05	0.12*	0.20**	-0.05	-0.02	-0.05	-0.07	-0.20**		
BW	0.09	0.09	0.05	-0.20**	0.16**	-0.03	0.16**	-0.02	-0.11*	

body weight with diagonal body length, height at wither, sac pelvic width and hearth girth were high, positive and significant has been reported (Ojedapo et al., 2007). The association between BW and linear characteristics in this study were low (-0.01- 0.47) across all the age groups compared to values reported in literature for the correlation between BW and other morphometric traits (Cam et al., 2010; Semakula et al., 2010 and Aziz and Al-Hur, 2013), however, weak negative associations based (-0.20) on age have also been cited in sheep (Oke and Ogbonnaya, 2011). Observations in this study were however at variance with the statement of with Sodiq *et al.* (2001) who observed that interrelationships among linear body measurements in sheep were high and positively ($P<0.05$) correlated with one another and this may be unconnected with the source and sampling strategy including environmental differences of the animals used in the different studies. The recurring negative associations (weak and strong) between BW, HG and BL at the different ages for the different breeds were at variance with literature reports among these traits (Cam et al., 2010; Semakula et al., 2010; Oke and Ogbonnaya, 2011; Okpeku et al., 2011 and Aziz and Al-Hur, 2013) it appeared that negative and decreasing coefficient of association increased with; Das et al. (2002) working with buffaloes noted that from 6 to 24 months of age, the correlation coefficient of body weight of calves was positive and highly significant. But, the coefficient values were decreased gradually with increase in age of calves. Yakubu et al., (2011) showed that as age advanced coefficients of determination decreased while residual mean square increased. Also Thiruvenkadan (2005) reported this trend in Kanni Adu kids under farmers management in Southern part of India, these observations may however be connected with the body condition score of the animals employed in this study which was not studied as animals could be tall or long but weigh less than stockier animals. Relationship of linear conformation traits with body weight body, condition score and milk yield in Friesian × Bunaji cows were positive indicating that taller, wider, deeper and fatter cows tended to be heavier (Alphonsus et al., 2010). It has been stated that the magnitude of the coefficient reflects active or passive growth at different age group in the species (Oke and Ogbonnaya, 2011). Further studies of the relationship between BW and other morphometric traits with the inclusion of body condition score using more advanced analytic tool is advocated such as that employed by Aziz and Al-Hur (2013) using discriminant analysis tool.

CONCLUSION

Correlated relationships among morphometric

measurements also varied with age in the general population and within breeds, but coefficients were generally low to moderate with the exception of the relationship between HG and PG which were generally high. BW was both positively and negatively correlated with other measurements due to the effect of age contrary to most literature reports where it is mostly positively correlated with these measures.

Live weight was significantly correlated with most morphometric traits across age and breeds in both directions. This may be unconnected with the highly variable structure of the population which consists mainly of animals culled for slaughter. Age is a major class factor in the study of the relationship among morphometric traits and performance of Nigerian indigenous goats.

REFERENCES

Oni OO (2002). Breeds and Genetic Improvement of small ruminant. *Small Ruminant Trimming worship*, held at the National Animal Production Research institute, Ahmadu Bello University, Shika, Zaria. 13th – 18th January 2002. pp.2.

Adu IF, Ngere LO (1979). The indigenous Sheep of Nigeria. World Rev. Anim. Production. 15(3); 52 – 62.

Delgado JV, Capote-Frenso MR, Camacho ME (2001) Autoctonos Cannaries. CAP Gobriernode Canarias, 14pp

Lerner IM, Donald HP (1996). Models of development in Animal Breeding. Academic Press, London 295pp.

Searle TM, McGraham N, Domely JB (1989a) Change of Skeletal Dimensions During growth in sheep: The effect of Nutrition. J. Agricul. Sci., 112:321 – 327.

Searle TM, Mcgraham N, Domely JB, Makgari DE (1989b). Breed and Sex Differences in Skeletal Dimensions of Sheep in the first year of Life. J. Agricul. Sci., 113:349 – 354.

Herrera M, Rodera E, Grutievrez MJ, Peria F, Rodero JM (1996). Application of Multifactorial Discriminate Analysis in the Morphostructural differentiation on Andulusian Caprine Breeds.Small Ruminant Res., 22:39 – 47. http://www.cssl.ca/goats/gi-us-Ca.htm.(Abstrt)

Riva J, Rizzi RI, Marelli S, Caralchini LG (2004). Measurements in Bergamasca Sheep.Small Ruminant Res., 55:221 – 227

Figueiredo EAP, Oliveira ER, Bellaver C, Simplicio AA (1983). Hair Sheep performance in Brazil. In: Hair Sheep of Western Africa and the Americas. Edited by Fitzhugh, H.A. and Bradford, G.E.

Salako AE, Ijadunola TO, Agbesola YO (2007) Haemoglobin polymorphism in Nigerian indigenous small ruminant populations preliminary investigation. Afr. J. Biotechnol.,, 6(22): 2636-2638 Available online at Http://www.academicjournals.org/AJB ISSN 1684-5315

SAS (1990). Statistical Analysis System (SAS). Institute Inc. (1990). SAS/STAT User's guide version 6, 4th edition Vol. 2 SAS Inst-Inc. carry, N.C 846.

Semakula J, Mutetikka D, Kugonza RD, Mpairwe D (2010). Variability in Body Morphometric Measurements and Their Application in Predicting Live Body Weight of Mubende and Small East African Goat Breeds in Uganda. Middle-East J. Sci. Res., 5 (2): 98-105.

Cam MA, Olfaz M, Soydan E (2010). Possibilities of Using Morphometrics Characteristics as a Tool for Body Weight Prediction in Turkish Hair Goats (Kilkeci). Asian J. of Animal and Vet. Adv., 5:52-59. http://scialert.net/abstract/?doi=ajava.2010.52.59

Assan N (2013). Bioprediction of body weight and carcass parameters from morphometric measurements in livestock and poultry. Sci. J. Rev., Vol 2:6

Ojedapo LO, Adedeji TA, Olayeni TB, Adedeji OS, Abdullah AR, Ojebiyi OO (2007). Influence of age and sex on body weight and some body linear measurements of extensively reared wad goats in derived savannah zone of Nigeria. J. Anim. Vet. Adv. 6(1), 114- 117.

Aziz MMA, Al-Hur FS (2013). Differentiation between three Saudi goat types using Size-free Canonical Discriminant Analysis. Emir. J. Food Agric. 2013. 25 (9): 723-735. http://www.ejfa.info/

Oke UK, Ogbonnaya EO (2011). Application of Physical Body Traits in the Assessment of Breed and Performance of WAD Sheep in a Humid Tropical Environment. Livestock Res. for Rural Dev. 23 (2).

Sodiq A, Proyono A, Soedjadi M, Sugiatno A, Marimono EA (2001). Small ruminants production system under rural area and improving weaning weight. Sci. pub. Fed. Univ. of Soediriman puroivokerto 27: 41 – 52.

Okpeku M, Yakubu A, Peters SO, Ozoje MO, Ikeobi CON, Adebambo OA, Imumorin IG (2011). Application of multivariate principal component Analysis to morphological characterization of indigenous goats in Southern Nigeria. Acta argicul. Slovenica, 98/2: 101–109

Das KS, Bhattacharya TK, Das N (2002). Correlation of body measurement. Ind. J. Anim. Res.36, 153 - 155.

Yakubu A, Ladokum AO, Adua MM (2011). Bioprediction of body weight from zoometrical traits of non-descript goats using linear and nonlinear models in North Central Nigeria. Liv. Res. Rur. Dev. 23(6).

Thiruvenkadan AK (2005). Determination of best fitted regression model for estimation of body weight in Kannu Adu Kids under farmers management system. Livestock Res. for Rural Dev. 17(7):1-11

Alphonsus C, Akpa GN, Oni OO, Rekwot PI, Barje PP, Yashim SM (2010). Relationship of linear conformation traits with body weight, body condition score and milk yield in Friesian*Bunaji cows. J. Appl. Anim. Res 38(1): 97 -100.