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Morphormetric Differentiation of Yankasa Sheep in Maiduguri, North-Eastern Nigeria

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ABSTRACT

A total of 227 (110 males and 177 females) Yankasa sheep were used for morphometric differentiation of Yankasa sheep in Maiduguri, North-eastern Nigeria to evaluate the effect of age, sex as well as the correlation between morphological traits in Yankasa sheep. Some of morphological traits measured were body weight (BW), body length (BL), height at wither (HW), head length (HDL), head wide (HDW), foreleg (FLG), hind leg (HLG), height at rump (HTR) and neck length (NL). The result of the effect of age showed that BL, HW, TL RL and RW are significantly (P<0.05) different with older animals having superiority over the younger ones. Increase in age lead to increase in morphometric characteristics. Sex had significant (p<0.05) effect on FLG, EL and HDL with males having significantly higher values than females. Coefficient of Variation (CV) ranged from 7.30 – 45.56. The highest CV was recorded in HNL and the least CV was recorded in CC. The phenotypic correlation of morphometric characteristics of Yankasa sheep in this study varied in magnitude and direction. The phenotypic correlation of BW the showed high and positive (p<0.01) correlation with all the phenotypic traits except NL (r= -0.39) and EL (0.15). BW showed positive correlation with all the morphometric traits except HDL. The positive correlation of BW with other traits showed that they are controlled by same gene.

Keywords: *Yankasa, Phenotypic, Traits, Sheep*

INTRODUCTION

Small ruminants are important genetic resources in the tropics, where they play a predominant role in the sustenance of the livelihoods of impoverished families especially in the rural areas. In Nigeria, they represent about 63.70% of the total grazing domestic animals (FAOSTAT (2011). The adaptive features of goats and sheep such as feeding behavior, disease and heat tolerance and remarkable recovery capacity from drought enable them to cope effectively with a variety of stressful tropical environmental conditions (Yakubu et al., 2010). Genetic improvement of these indigenous breeds can thus improve the productivity and sustainability of the goat enterprise in the tropics faster than trying to improve the exotic breeds (Alphonsus et al., 2010; Shoyombo et al., 2015). Traditionally, animals are usually assessed visually, which is a subjective method of judgment (Abanikannda et al., 2002).

Body size and shape measured objectively could improve selection for growth by enabling the breeder to recognize early maturing and late maturing animals of different sizes. Measurement of various body conformations are of value in judging quantitative characteristics of meat animals and are also helpful in developing suitable selection criteria. Morphological variation within a species canprovide biologists with a wealth of information (Brown etal., 2006; Vargas et al., 2007). Morphological and morphometric animalselection can constitute an effective system to the breedpreservation and improvement (Nsoso et al., 2004; Araujo etal., 2006; Sowande et al., 2010) Yankasa is one of the important sheep in Nigeria. The Yankasa isthe most widely distributed being found all over the country (Adu and Ngere, 1979). Yankasa sheep has good ability of adapting to different environment. Information on morphometric differentiation of Yankasa sheep in the North-eastern Nigeria is scarce. The objective of this paper therefore is to evaluate effect of age, sex as well as the phenotypic correlation between phenotypic parameters of Yankasa sheep.

Materials and Methods

Study Area

Maiduguri is the capital and the largest urban center of Borno State, North Eastern Nigeria. The state lies between latitude 11°32′ North and 11°40′ North and latitude 13°20′ East and 13°25′ East between the Sudan Savanna and Sahel Savanna vegetation zones, characterized by short rainy season of 3-4 months (June-September) followed by a prolonged dry season of more than 8 months duration Borno State Ministry of Land a nd Survey (BMLS), (2016).

Management System of the Experimental Animals

The animals were managed under the traditional extensive system, with little or no provision for shelter in the day and night. They grazed during the day on natural pasture containing forages such as northern gamba grass (Andropogongayanus), stylo (Stylosanthesgracilis) and leucaena (Leucaenaleucocephala). Occasionally, supplements such as cassava and yam peels, cereal offal and crop residues were provided prior and/or after grazing of natural pastures. Adequate health care was virtually non-existent while non-directional breeding was the practice (Yakubu and Ibrahim, 2011).

Morphometric Variables Measured

A total of 227 (110 males and 117 females) Yankasa sheep were randomly sampled from a population of the breed for morphometric traits. The parameters measured were bodyweight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HDL), head width (HDW), ear length (EL), horn length (HNL), horn circumference (HNC), tail length (TL), rump width (RW), rump length (RL), foreleg (FLG), hind leg (HLG) and neck length (NL). The bodyweight (Kg) were measured by Using glass fiber with model number WJ515 and the height measurement (cm) was done using a meter rule. This was achieved by placing the animals on a flat ground and held by two field assistants. The length and circumference measurements (cm) were carried out using graduated tape. Measurements were done in the morning before the animals were released for grazing. All measurements were carried out by the same person, in order to avoid inter-individual variations as outlined by (Yakubu and Ibrahim, 2011).

Statistical Analysis

The data set were analyzed using the General Linear Model of SAS, 2004 while means with significant difference were compared with Duncam Multiple Range Test (DRMT, 1954). The fixed effects of sex and age on linear body measurements were tested using linear model given as follows:

$$Y_{ij} = \mu + S_i + A_j + e_{ij}$$

Where Y_{ij}= individual observation of each body traits;

μ = overall mean;

S_i = fixed effect of ith sex (i = male, female);

A_j = fixed effect of jth age (j < 1 year old, 2 years old, and > 2 years old)

e_{ij}=random residual error associated with record of each animal

Data collected were also subjected to Pearson correlation analysis of the same software to determine the phenotypic correlation values among the phenotypic traits.

Result And Discussion

The results of the effect of age on phenotypic traits are presented in Table 1. The result showed that age significantly ($P<0.05$) influenced BL, HW, TL RL and RW with the older animals having higher values than the younger ones. The phenotypic traits increase with change in age implying that morphometric traits increase with increase in age of animals. Even though other phenotypic trait showed non-significant ($P>0.05$) difference, there were slight increase with change in age. The result from this study corroborated with the report of Adejoro and Salako (2012) who opined that the positive influence of age of the animals on body size and weight is not surprising since the size and shape of the animals is expected to increase with increasingage of the animals. This result also concord with the report of Asefa et al. (2017) who opined that Body weight and all body measurements are affected byage. Also, inagreement to the finding, Akpa et al. (2017) reported a significant effect of age on meat indices of sheep with the adult and aged sheep having higher values. The increase in phenotypic trait with change in age could be termed as growth.

The effect of sex on phenotypic traits is presented in Table 2. The results showed that only FLG, EL and HDL were significantly (P<0.05) influenced by sex effect with males having superiority over the females. The superiority of male could also be attributed to concentrations of thyroxine in comparison to females (Carlos et al., 2015). This may also be due to testosterone hormone which is secreted in male animals, which stimulate growth. This result agreed with the report of Birteeb et al (2012) who opined that males were superior to females in all the body measurements. Again, the result concord with the report of Akpa et al, (2017) who reported that male sheep were superior in meat offals than their female counterparts. This is also in line with the reports of some authors that some genetic and non-genetic factors such as breed, sex, type of birth, parity order, season of kidding, management and birth weight have been known to influence growth rate of kids which will later affect any meaningful success expected to be achieved in any improvement program (Haddad, 2005, Zhang et al., 2009; Jamenez- Badillo et al., 2010).

The results of summary of statistics and Coefficient of Variation (CV) are presented in Table 3. The CV of the phenotypic traits ranges from 7.30 – 45.56. The highest CV was recorded in HNL and the least CV was recorded in CC. Traits having high CV suggest that the traits are heterogeneous in nature hence possessing more room for genetic improvement through selection while traits having less CV suggest that those traits are homogenous and possesses less room for improvement. Therefore, the variation that exists in the phenotypic traits of Yankasa sheep could be exploited for selection and improvement of the breed since the characterization of local genetic resources depends on the knowledge of the

variation of morphological traits, which have played a very fundamental role in classification of livestock based on size and shape (Yakubu et al., 2010). This finding corroborated with the report of Crepaldi et al. (2001) who opined that domestic animal diversity is critical for food security and essential to meet unpredictable future demand of population increase, climate change and more virulent disease pathogens, thus, a reservoir not only depends on the number of breeds but also on the genetic diversity within and between these breeds.

The results of phenotypic correlation are presented in Table 4. BW showed high positive correlation with all the phenotypic traits except NL (r=-0.39) and EL (0.15) while NL correlated negatively with all the phenotypic traits except EL (r= 0.35) and FLG (r= 0.06). All the phenotypic traits that showed high positive correlation with the bodyweight are good estimators of bodyweight (Abera et al., 2014). The significant positive correlation between bodyweight and other traits in this study is agreement with the report of several authors (Peña et al. 2007; Mayi et al., 2010; Kaić et al., 2012) who reported that increase in live weight resulted in increase in edible offal of sheep. Also, Also, Kadim et al. (2008) and Salehi et al. (2013) had reported a positive correlation between live weight and carcass weight and some carcass characteristics. This means that an improvement in one trait will lead to improvement in the other while the negative correlation between traits implies that improvement in one trait will lead to decrease in the other trait. This also implies that the traits are controlled by more than one gene (pleiotropy) (Fayeye, 2014).

Table1. *Effect of age Phenotypic Parameters*

TRAITS	<1YEARS	1 YEARS	>2YEARS	SEM
BW	48.143	51.80	53.50	4.86
BL	46.28^{b}	51.80^{a}	53.00^{a}	2.20
HW	72.00^{b}	77.20^{ab}	79.83^{a}	3.36
CC	74.82	77.00	78.83	3.17
HDL	20.00	20.80	21.83	1.58
HDW	10.42	12.00	12.83	1.65
EL	16.57	17.80	18.41	1.09
TL	38.00^{b}	47.60^{a}	48.83^{a}	4.01
RL	17.14^{b}	22.00^{a}	23.00^{a}	1.67
RW	15.28^{b}	18.20^{a}	18.50^{a}	0.64
HTR	64.71	71.17	71.40	2.98
FLG	49.57	49.80	55.17	2.37

HLG	57.00	59.83	62.80	3.86
NL	28.80	29.14	34.33	2.69
HNL	16.50	25.50	27.00	6.25
HNC	10.00	13.00	14.00	1.97
SC	26.67	24.50	24.50	2.27

SEM=Standard Error of Mean, Significant difference (p<0.05), abcd = Means in the same row bearing different superscripts differ significantly (p<0.05). body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HDL), head wide (HDW), ear length (EL), horn length (HNL), horn circumference (HNC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLG), height at rump (HTR) and neck length (NL)

Table 2.*Effect of Sex Phenotypic Parameters*

TRAITS	MALE	FEMALE	SEM
BW	49.35	54.00	5.88
BL	51.55	49.25	3.60
HW	78.10	74.75	4.77
CC	75.98	78.58	3.95
HDL	22.00^{a}	19.58^{b}	2.04
HDW	13.05^{a}	10.25	2.10
EL	19.00^{a}	16.58^{b}	1.14
TL	47.45	42.83	4.91
RL	20.95	20.75	2.76
RW	17.70	17.0	1.80
HTR	69.60	69.41	4.55
FLG	53.65^{a}	48.08^{b}	5.24
HLG	60.60	59.00	5.24
NL	31.45	34.17	4.78

SEM=Standard Error of Mean, Significant difference (p<0.05), abcd = Means in the same row bearing different superscripts differ significantly (p<0.05). body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HDL), head wide (HDW), ear length (EL), horn length (HNL), horn circumference (HNC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLG), height at rump (HTR) and neck length (NL)

Table 3.*Summary Statistics of morphometric traits of Yankasa*

Trait	Mean ± S. E	CV
BW	51.09±1.49	16.58
BL	50.68±0.90	10.10
HW	76.84±1.20	8.88
CC	76.96±0.99	7.30
HDL	21.09±0.54	14.57
HDW	12.00±0.56	26.87
EL	18.09±0.35	10.95
TL	45.71±1.27	15.76
RL	20.87±0.67	18.36
RW	17.43±0.46	14.48
HTR	69.53±1.11	9.09
FLG	51.56±1.37	15.06
HLG	60.00±1.29	12.18
NL	32.48±1.16	20.85
HNL	22.94±2.46	45.56
HNC	12.72±0.87	28.25
SC	25.00±0.85	15.25

SE=Standard Error, CV=coefficient of variation, SEM=Standard Error of Mean, Significant difference (p<0.05), abcd = Means in the same row bearing different superscripts differ significantly (p<0.05). body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HDL), head wide (HDW), ear length (EL), horn length (HNL), horn circumference (HNC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLG), height at rump (HTR) and neck length (NL)

Table 4. *Phenotypic Correlation between morphometric traits of Yankasa breed of sheep*

	BW	BL	HW	CC	HDL	HDW	EL	HNL	HNC	TL	SC	RL	RW	HTR	FLG	HLG
BW																
BL	0.91**															
HW	0.69**	0.61**														
CC	0.99**	0.90**	0.73**													
HDL	0.93**	0.86**	0.55*	0.94**												
HDW	0.92**	0.79**	0.85**	0.95**	0.90**											
EL	0.15	0.31	0.53*	0.20	0.21	0.34										
HNL	0.96**	0.94**	0.59**	0.93**	0.85**	0.80**	0.07									
HNC	0.94**	0.94**	0.74**	0.93**	0.87**	0.89**	0.32	0.94**								
TL	0.66**	0.68**	0.93**	0.69**	0.56*	0.78**	0.68**	0.62**	0.81**							
SC	0.79**	0.56*	0.29	0.78**	0.85**	0.71**	-0.08	0.67**	0.61**	0.23						
RL	0.62**	0.65**	0.97**	0.66**	0.51*	0.78**	0.68**	0.55*	0.73**	0.96**	0.15					
RW	0.74**	0.69**	0.63**	0.75**	0.79**	0.80**	0.43	0.69**	0.87**	0.76**	0.59*	0.61**				
HTR	0.69**	0.47*	0.90**	0.74**	0.60**	0.86**	0.35	0.53*	0.61**	0.74**	0.53*	0.78**	0.54*			
FLG	0.54*	0.52*	0.96**	0.58*	0.40	0.72**	0.68**	0.43	0.59**	0.90**	0.12	0.97**	0.47*	0.83**		
HLG	0.60**	0.41	0.94**	0.65**	0 .50*	0.82**	0.46	0.43	0.56*	0.79**	0.39	0.85**	0.54*	0.98**	0.89**	
NL	-0.39	-0.18	-0.20	-0.33	-0.26	-0.29	0.35	-0.45	-0.43	-0.24	-0.39	-0.04	-0.53	-0.21	0.06	-0.15

** significant at 0.05 level, **highly significant at 0.05 level SEM=Standard Error of Mean, Significant difference (p<0.05), abcd = Means in the same row bearing different superscripts differ significantly (p<0.05). body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HDL), head wide (HDW), ear length (EL), horn length (HNL), horn circumference (HNC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLG), height at rump (HTR) and neck length (NL)*

CONCLUSION

Age and sex have effect on some phenotypic traits of Yankasa sheep. BW showed positive high correlation with all phenotypic traits except NL while NL showed negative correlation all phenotypic traits except EL and FLG. The positive correlation between the phenotypic traits signifies they are controlled by same gene while negative correlation. The CV showed high in HNL and least in CC which could be exploited the phenotypic traits could be exploited for selection and improvement of Yankasa sheep.

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