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Phenotypic Characterization of Uda Sheep in Maiduguri, Northern Nigeria

Dauda A. *
Department of Animal Science University of Calabar P. M. B Calabar, Nigeria

Ibom L. A.
Department of Animal Science University of Calabar P. M. B Calabar, Nigeria

Ebegbulem V. N.
Department of Animal Science University of Calabar P. M. B Calabar, Nigeria

Abstract

The study used a total of 255 (122 males and 133 females) Uda sheep were randomly sampled from the population. The parameters considered were body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HL), head wide (HW), ear length (EL), horn length (HRL), horn circumference (HRC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLD) and neck length (NL). The weight (Kg) was measured by using glasfiberband with model number WJ515 and the height measurement (cm) was done using a graduated measuring rule. The data obtained were analyzed using General Linear Model Procedure of SAS and Means differences were compared using Duncan Multiple Range Test. The result showed that age have significant (P<0.005) different on all the phenotypic traits except HL, EL, RL, RW, HRL and HRC are non-significant (P>0.005) different, although they are statistically the same but showed slight increase with increase in age. The effect of sex on phenotypic traits of uda sheep showed HRL, HRC and HDW are significant (P<0.005) different. The phenotypic correlation showed both positive and negative correlation between phenotypic traits. The study concluded that this research will initiate a selection and breeding programme for the improvement of Nigerian uda sheep.

Keywords: Phenotypic; Traits uda; Sheep; Age; Sex.

1. Introduction

Within the livestock industry in Nigeria, small ruminants represent a very important national resource. Uda sheep is one of such small ruminant and is most predominantly found in the Northern part of the country. Sheep are reared primarily for meat and play significant socio-economic roles in the lives of rural dwellers [1]. Uda Sheep like other small ruminants are reared mainly for four functions: meat, milk, skin and wool, according to order of importance [2]. The Uda sheep coat colour usually consists of short, coarse and straight hair. The classical hair coat colour of the Uda is dark head and forequarters or brown head and forequarters, with white hindquarters and droopy ears [3, 4]. This variation in coat colour could be genetic. Animal genetic resources are components of biological diversity and are important in meeting the food requirement of countries of the world [1]. The relative contribution of livestock to agricultural gross domestic product (GDP) is higher in the developed regions but the trend has been slightly downwards over the past 30 years, whereas in most developing regions, there has been a rise in the importance of livestock [5]. 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 [6]. Size and conformation are important characteristics in meat animals especially ruminants. Traditionally, animals are usually assessed visually, which is a subjective method of judgment [7]. 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. Body measurements and live weights taken on live animals have been used extensively for a variety of reasons both in experimental work and in selection practices [8]. Body measurements have been used to evaluate breed performance and to characterize animals. In addition, they have been used as a means of selecting replacement animals [9]. This study was designed to check the effect of age, sex and correlation among the phenotypic traits of Uda breed of sheep in Maiduguri and its environs.

2. Materials and Method

2.1. 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 [10].

*Corresponding Author

2.2. Management System

The animals are managed under extensive management which they are subjected to the traditional extensive management 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 (*Andropogon gayanus*), Stylo (*Stylosanthes gracilis*) and Leucaena (*Leucaena leucocephala*). 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 [1].

2.3. Phenotypic Differentiation Uda Sheep

A total of 255 (122 males and 133 females) Uda sheep were randomly sampled from the population. The parameters measured were body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HL), head wide (HW), ear length (EL), horn length (HRL), horn circumference (HRC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLD) and neck length (NL). The weight (Kg) was measured by using glasfiberband with model number WJ515 and the height measurement (cm) was done using a graduated measuring rule. This was achieved by placed the animals on a flat ground and held by two field assistants. The length and circumference measurements (cm) were carried out using a tailor tape and a wooden ruler. 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 outline [1].

2.4. Statistical Analysis

The data set was analyzed using SAS [11]. The fixed effects of sex and age on linear body measurements were tested using linear model given as:

Yij=μ+Si + Aj+eij

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

μ = overall mean;

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

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

eij=random residual error associated with record of each animal

Data collected were also subjected to Pearson Correlation Analysis analysis using SPSS (2015) version to determine the phenotypic correlation of values among the phenotypic traits.

Figure-1. 8 month female Uda sheep

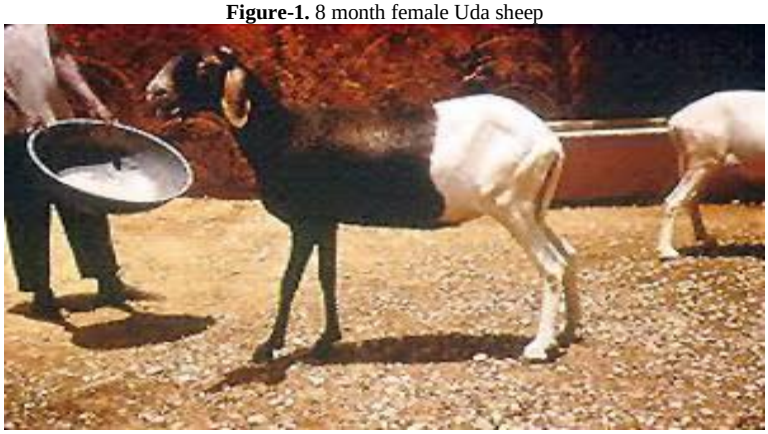


Figure-2. Mature Male and Female Uda sheep

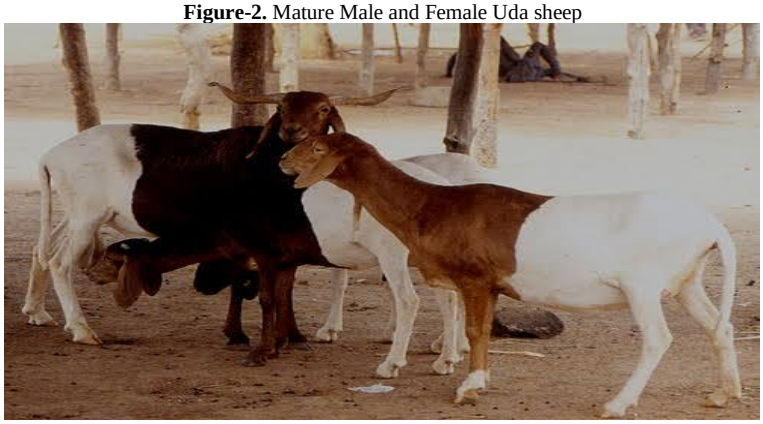
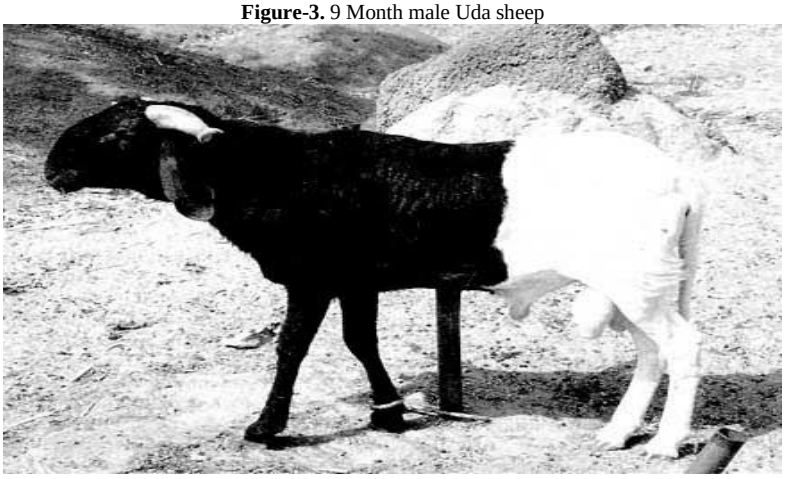


Figure-3. 9 Month male Uda sheep



3. Results and Discussion

The results of the effect of sex on phenotypic traits of uda sheep are presented in Table 1. HRL, HRC and HDW showed significant (P<0.005) different. HRL and HRC are higher in male while HDW is high in female. This finding agreed with the report of Agaviezor, *et al.* [12]. Although, other phenotypic traits showed non-significant (P>0.005) different but RW and RL are slightly higher in female. This could be as a result of their well-developed pelvic girdle, an adaptive feature of female animals for conception and parturition Female animals require wide pelvic girdle to allow for easy pass of the fetus during parturition. This finding agreed with report of Adejoro and Salako [13] while disagreed with the report of Birteeb, *et al.* [14] in which males were superior to females in all the body measurements. The results of the effect of age on body parameter of uda sheep are presented in Table 2. The result showed significant (P<0.005) different on all the phenotypic traits except HL, EL, RL, RW, HRL and HRC are non-significant (P>0.005) different, although they are statistically the same but showed slight increase with increase in age. Age has effect on morphological parameters of uda sheep as Increase in age lead to increase in the value of morphological parameters. This could be termed as growth. This result agreed with the reports of Maria, *et al.* [15] and Musa, *et al.* [16] who opined that factors such as sex, age, and herd have effect on body weight

The results of Summary of statistic of phenotypic traits of uda sheep are presented in Table 3. The coefficient of variation (CV) ranges from 49.54 – 7.68. The highest CV value was recorded in HRL and the least in HW. The variations in the phenotypic traits recorded in this study could be exploited for selection, improvement and conservation within and between breeds. This finding corroborated with the report of Agaviezor, *et al.* [12]. Also phenotypic traits variations could be use in providing a basis for understanding flock structure and variation due to environment although, more applicable to livestock management. This concord with the report of Gizaw, *et al.* [17] who opined that morphological description is an essential component of breed characterization that can be used to physically identify, describe, and recognize a breed, and also to classify livestock breeds into broad categories. The results of phenotypic correlation of uda sheep are presented in Table 4. The result showed both positive and negative correlation among phenotypic traits of uda sheep. The result revealed negative correlation between BW and BL, BW and HW, and TL and BW this disagreed with the findings of Boubekeur, *et al.* [18]. while high positive significant (P<0.005) correlations was between BW and CC (r=0.99), BW and FLG (r=0.61), HW and EL (r=0.53), HW and HRL (r=0.84), HW and HRC (r=0.87), CC and EL (r=-0.59), CC and RL (r=0.68), also TL showed High, positive and significant (P<0.005) correlations between with RW (r=0.58), HR (r=0.75), FLG (r=0.59), HLG (r=0.91) and NL (r=0.61). High degree negative correlation showed recorded between BW and EL (r=-0.60) while low degree correlation showed between BW X BL (r=-0.19), BW X HW (r=-0.3), BW X HRL (r=-0.02), BW X HRN (r=-0.36), BW X TL (r=-0.28), BW X HLG (r=-0.13) and BW X NL (r=-0.41). BL X TL (r=-0.15) and BL X CC (r=-0.19). The positive correlation signifiers that they are controlled by same gene, which implies that improvement for any of these phenotypics traits that are positively correlated, may lead to improvement in the others phenotypic traits. This could also be an indication that any of these body dimension could serve as a predictor of body weight [19]. The negative correlation observed in the present study may imply that an improvement in one trait may lead to with a decrease in the other Fajemilehin, *et al.* [20].

Table-1. Effect of sex on body parameters of uda sheep

Traits	Male	Female	SEM
BW	59.08	56.17	6.67
BL	51.31	49.37	5.78
HW	79.17	79.34	5.04
CC	81.41	76.71	8.76
HL	21.75	23.13	1.89
HDW	11.09[b]	13.04[a]	1.43
EL	21.84	23.21	2.00
TL	45.00	43.29	3.16
RL	18.75	18.92	3.33
RW	15.19	16.63	2.17
HR	73.34	72.25	4.30
FLG	54.09	53.33	2.61
HLG	63.31	63.92	4.07
NL	34.19	31.79	3.26
HR L	18.02[a]	8.33[b]	5.63
HR C	13.04[b]	6.33[b]	3.34

SEM=standard error mean, a ,b,c Means within the same column carrying different superscripts differ significantly (P<0.05), ** p <0.05 significant*

Table-2. Effect of age on body parameters of uda sheep

Traits	<1years	1 Years	>2years	SEM
BW	41.78[b]	56.64[a]	63.20[a]	4.88
BL	43.89[b]	51.90[a]	50.86[a]	3.01
HW	73.83[b]	79.14[a]	80.40[a]	2.77
CC	67.93[b]	79.57[a]	84.18[a]	4.62
HL	21.44	21.60	22.14	1.46
HDW	11.17[ab]	11.75[a]	10.14[b]	0.73
EL	21.22	22.35	23.14	1.65
TL	42.50[b]	44.05[ab]	48.14[b]	3.30
RL	16.17	19.15	20.71	2.16
RW	14.50	15.80	16.43	1.56
HR	67.83[c]	73.30[b]	76.29[a]	1.91
FLG	51.72[b]	54.40[a]	53.86[ab]	1.77
HLG	59.28[b]	64.40[a]	66.43[a]	2.50
NL	29.22[c]	34.25[b]	38.29[a]	1.94
HR L	9.00	10.92	11.13	3.01
HR C	7.67	8.00	9.00	1.82
SC	21.08[b]	29.33[a]	31.00[a]	3.15

SEM=standard error mean, a ,b,c Means within the same column carrying different superscripts differ significantly (P<0.05), ** p <0.05 significant*

Table-3. Summary of statistic of body parameter of uda sheep

Trait	Mean	Min	Max	CV
BW	60.87	37.37	84.00	23.50
BL	52.80	42.00	66.00	11.02
HW	81.12	68.00	91.00	7.68
CC	82.12	67.00	95.00	10.26
HL	23.90	16.00	71.00	40.67
HDW	12.31	10.00	22.00	14.74
EL	24.11	18.00	32.00	13.63
TL	45.62	33.00	65.0	14.84
RL	22.18	17.00	29.00	15.15
RW	16.42	11.00	21.00	18.11
HR	74.85	63.00	88.00	8.79
FLG	53.93	44.00	68.00	9.41
HLG	62.98	55.00	78.00	7.91
NL	31.51	24.00	39.00	10.91
HR L	21.07	2.00	38.00	49.54
HR C	12.81	2.00	21.00	41.52
SC	29.33	21.0	39.00	17.42

CV=coefficient of variation, max=maximum, min=minimum

Table-4. Phenotypic correlation of Uda Sheep

	BW	BL	HW	CC	HL	HDW	EL	HRL	HRC	TL	RL	RW	HR	FLG	HLG	NL
BW																
BL	-0.19															
HW	-0.03	0.27														
CC	0.99**	-0.19	-0.07													
HL	0.29	0.25	0.72**	0.28												
HW	0.23	0.31	0.12	0.24	-0.27											
EL	-0.60*	0.53	0.54	-0.59*	0.55	-0.31										
HRL	-0.02	-0.20	0.84**	-0.04	0.49	0.15	0.31									
HRC	-0.36	0.01	0.87**	-0.41	0.55	-0.23	0.62*	0.82**								
TL	-0.28	-0.15	-0.44	-0.25	0.09	-0.83**	0.33	-0.42	-0.16							
RL	0.71*	0.21	0.54	0.68*	0.87**	-0.04	0.11	0.30	0.22	-0.15						
RW	0.42	0.15	0.03	0.44	0.71**	-0.52	0.28	-0.18	-0.09	0.58*	0.70*					
HR	0.25	-0.22	-0.01	0.26	0.62*	-0.79**	0.27	-0.04	0.08	0.75**	0.51	0.89**				
FLG	0.61*	-0.29	-0.43	0.63*	0.27	-0.47	-0.25	-0.40	-0.48	0.59*	0.43	0.81**	0.80**			
HLG	-0.13	-0.12	-0.07	-0.11	0.48	-0.89**	0.49	-0.11	0.15	0.91**	0.22	0.76**	0.93**	0.62*		
NL	-0.41	-0.32	0.31	-0.40	0.45	-0.73*	0.63*	0.44	0.62	0.61	0.03	0.32	0.64	0.13	0.77	

** p <0.05 significant, **P<0.005 highly significant,* body weight (BW), body length (BL), height at wither (HW), chest circumference (CC), head length (HL), head wide (HDW), ear length (EL), horn length (HRL), horn circumference (HRC), tail length (TL), rump wide (RW), rump length (RL), height at rump (HR), foreleg (FLG), hind leg (HLG) and neck length (NL)

4. Conclusion

The study concluded that age and sex had effect on the phenotypic parameters of uda sheep. The CV showed high in HRL and least in HW. This could be exploited for selection and improvement of uda sheep. The correlation revealed both positive and negative values. This is an indication that traits that are positively correlated are controlled by same gene while traits that are negatively correlated are controlled by separate gene. This will initiate a selection and breeding programme for the improvement of Nigerian uda sheep. The overall benefit will increase the productivity of Nigerian sheep, and thereby improving the income of livestock farmers.

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