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Phenotypic Characterization of Balami Breed of Sheep in Maiduguri, North-Eastern Nigeria

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Target Audience: *Animal Breeders, Academia, sheep industries*

Abstract

A total of 227 Balami breeds (50 males and 177 females) were randomly sampled from the population of Balami sheep for body characterization. The study evaluated morphometric characteristics of Balami sheep to check the effect of age, sex, correlation and descriptive statistics The morphometric characteristics evaluated were; body weight (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), height at rump (HTR) and neck length (NL).The result revealed that age has significant ($p<0.005$) effect on morphometric characteristics of Balami sheep. Increase in age lead to increase in morphometric characteristics. Sex also has significant ($p<0.005$) influence on morphometric traits. Male shows superiority over female in HDW, EL, TL, FLG, HLG, NL RL, HTR, HNL and HNC. Females were high in HW and CC. Skeletal measurements such as wither height, and chest circumference are less affected by nutrition and thus indicate inherent size better than measures related to muscle and fat deposition such as girth measurements and body weight. The phenotypic correlation of morphometric characteristics of Balami sheep in this study varied in magnitude and direction. 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..

Key words: Balami, Phenotypic, Characterization, sheep

Description of Problem

Phenotypic characterization is important in breed identification and classification in ways that both research scientists and farming communities can relate with (1). Body measurements have also been used to assess type and function in beef and dairy cattle, sheep and goats and the animal's value as a potential breeding stock (2, 3). Characterization of Farm Animal Genetic Resources (FAnGR) encompasses all activities associated with the identification, quantitative and qualitative description, and documentation of breed populations and the natural habitats and production systems to which they are or are not adapted (4). The characterization of domestic animal diversity is essential to meet future needs in Nigeria and sub Saharan Africa in general. Comparison or characterization based on morphological properties can provide to some extent a reasonable representation of the differences among the breeds, though not exhaustive, it serves as the foundation upon which DNA analysis can be built (5). Knowledge of morphometric characteristics marks the first step in classification of FAnGR (6). The Balami sheep is the largest breed of sheep in

Nigeria. It is predominantly white and hairy, has pronounced convex head and a dewlap-like fold of skin with white mane (7). This sheep breed has large and droopy ear, long tails which touches the hock. It has a year-round reproduction and is a favoured stall-fed breed. It has been classified as a meat type breed (8There is however, paucity of information on morphometric characterization and relationship among morphometric variables of Balami breed of sheep. Thus, this study help to increase the knowledge about morphometric characterization of Balami sheep in Nigeria in order to have an objective planning, selection and breeding programmes.

Materials and Method

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 vegetational 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 and Sur vey (9).

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 (*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 (10).

Morphometric Variables of Balami Sheep

A total of 227 (50 males and 177 females) Balami breed of sheep in the same age group 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), height at rump (HTR) and neck length (NL). The bodyweight (Kg) were measured by using of weighing scale with model number WJ515 and the height measurement (cm) was done using a graduated measuring stick. 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 a measuring 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 outlined by(10).

Statistical Analysis

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

$Yij=\mu+ Si + Aj + eij$

Where Y_{ij}= 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 using (11)version

to determine the phenotypic correlation values among the phenotypic traits.

Results and Discussion

The results of effect of age on body traits of Balami breed of sheep is presented in Table 1. BL, HDW, RL and RW showed significant ($P<0.05$) difference. The value of BL for <1 year, 1 year and >2 years were 46.28, 51.80 and 53.00cm respectively. Similarly, HDW for <1, 1 and >2 years were 70.00, 77.20 and 79.83cm respectively. The same trend was observed in RL and RW with the values of 17.14 and 15.28cm, 20.00 and 18.20cm and 23.00 and 18.50cm for <1, 1 and >2 years respectively. This was also observed in TL with the values of 38.00, 47.60 and 48.83cm respectively. Although other parameters that were statistically the same also follow the same trend with increase in age of Balami breed of sheep. These findings agreed with the result of(1) who reported that the general positive influence of age of animals on body size and weight is not surprising since the size and shape of animals were expected to increase with increasing age of the animals.

The effect of sex on body traits of Balami sheep is presented in Table 2. The body traits were significantly ($p<0.005$) influence by sex. TL, RL, RW, FLG were higher in female than what obtained in male Balami breed of sheep in this study which is in accordance with the result of (1). The superiority of RL and RW in female could be as a result of their well-developed pelvic girdle, an adaptive feature of female animals for conception and lambing. Female animals require wide pelvic girdle to allow for easy pass of the fetus during lambing (1). HNL, HNC, NL and HDW were higher in male than female in this study. The superiority of male over female in some of the body trait could be as a result of secretion of testosterone hormone which is secreted in male animal. Although some female balami breed showed presence of horn, this is one of the criteria that most of the farmers in Maiduguri considered as a sign of good mothering ability. This view by the local farmers in Maiduguri should be taken into consideration by animal breeders to ascertain this fact. There are findings that reported that the skeletal measurements such as wither height, and chest circumference are less affected by nutrition and thus indicate inherent size better than measures related to muscle and fat deposition such as girth measurements and body weight (12, 13,14).

The result of the summary of statistics on body traits of Balami sheep is presented in Table 43. The value of coefficient of variation (CV) from this study ranges from 49.53 – 7.68. The highest CV value is from HNL (49.53) and the least is HW (7.63). The coefficient of variation indicated high to low variation within the body traits. The variations that exist in the body traits of Balami breed showed possibility of respond to selection and improvement. Phenotypic correlation of the morphometric traits is presented in Table 4. The result showed that morphometric traits of Balami sheep correlated positively with the bodyweight except HDL is negatively correlated, although some parameters showed low degree of correlation. The phenotypic correlation among the traits showed both positive and negative correlation with low and high degree of values among the variables. The positive correlation signifies that they are controlled by same gene and similarly it is an indication that any of these body dimensions could serve as a predictor of body weight. This result agreed with the report of(15). 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) (16).

Table 1: Effect of age on morphometric traits of Balami breed of sheep

TRAITS	<1YEARS	1 YEARS	>2YEARS	SEM
BW	48.14	51.80	53.50	15.85
BL	46.28[b]	51.80[a]	53.00[a]	3.54
HDW	72.00[b]	77.20[ab]	79.83[a]	7.76
CC	74.83	77.00	78.83	3.86
HDL	20.00	20.80	21.83	7.88
HW	10.42	12.00	12.83	2.02
EL	16.57	17.80	18.41	2.83
TL	38.00[b]	47.60[a]	48.83[a]	2.63
RL	17.14[b]	22.00[a]	23.00[a]	4.86
RW	15.28[b]	18.20[a]	18.50[a]	1.79
HTR	64.71	71.16	71.40	6.21
FLG	49.57	49.80	55.16	4.06
HLG	57.00	59.83	62.80	3.34
NL	28.80	29.14	34.33	6.58
HNL	16.50	25.50	27.00	6.13
HNC	10.00	13.00	14.00	3.65
SC	24.50	24.50	26.67	7.84

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 on morphometric traits of Balami breed of sheep

TRAITS	MALE	FEMALE	SEM
BW	59.72	61.43	10.23
BL	52.27	53.89	4.20
HW	81.03	82.50	4.45
CC	80.32	83.00	5.96
HDL	23.72	24.00	6.96
HDW	13.28[a]	11.88[b]	1.21
EL	24.44	23.95	2.35
TL	50.33[a]	43.33[b]	4.23
RL	23.61[a]	21.48[b]	2.20
RW	16.89	16.18	2.11
HTR	75.94	74.32	4.67
FLG	55.94[a]	52.97[b]	3.49
HLG	65.78[a]	61.62[b]	3.28
NL	33.72[a]	30.44[b]	2.19
HNL	24.25[a]	2.00[b]	4.90
HNC	14.61[a]	2.00[b]	2.04
SC	29.33	27.09	3.62

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 of statistics on morphometric traits of Balami breed of sheep

Trait	**Means ± S.E**	Min	Max	CV
BW	60.87±1.92	37.00	84.00	23.50
BL	52.80±0.78	42.00	66.00	11.01
HW	81.50±0.84	68.00	91.00	7.68
CC	82.12±1.13	67.00	95.00	10.25
HDL	23.90±1.31	16.00	71.00	40.67
HDW	12.30±0.24	10.00	22.00	7.68
EL	24.10±0.44	18.00	32.00	13.63
TL	45.61±0.91	33.00	65.00	14.84
RL	22.18±0.45	17.00	29.00	15.10
RW	16.41±0.40	11.00	21.00	18.10
HTR	74.85±0.88	63.00	88.00	8.79
FLG	53.92±0.68	44.00	68.00	9.41
HLG	62.98±0.67	55.00	78.00	7.91
NL	31.50±0.46	24.00	39.00	10.90
HNL	24.10±2.27	2.00	38.00	49.53
HNC	21.07± 1.16	2.00	21.00	41.52
SC	29.33 ±1.20	21.00	39.00	17.42

CV=Coefficient of Variation, Max=Maximum, Min= Minimum, 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 of morphometric traits of Balami breed of sheep

	BW	BL	HW	CC	HDL	HDW	EL	HNL	HNC	TL	SC	RL	RW	HTR	FLG	HLG	NL
BW																	
BL	0.81**																
HW	0.78**	0.76**															
CC	0.96**	0.82**	0.84**														
HDL	-0.06	-0.11	-0.07	-0.06													
HDW	0.168	0.37**	0.36**	0.18	0.18												
EL	0.28*	0.41**	0.49**	0.37**	-0.12	0.53**											
HNL	0.17	0.30	0.61**	0.14	0.72**	0.39	0.11										
HNC	0.08	0.26	0.58**	0.02	0.60**	0.46*	0.09	0.96**									
TL	0.27*	0.29*	0.09	0.11	-0.02	0.52**	-0.04	0.35	0.43								
SC	0.53*	0.48*	0.58*	0.54*	0.92**	0.50*	0.30	0.87**	0.82**	0.48*							
RL	0.54**	0.56**	0.73**	0.53**	-0.08	0.52**	0.27	0.56*	0.68**	0.41**	0.31						
RW	0.63**	0.58**	0.79**	0.67**	-0.11	0.41**	0.36**	0.13	0.10	0.26	0.39	0.86**					
HTR	0.18	-0.04	0.28*	0.15	0.46**	0.29*	-0.02	0.63**	0.54*	0.12	0.83**	0.31*	0.29*				
FLG	0.45**	0.38**	0.77**	0.50**	-0.01	0.46**	0.44**	0.57**	0.47*	0.13	0.72**	0.75**	0.83**	0.57**			
HLG	0.50**	0.51**	0.80**	0.54**	-0.05	0.59**	0.49**	0.59**	0.53*	0.31*	0.73**	0.82**	0.88**	0.45**	0.95**		
NL	0.40**	0.37**	0.58**	0.38**	0.15	0.49**	0.04	0.78**	0.78**	0.32*	0.78**	0.75**	0.60**	0.57**	0.72**	0.75**	1

*Significant ($p<0.05$), ** Highly Significant ($p<0.01$) 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

1. Age and sex have great influence on body traits of balami sheep. Increase in age leads to increase in body traits,.
2. Sex also influence body trait of balami breeds. Female were high in RL and RW which is an adaptive feature of female animals for conception and lambing.
3. The high CV obtained for some traits shows that there could be more room for improvement of such traits in Balami breeds.
4. The correlation coefficients obtained in this study could be used in designing a selection and breeding plan in Balami sheep breed in developing countries like Nigeria.

References

1. Adejoro, F. A. and Salako, A. E. (2012). Morphobiometric characterization of the Balami sheep of Nigeria. *African Journal of General Agriculture*, 8(4):169 173.
2. Alderson, G. L. H. (1999). The development of a system of linear measurements to provide an assessment of type and function of beef cattle. *Animal Genetic Resources Information*. 25:45-56.
3. Salako, A E. (2006). Application of Morphological indices in the Assessment of Type and Function in Sheep. *International Journal Morphology*, 24 (1): 13-18
4. Gizaw, S., Komen, H., Hannote, O., Van, A. J. A. M., Kemp, S., Haile, A., Mwai, O. and Dessie, T. (2011). Characterization and conservation of indigenous sheep genetic resources: A practical framework for developing countries. ILRI Research Report No 27. Nairobi, Kenya.
5. Crepaldi, L., Gasperini, S., Lapinet, J. A., Calzetti, F., Pinardi, C., Liu, Y. and Zurawski, S. (2001). Up-regulation of IL-10R1 expression is required to render human neutrophils fully responsive to IL-10. *Journal of Immunology* 167: 2312-2322.
6. Delgado, J. V., Barba, C., Camacho, M. E., Sereno, F.T.P.S., Martinez, A. and VegaPla, J. L. (2001). Livestock characterisation in Spain. *AGRI*. 29:7-18.
7. Adu, I. F. and Ngere, L. O. (1979). The indigenous sheep of Nigeria. *World Review of Animal Production.* 15(3):51–62.
8. Wilson, R. T and Payne, W. J. A. (1999). An introduction to animal husbandry in the tropics. London, UK. Blackwell Sciences. Ed 5. 413pp
9. Borno State Ministry of Land and Survey(BMLS), (2016). Annual Report 15-58.
10. Yakubu, A. and Ibrahim, A. I. (2011). Multivariate analysis of morphostructural characteristics in Nigerian indigenous sheep. *Italian Journal of Animal Science* 10(2):46-52
11. Statistcal Package for Social Sciences . (2015)
12. Lawrence, T. L. J. and Pearce, J. (1964). Some effects of wintering beef cattle on different planes of nutrition. I: Liveweight gain, feed consumption and body measurement changes during the winter period and the subsequent grazing period. *Journal of Agricultural Science (Cam)*, 63:5-20.
13. Kamalzadeh, A., Koops, W. J. and Van Bruchem, J. (1998). Feed quality restriction and compensatory growth in growing sheep: Modelling changes in body dimensions. *Livestock production science*, 53:57-67
14. Yunusa, A. J., Salako, A. E. and Oladejo, A. O. (2013). Morphometric characterization of Nigerian indigenous sheep using multifactorial discriminant

analysis. *International Journal of Biodiversity and Conservation*, 5(10): 661-665

15. Yakubu, A. and Ayoade, J. A. (2009): Application of principal component factor analysis in quantifying size and morphological indices of domestic rabbit. *International Journal of Morphology*, 27 (4): 1013-1017
16. Fayeye, T. R. (2014). *Genetic principles and animal breeding*. Happy Printing Enterprises, Ilorin, Nigeria.