

SEXUAL DIMORPHISM IN MORPHOLOGICAL CHARACTERISTICS OF TWO NIGERIAN INDIGENOUS GOAT BREEDS

C. ALPHONSUS^{1*}, G. N. AKPA², P. P. BARJE, B. I. NWAGU³, M. ORUNMUYI⁴, I. M. SAM⁵ AND N. P. ACHI³

¹Animal Science Department, Kaduna state University, Kafanchan Campus, Kaduna state

²Animal Science Department, Ahmadu Bello University, Zaria, Nigeria.

³National Animal Production Research Institute, Shika-Zaria

⁴Department of Animal Science, Faculty of Agriculture, Federal University, Oye-Ekiti

⁵Department of Animal Science, Akwalbom State University, ObioAkpa, OrukAnam, Nigeria

*Correspondence: mcdyems@gmail.com: 07035595978

ABSTRACT

The morphological traits of 594 indigenous goats comprised of 316 and 279 Red Sokoto goat (RSG) and West African dwarf (WAD) goats, respectively, were measured to determine the presence or otherwise of sexual dimorphism in the morphological characteristics of the two indigenous goats. The morphological traits measured were body length (BL), withers height (WH), rumps height (RH), heart girth (HG), body depth (BD), tail length (TL), head length (HL), head width (HW), ear length (EL), and horn length (HL). Also recorded were body weight (BW) and sex of each animal. The data collected were analysed using descriptive statistics and Analysis of Variance of fixed effect of sex on the morphological characteristics. The result revealed the presence of marked sexual dimorphism in morphological characteristics of both the RSG and WAD goats. The adult females were significantly ($P < 0.05-0.01$) heavier and larger in size than the males. The respective coefficients of variation (CV) between breeds were high in most of the morphological traits suggesting high heterogeneity, an indication of the amount of opportunity available for improving the breeds through selection.

Key words: Morphological traits, sexual dimorphism, indigenous goats

INTRODUCTION

The need to document indigenous goat breeds prior to strategizing means of their conservation, characterization, and improvement, cannot be overemphasized (Rege and Lipner, 1992; Franklin, 1997; FAO, 2007; Mavule *et al.*, 2013). Several studies have documents morphological measurements of Red Sokoto goats (Hassan and Ciroma, 1990; Akpa *et al.*, 1998) and West African dwarf goats (Ozoje and Hubert, 1987; Yakubu *et al.*, 2010). Cephalic dimensions have also been used as indicator of breeds (Chacon *et al.*, 2011). However, studies on the sexual dimorphism in the morphological characteristics of Nigerian indigenous goats are scarce. Sexual dimorphism is a fundamental morphological component of ruminants and has a bearing on population dynamics, evolution, adaptability as well as breed characterization. Therefore, this study had the objective to determine the existence or otherwise of sexual dimorphism in the morphological characteristics of two Nigerian indigenous goat breeds.

MATERIALS AND METHODS

Morphological traits of 316 Red Sokoto goats (RSG) and 279 West African dwarf (WAD) goats were measured in Kano and Kogi state, respectively. Kano state is located within the Sudan Savannah zone of Nigeria, while Kogi is located within the derived Savannah zone of Nigeria. In each of the two locations, goats were randomly selected and measurements were taken and recorded. A mobile scale was used to determine the body weight of the goats. While different body measurements were taken using flexible measuring tape (with record taken in cm) after restraining and holding the animals in unforced position. The measurement of the body parts were as described by Salako *et al.* (2006) and Mavule *et al.* (2013). The morphological measurements were body length (BL), withers height (WH), rumps height (RH), heart girth (HG), body depth (BD), tail length (TL), head length (HL), head width (HW), ear length (EL), and horn length (HL) were measured. Also

recorded were body weight (BW) and sex of each animal.

Statistical Analysis

The data collected were analysed using descriptive statistics and Analysis of Variance of fixed effect of sex on the morphological characteristics was done by Univariate Analysis of the General Linear Model procedure of SAS (2000).

RESULTS AND DISCUSSION

The study revealed that Red Sokoto goats (RSG) and West African dwarf (WAD) goats have marked sexual dimorphism, as the adult females were shown (Table) to be significantly ($P < 0.05$ - 0.01) heavier and larger in size than the males in both breeds. The females were on average 2.22kg and 5.08kg heavier than the males in RSG and WAD, respectively. This is in contrast to what was observed in sheep whereby the males were larger than the females (Mavule *et al.*, 2013). The differences in the morphological traits between males and females goats may reflect differences in the hormonal secretion and their activities in the two sexes (Manuvele *et al.*, 2013).

Although there was sexual dimorphism in weight and morphological characteristics in both breeds, however there was no significant ($P > 0.05$) sexual dimorphism in the cephalic measurements (HL and HW). The cephalic measurement which were similar in both sexes are of ethnological importance, particularly because its variation is less influenced by environmental factors and management (Cerqueira *et al.*, 2011), probably due to their close association with cranial bones. Thus, they are related to breed origin and characterization based on their head structure. The goats in both breeds can be classified as dilichocephalic (i.e. head length is larger than head width).

The coefficients of variation (CV) in the WAD (14.45 – 55.74%) were relatively higher than those obtained in RSG (6.41 – 25.08%), and indication of higher heterogeneity in the WAD goats. Larger variations shown by higher CVs in most of the morphological traits measured in both breeds are probably results of absence of artificial selection. The indigenous goats have not been subjected to intense selection, hence the within breed variation they portray is as a result of their presumed broad genetic pool. And this

provides opportunity for the improvement of these indigenous breeds through selection.

CONCLUSION

There is high sexual dimorphism in the morphological characteristics of Nigerian indigenous goats whereby the females are heavier and larger in size than the male goats.

REFERENCES

- Akpa, G.N, Duru, S and Amos, T.T (1998). Influence of strain and sex on estimation of within age group body weight of Nigerian Maradi goats from their linear body measurements. *Tropical Agric.(Trinidad)* 75(4):462-466
- Cerqueira J.O.L, Feás X, Iglesia, A, Pacheco L.F, Araújo J. P.P (2011). Morphological traits in Portuguese Bordaleira de Entre Douro e Minho sheep: divergence of the breed. *Animal Production Science* 51: 635-641.
- FAO, (2007). The State of the World's Animal Genetic Resources for Food Agriculture. <http://www.fao.org/docrep/010/a1250c/a1250c00.htm>
- Franklin, I.R., (1997). The utilization of genetic variation. In: *Proceedings of the 19th Conference of the Association for the Advancement of Animal Breeding and Genetics*, vol. 12, pp. 39–47.
- Hassan, A. and Ciroma, A. (1990). Body weight measurements relationship in Nigerian Red Sokoto goats. In: B. Rey, S.H.B Ibbie and L. Reynolds (Eds) *Small Ruminant Research and Development in Africa. Proceedings of the first Biennial Conference of the small Ruminant Research Network. ILRAD, Nairobi, Kenya*, 10-14, December, 1990. ILCA (International Livestock Centre for Africa), Nairobi, Kenya, pp: 428-432.
- Mavule, B.S, Muchenje, V, Bezuidenhout C.C, Kunene N.W (2013). Morphological structure of Zulu sheep based on principal component analysis of body measurements. *Small Ruminant Research* 111: 23-30.
- Rege, J.E.O and Lipner, M.E., 1992. The African animal genetic resources: their characterization, conservation and utilization. In: *Proceedings of the Research Planning Workshop, 19-21 February 1992, ILCA (International Livestock Centre For Africa), Addis Ababa, Ethiopia*, p. 164.
- Yakubu, A., Salako, A.E., Imumorin, I.G., Ige, A.O., Akinyemi, M.O., (2010). Discriminant analysis of morphometric differentiation in the West African Dwarf and Red Sokoto goats. *S. African Journal of Animal Science*. 40, 381–387.

(c) V.I./J.

warf (WAD)		Sexual		Sex
CV	dimorphism	CV	dimorphism	effect
(%)	(f/m)	(%)	(f/m)	
39.85	1.42	**		
17.69	1.16	**		
14.71	1.12	**		
15.07	1.10	*		
16.94	1.13	**		
19.43	1.13	*		
20.48	1.12	*		
15.35	1.11	*		
15.29	1.02	ns		
14.45	1.07	ns		
39.92	0.89	ns		