International Journal of Development and Sustainability
ISSN: 2186-8662 – www.isdsnet.com/ijds
Volume 8 Number 8 (2019): Pages 503-510
ISDS Article ID: IJDS18042602

Phenotypic variations among the West African Dwarf (WAD) sheep in Ijebu province of Ogun State, Nigeria

Yusuph Olawale Abiola [1,2*], Olukoya Kolawole Awobajo [1], Oladapo Oluwaseye Olukomaiya [3], Oluwadamilola Samuel Omotainse [4]

[1] *Department of Agricultural Science Education, College of Science and Information Technology, Tai Solarin University of Education, Ogun State, Nigeria*
[2] *Faculty of Agricultural and Environmental Sciences, Szent Istvan University, Pater Karoly utca 1, Hungary*
[3] *Department of Animal Production and Health, College of Animal Science and Livestock Production, Federal University of Agriculture, Abeokuta, Nigeria*
[4] *Department of Veterinary Pathology, College of Veterinary Medicine, Federal University of Agriculture, Abeokuta, Nigeria*

Abstract

This study involved the assessment of phenotypic variations among West African Dwarf (WAD) sheep in six local government areas of Ijebu province of Ogun State, Nigeria. A total of one hundred and twenty (120) mature WAD sheep comprising of 49 males and 71 females were randomly selected for the study. Animals were randomly selected across 12 locations within six local government areas. Measurements were restricted to apparently healthy (WAD) sheep that conformed to the classification description of the breed. Data on 14 morphometric traits which included horn length, head width, head length, shoulder width, foreleg length, heart girth, body length, paunch girth, rump length, rump width, wither height, tail length, ear length and thorax depth were measured. Data collected were subjected to statistical analysis. Results obtained indicated that location had a significant effect ($P<0.05$) on the body parameters measured. The result revealed the presence of morphological and phenotypic variation within WAD sheep in different local government areas studied. The information obtained in the present study may be useful for phenotypic characterization of Nigerian West African Dwarf (WAD) sheep and could assist farmers and breeders when conducting management, selection and preservation programs.

Keywords: West African Dwarf; Sheep; Nigeria; Phenotypic Variation; Body Measurement

Cite this article as: Abiola, Y.O., Awobajo, O.K., Olukomaiya, O.O. and Omotainse, O.S. (2019), "Phenotypic variations among the West African Dwarf (WAD) sheep in Ijebu province of Ogun State, Nigeria", *International Journal of Development and Sustainability*, Vol. 8 No. 8, pp. 503-510.

* Corresponding author. *E-mail address:* abiolayusuph2@gmail.com

1. Introduction

The human population in Nigeria is estimated to be about 198 million (NPC, 2018), this population is continuously increasing every year. Consequently, this increase has resulted in more demand for animal-derived food products to meet up with the minimum daily animal protein requirement per individual. This inadequate animal protein supply is due to inadequate meat producing livestock which include poultry, goat, cattle, pig, sheep, rabbit, etc. Thus, the need to increase animal protein supply through meat consumption could be achieved through efficient use of promising indigenous animals such as the West African Dwarf sheep (WAD) which are prolific, immunotolerant to most of the endemic diseases (Baker, 1995) and physiological tolerance to the hot humid climate of tropical West Africa (Fadare et al., 2012). Being a vital animal in the history of farming, sheep have a deeply entrenched place in human culture. Their management include overnight housing and tethering by day during the wet season. Some cut and dairy feeding slightly before harvesting their grain crops and allowing them to roam freely in the dry season (Wilson, 1991). The world population of sheep is estimated to be 1.17 billion (FAO, 2015) with 19% found in Asia and Africa. In Nigeria, goats are more numerous than sheep among the domesticated small ruminants as presented in Table 1. The population of sheep in sub-Saharan Africa is estimated at over 158 million and that of Nigeria is over 20.5 million (FAOSTAT, 2000) being owned by rural households, farmers, small-scale business men and women, traders, etc. The Nigerian native sheep breeds are Balami, Uda, Yankassa and West African Dwarf (WAD). They differ considerably in size, coat colour and other characteristics. However, only the first three are well adapted to arid conditions which characterize the Northern part of the country (Adebambo et al., 2000). The WAD sheep is a small-bodied, compact breed which may be all white, black, brown or spotted black or brown on a white coat. Its variation in colour and patchy distribution make it difficult to distinguish clearly from the Yankassa. Adu and Ngere (1979) stated that different types exist, mentioning the 'Pagan' variety on the Jos Plateau and the 'Umuahia' variety near the confluence, but there is no published account of such varieties. WAD sheep are predominantly bred in the humid tropics where majority are reared under the traditional management system. The weight of the adult males is approximately 35 kg and are usually horned. Many African native small ruminant breeds have been characterized by phenotype (Oke and Ogbonnaya, 201l). Morphological characterization of a breed assists in breed description and setting breed standards, thus allowing distinction between breed and strains (Mc Manus et al., 2010).

Table 1. Nigeria livestock population estimates

Species	Number
Chickens	82 400 000
Goats	34 500 000
Sheep	22 100 000
Cattle	13 900 000
Donkeys	900 000
Horses	200 000
Camels	90 000
Other poultry*	31 900 000
Pigs	3 500 000
Rabbits	1 700 000

Guinea pigs	500 000

**Pigeons, ducks, guinea fowls and turkeys*
Source: Bourn et al. (1994)

There is a need to study variations among native breed populations via characters to facilitate their efficient utilization (Salako and Ngere, 2002). Qualitative characters have been used for classification and identification of animal populations (Lauvergne et al., 1996). The ability of the producers and buyers to relate the measurement of live animals to growth characteristics is important for optimal production and value-based trading system. This ability will also effectively reward livestock farmers rather than the middlemen that tend to gain more profit in livestock production business especially in developing countries (Afolayan et al., 2006). A study of linear body measurements on most farms in the tropics is important because most farmers lack weighing scales and the education to understand their manipulations (Gerald, 1994). Previous studies on phenotypic variation among sheep in Nigeria were mainly on three breeds (Balami, Yankassa, and Uda) located mainly in the Northern part of the country. Yakubu et al. (2010) studied genetic and phenotypic differentiation of qualitative traits in Nigerian indigenous goats and sheep in three states in Northern Nigeria. Yakubu and Ibrahim (2011) also reported on multivariate analysis of morphostructural characteristics in Nigerian indigenous sheep in four Northern states. To the best of our knowledge, there is still dearth of information on the phenotypic variation among WAD sheep being the predominant breed in the South-Western part of Nigeria. Therefore, this study aims at studying the phenotypic variation in WAD sheep from different local government areas of Ijebu province in Ogun State, Nigeria.

2. Materials and methods

2.1. Description of study area

The study was conducted in six local government areas (LGA) in Ijebu province of Ogun State, South West Nigeria; two towns in each LGA summing up to 12 randomly selected for sampling. The study areas included Ijebu-Ode and Ijebu-Isiwo in Ijebu-Ode LGA, Itanrin and Abapawa in Odogbolu LGA, Ijebu-Ife and Ijebu-Imushin in Ijebu East LGA, Atan and Ogbogbo in Ijebu North-East LGA, Abigi and Ibiade in Ogun Waterside LGA and Mamu and Ago Iwoye in Ijebu North LGA. The study area lies in the tropical rainforest belt within latitudes 6º 15' and 6º 50' N, longitudes 3º40' and 4º45' E (Agbolade et al., 2008). The temperature is relatively high during the dry season with the mean around 30°C. Low temperatures are experienced during the rains, especially between July and August when the temperatures could be as low as 24°C.

2.2. Animal management and experimental design

A total of one hundred and twenty (120) mature West African Dwarf (WAD) sheep comprising of 49 males and 71 females with different coat colours were randomly selected and used for this study. All the animals were selected using phenotypic parameters. The animals were semi-intensively managed. During the day, the animals roamed about without any form of shelter provided except when the animals decided to rest under a

shade, while at night the animals were housed. Each of the animals selected for measurement was restrained and calmed before measurements were taken to ensure that they were not unnecessarily stressed. The following measurements were taken on each of the animals as described by Adebayo (2009) and Yakubu (2009):

Horn length (cm): Measured from the temple of the head to the tip of the horn.

Head width (cm): Measured between the roots of the horns and the nuchal crest.

Head length (cm): Measured from the tip of the skull at the mouth region to the point where the cervical vertebrae connect to the skull.

Shoulder width (cm): Measured as the distance between the processes on the left shoulder blade and that on the right shoulder blade.

Foreleg length (cm): measured as the distance from the proximal extremity of the colcannon process to the mid-lateral.

Heart girth (cm): The heart girth was measured by taking the measurement of the circumference of the chest.

Body length (cm): Measured as the distance from the occipital protuberance to the base of the tail.

Paunch girth (cm): Measured immediately posterior to the last rib.

Rump length (cm): Measured as the distance from the hip (tuber coxa) to the pin (tuberins chi).

Rump width (cm): Measured as the distance between the two tuber Coxa.

Wither height (cm): A flat platform was used upon which the animal was placed. The height at withers was measured as the distance from the surface of the platform to the withers using a measuring tape.

Tail length (cm): Measured from the base of the tail to the end of' the coccygeal vertebrae.

Ear length (cm): Measured as the distance from the point of attachment to the tip of the ear.

Thorax depth (cm): Measured from the spianus process to the xyphoid process of the sternum.

All measurements were taken in the morning before the animals were fed to avoid feed and water interference in the records. Height (in cm) was measured using a graduated measuring stick, length and circumference (in cm) were measured with a tape rule and the measurement of width was taken using a rope. All measurements were carried out by the same person to avoid any individual variations.

2.3. Statistical analysis

Data collected were analyzed using Statistical Package for Social Sciences (SPSS, 2001 for Windows Version 11.1 SPSS Inc., Chicago, Illinois).

3. Results and discussion

Table 2 presents the total number of sheep sampled per sex in the study areas. Percentage of the female animals was higher than that of males (59.2% and 40.8%, respectively). This may be due to preference of

female animals in the herd than males by the rural farmers to reduce feeding cost and increase efficiency of production as well as multiplication. Most farmers prefer to keep females for breeding purpose while males are rather castrated, fattened and raised up to market weight for sale as meat (slaughtered for festival use or for personal consumption) to generate income for the owners in time of financial need at about the age of not more than two years. The net effect of this act is availability of very few males at age above 2 years. This agrees with the report of Rotimi et al., (2017) who stated that the number of females were higher than that of males when WAD goats were sampled in Bassa local government area of Kogi State, Nigeria.

Table 2. Total number of sheep sampled per sex in the study areas

Location (LGAs)	Number of females	Number of males	Total
Ijebu-Ode	11	9	20
Odogbolu	11	9	20
Ijebu East	10	10	20
Ijebu North-East	12	8	20
Ogun Waterside	14	6	20
Ijebu North	13	7	20
Total	71	49	120
Percentage (%)	**59.2**	**40.8**	**100**

LGAs = Local Government Areas

The morphological traits of WAD sheep according to the study areas is presented in Table 3. There were no significant (P>0.05) differences observed except in horn length, shoulder width, foreleg length, heart girth, body length, rump length, rump width, wither height and tail length. The values obtained in the present study are comparable to those reported by Fajemilehin and Salako (2008) and Rotimi et al. (2017) for WAD goats. The variations in values may be attributed to specie differences between sheep and goat, management system, experimental location, age and sex of the animal. In contrast to the result obtained in the present study, Rotimi et al. (2017) noted that location had no significant effect on morphometric parameters of WAD goats. This observation in the present study is suspected to be due to the type of management system used in the study areas. The animals were semi-intensively managed with little or no feed supplementation as compared to if they had been kept in research stations under better management conditions.

Table 3. Morphological traits of West African Dwarf (WAD) sheep according to the study areas

Traits (cm)	Ijebu-Ode	Odogbolu	Ijebu East	Ijebu North East	Ogun Waterside	Ijebu North	SEM
Horn length	3.65^{b}	2.55^{bc}	4.00^{b}	1.30^{c}	6.45^{a}	7.50^{a}	0.558
Head width	12.93	12.60	13.00	12.55	12.00	12.65	0.094
Head length	22.80	23.40	23.00	22.15	21.05	23.80	0.223
Shoulder width	17.65^{ab}	17.10^{b}	15.10^{c}	17.95^{a}	15.65^{c}	18.30^{a}	0.302
Foreleg length	30.05^{c}	39.05^{a}	37.10^{b}	38.60^{ab}	39.05^{a}	37.45^{ab}	0.783
Heart girth	32.95^{a}	30.80^{b}	28.05^{d}	26.90^{e}	29.30^{c}	28.60^{cd}	0.493
Body length	63.20^{a}	61.30^{b}	58.40^{c}	60.55^{b}	60.60^{b}	59.25^{c}	0.393
Paunch girth	29.15	27.05	25.80	25.45	27.85	28.10	0.327
Rump length	19.00^{bc}	17.75^{d}	18.90^{c}	19.05^{bc}	19.80^{b}	21.50^{a}	0.292
Rump width	25.80^{c}	23.95^{d}	26.35^{c}	25.85^{c}	27.75^{b}	30.10^{a}	0.470

Wither height	52.45 bc	52.40 bc	52.70 b	51.05 c	53.75 b	55.20 a	0.350
Tail length	26.00 d	26.95 d	27.20 cd	27.75 c	29.80 b	39.05 a	1.086
Ear length	11.50	10.05	10.95	10.05	11.50	11.35	0.163
Thorax depth	22.45	22.70	20.55	21.85	21.00	23.20	0.242

a-e Means in the same row with different superscripts are significantly different (P<0.05)

Hall (1991) had reported that WAD sheep and goats are evidently smaller than their northern counterparts. Animals from the south are relatively smaller than those from the central part of the country, but this is more obvious in WAD sheep than in WAD goats Apparently, there is a zone of mixing between the WAD breeds and the northern breeds and it is predicted that this zone will be found to be wider for sheep than for goats. It might be possible that the Yankassa, one of the northern breeds may be connected to WAD sheep. Variations in some morphological traits in different ecological zones could be due to differences in availability of feed resource in terms of quality and quantity, availability of natural grazing area and management conditions which the animals were subjected to (Cam et al., 2010). Ebegbulem et al. (2011) stated that sex did not affect traits measured when WAD goats were studied in Abia state, South East of Nigeria. Age might have influenced some of the parameters measured in the WAD sheep. Heart girth and body weight are environment-dependent and thus, increase with age. Foreleg length is one of the body parameters that are regarded as indicators of characteristic body size and attains about 80% of the expected adult size in less than a year (Salako, 2004).

4. Conclusion

The significance of phenotypic characterization of WAD sheep genetic resources cannot be over emphasized. The result revealed the presence of morphological and phenotypic variation within the WAD sheep in different local government areas studied. The information obtained in the present study may be useful for phenotypic characterization of Nigerian West African Dwarf (WAD) sheep and could assist farmers and breeders when conducting management, selection and preservation programs.

References

Adebambo, O., Williams, J.L., Bloti, S. and Urquhart, B. (2000), "Genetic relationships between native sheep breeds in Nigeria based on microsatellite DNA polymorphisms", *Nigerian Journal of Animal Production*, Vol. 27 No. 1, pp. 1-8.

Adebayo, A.T. (2009), "Application of principal component factor analysis in quantifying size and morphometric traits of West African Dwarf goats in Oyo State", Postgraduate Diploma Thesis, Department of Animal Science, Nasarawa State University, Keffi, Shabu-Lafia Campus, Lafia, Nigeria, p. 39.

Adu, I.F. and Ngere, L.O. (1979), "The indigenous sheep of Nigeria", *World Review of Animal Production*, Vol. 15 No. 3, pp. 51–62.

Afolayan, R.A., Adeyinka, I.A. and Lakpini, C.A.M. (2006), "Prediction of live weight from objective live-dimentional trais in Yankassa sheep", in *Proceedings of the 31st Annual Conference of the Nigerian Society for Animal Production*, March 12th – 15th, 2006, Bayero University, Kano, Nigeria.

Agbolade, O.M., Soetan, E.O., Awesu, A., Ojo, J.A., Somoye, O.J. and Raufu, S.T. (2008), "Ectoparasites of domestic dogs in some Ijebu communities, Southwest Nigeria". *World Applied Sciences Journal*, Vol. 3 No. 6, pp. 916-920.

Baker, R.L. (1995), "Genetics of disease resistance in small ruminants in Africa", in Gray G.D., Woolaston, R.R. and Eaton, B.T. (Eds.), *Breeding for resistance to infectious diseases in small ruminants*, Australian Centre for International Agricultural Research (ACIAR) Monograph Series, No. 34, pp. 118-138.

Bourn, D., Wint, W., Blench, R., and Woolley, E. (1994). "Nigerian livestock resources survey". *World Animal Review*, Vol. 78 No. 1, pp. 49-58.

Cam, M.A., Olfaz, M. and Soydan. E. (2010), "Possibilities of using morphometric characteristics as a tool for body weight prediction in Turkish hair goats (Kilkeci)". *Asian Journal of Animal and Veterinary Advances*, Vol. 5 No. 1, pp. 52-59.

Ebegbulem, V.N., Ibe, S.N., Ozing, P.O. and Ubua, J.A. (2011), "Morphometric trait characteristics of West African Dwarf goats in Abia State, South East Nigeria". *Continental Journal of Agricultural Science,* Vol. 5 No. 2, pp. 1-6.

Fajemilehin, O.S. and Salako, A.E. (2008), "Body measurement characteristics of the West African Dwarf (WAD) goat in deciduous forest zone of South Western Nigeria". *African Journal of Biotechnology*, Vol. 7 No. 14, pp. 2521 – 2526.

FAO (2015), *FAO Statistical Pocketbook World Food and Agriculture 2015*, Food and Agriculture Organization of the United Nations, Rome.

FAOSTAT (2000), *FAOSTAT data*, Food and Agriculture Organization of the United Nations Rome.

Fadare, A.O., Peters, S.O., Yakubu, A., Sonibare, A.O., Adeleke, M.A., Ozoje, M.O. and Imumorin, I.G. (2012), "Physiological and haematological indices suggest superior heat tolerance of white-coloured West African Dwarf sheep in the hot humid tropics. *Tropical Animal Health and Production*, Vol. 45 No. 1, pp. 157-165.

Gerald, W. (1994), *The Tropical Agriculturalist*, Macmillan Press Ltd. London, pp. 54-57.

Hall, S.J.G. (1991), "Body dimensions of Nigerian cattle, sheep and goats". *Animal Science*, Vol. 53 No. 1, pp. 61-69.

Lauvergne, J.J., Dolling, C.H.S. and Renieri, C. (1996), *Mendelian inheritance in sheep (MIS 96)*, Committee on Genetic Nomenclature of Sheep and Goat (COGNOSAG), France. pp. 73-78.

McManus, C., Paiva, S.R., Silva, A.V.R., Murata, L.S., Louvandini, H., Cubillos, G.P.B., Castro, G., Martinez, R.A., Dellacasa, M.S.L. and Perez, J.E. (2010), "Phenotypic characterization of naturalized swine breeds in Brazil, Uruguay and Colombia". *Brazilian Archives of Biology and Technology*, Vol. 53, pp. 583- 591.

National Population Commission (NPC). (2018), http://population.gov.ng/nigerias-population-hit-198m-people-npopc-chairman/ (accessed April 24, 2018).

Oke, U.K. and Ogbonnaya, E.O. (2011), "Application of physical body traits in the assessment of breed and performance of WAD sheep in a humid tropical environment". *Livestock Research for Rural Development. Vol. 23, Article #24.* http://www.lrrd.org/lrrd23/2/oke23024.htm (accessed April 22, 2018).

Rotimi, E.A., Egahi, J.O. and Adeoye, A.A. (2017), "Body characteristics of West African Dwarf (WAD) goats in Bassa Local Government Area of Kogi State". *World Scientific News*, Vol. 69, pp. 179-189.

Salak, A.E. and Ngere, L.O. (2002), "Application of multifactorial structural discriminant analysis in the morphometric structural differentiation of West African Dwarf and Yankassa sheep in South West Nigeria". *Nigerian Journal of Animal Production*, Vol. 29 No. 2, pp. 163-167.

Salako, A.E. (2004), "Maturity rate of some morphometric traits in the West African Dwarf sheep of Nigeria". *Tropical Journal of Animal Science*, Vol. 7 No. 1, pp. 51-55.

SPSS, (2001). *Statistical Package for the Social Sciences*, SPSS Inc., 444 Michigan Avenue, Chicago.

Wilson, R.T. (1991). *Small ruminant production and the small ruminant genetic resource in tropical Africa*. Food and Agricultural Organization of the United Nations, Rome, Italy, No. 88.

Yakubu, A. (2009), "Fixing collinearity instability in the estimation of body weight from morpho-biometrical traits of West African Dwarf goats". *Trakia Journal of Science*, Vol. 7, pp. 61-66.

Yakubu, A. and Ibrahim, I.A. (2011), "Multivariate analysis of morphostructural characteristics in Nigerian indigenous sheep". *Italian Journal of Animal Science*, Vol. 10 No. 2, e17.

Yakubu, A., Raji, A.O. and Omeje, J.N. (2010), "Genetic and phenotypic differentiation of qualitative traits in Nigerian indigenous goat and sheep populations". *ARPN Journal of Agricultural and Biological Science*, Vol. 5 No. 2, pp. 58-66.