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Prevalence and influence of qualitative traits on morphometric traits in West African Dwarf Goat in Oruk Anam Local Government Area of Akwa Ibom State

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ABSTRACT: The study was conducted to assess the prevalence of qualitative traits and their influence on morphometric traits. A total of 499 West African Dwarf (WAD) goats were used comprising of 113 and 386 males and females respectively. The qualitative and morphometric traits were identified and their associations were assessed. The distribution and frequencies of qualitative traits were investigated and scored for presence or absence of wattle (Wa^w or Wa^+), beard (Br^b or Br^+), horn (Ho^+ or Ho^p) were recorded. Four coat colours were observed, the white, white/black, black and mixed colour (white, black and brown). There was a high preponderance of white coat colour (56.51%) followed by white/black (31.06%), the frequencies of black and mixed colour were similar (6.21%). The frequency of wattle was low (0.4%), beard was present in both sexes although a higher frequency was observed in males (56.88%), horn was equally present in both sexes. The presence of wattle had no influence on morphometric traits, whereas goats with beard and horn were significantly ($p < 0.05$) superior in body length, heart girth and height at wither. Sex significantly ($P<0.05$) influenced the morphometric traits measured. The significant effect of beard and horn on morphometric traits in this study suggest that beard and horn may be important factors to consider in making selection and culling decisions in WAD goats.

Key words: Morphometric traits, qualitative traits, WAD goats.

INTRODUCTION

In recent years, goats of different breeds are widely distributed over the territory of Nigeria and due to this; the production of West African dwarf goat has reduced drastically. Goat contributes about 24% of Nigerian meat supply (Oni, 2002) and one of the cheapest sources of animal protein, because of its high fertility rate and quick maturity traits (Jansen and Burg, 2004). They are hardy, small, early maturing, prolific, non-seasonal breeders and plump (Osuagwuh, 1985). West African dwarf goats possess the widest margin for adaptation amongst the ruminants and have quite specific physiological properties that made acclimatization possible. Their coat colour varies from white, brown, black and various combinations of these colours. Not much is known about the inheritance of qualitative traits and possible influence on production performance of livestock generally in Nigeria and perhaps Africa. Most of the efforts at improving performance have been concentrated on the quantitative traits to the neglect of qualitative traits. It is well known fact that cryptochidism is linked with polledness in goat so it is expected that the polled gene will affect reproductive performance (Osuagwuh, 1985).

Qualitative traits are the traits where there is a sharp distinction between phenotypes such as black and white. Some of these traits are polledness, wattle gene, present or absent of beard, coat colour, hair type and sex. Quantitative traits are traits which shows continuous variation, these traits are the sum of several small effect caused by the gene such as body weight, body length, hearth girth, height at wither, body depth, rump height. The use of qualitative genes in poultry, sheep, and goat is gaining wide applications and recognition (Horst,

1988). According to Horst (1988), these qualitative traits may offer a cheaper and indirect method of improving production performance of indigenous livestock. Ijomanta (2012) reported that ewes with wattles tended to have higher prolificacy and higher milk yield than those without. Shongjia et al., (1992) also reported that litter size and milk yield of Wattled Saanen does were significantly higher than non-wattle does. The report of Osinowo et al., (1989) on the effects of coat colour and wattle on fertility and body weight in Yankasa sheep though not conclusive tended to be positive. According to Oseni et al., (2006) varied expression of qualitative traits may represent some adaptive mechanism related to adaptation and survival for these goats. The morphometric criteria generally used to classify West African dwarf goats are height at wither, body length, rump height, heart girth, thorax depth and ear length (Dossa et al., 2007; Sam et al., 2016). Research and development investment to improve the relatively low level of goats' production do not match their importance especially in West African dwarf goat resulting in poor management therefore showing low production yield. Adequate attention given to these qualitative traits in West African dwarf goat in relation to their influence on production will aid in good management and breeding therefore increasing their production capacity.

Although some researches have been carried out on the influence of qualitative traits on production, they are mostly centralized and focused on research institutions and universities without major consideration on the actual population of the animal. Therefore, the objective of this work was to determine the prevalence of qualitative traits and their influence on morphometric traits in West African Dwarf goats.

MATERIALS AND METHOD

Study area

The study was carried out in the three districts that make up Oruk Anam Local Government Area in Akwa Ibom State. Akwa Ibom is a coastal state located between latitudes $5^0$17'N and $5^0$27'N and longitudes $7^0$27'N and $7^0$58'E with an annual rainfall ranging from 3500 to 5000 mm and average monthly temperatures of 25^0C, with a relative humidity between 60 to 90%. It is a tropical rain forest zone of Nigeria (Wikipedia, 2017).

Animal management

Population survey of WAD goat was carried out from August to December 2016. A total number of 499 Goats consisting of 386 females and 113 males were sampled. The animals were between the ages of 1 to 4 years determined using dentition methods as described by Hassan and Ciroma 1990. The Goats were managed under semi-intensive system. They were fed supplemental feed such as kitchen wastes, cassava peels, yam peels, cocoyam peels, seed cakes in the mornings before being released to scavenge for the bulk of feed. The animals were however housed in the night.

Measurements/observation of physical parameters

The measurement and observation of physical traits were carried out, which lasted for a period of five months (August to December). Instruments used for the measurement included; measuring stick, weighing scale and flexible measuring tape (Tailor's tape). The parameters considered were body weight, age, sex, body length, height at withers, body depth and heart girth. The qualitative traits observed include, wattle, beard, coat colour, and presence of horn.

The body measurements were determined using the methods described by Hassan and Ciroma 1990), they included:

Body Weight (BW): The body weight was taken for each goat using a weighing scale in kilograms (kg).

Body Depth (BD): This was measured with a measuring tape as the circumference of the region immediately after the hind-leg towards the abdomen in centimetres (cm).

Rump Height (RH): This was recorded as the distance from the grounds to the rump using a measuring tape in centimetres (cm).

Heart Girth (HG): This was measured as the circumference of the chest using the measuring tape in centimetres (cm).

Height at Wither (HW): This was measured as the distance from the ground level to the wither using a measuring tape in centimetres (cm).

Body Length (BL): This was measured as the distance from the occipital protuberance to the base of the tail in centimetres (cm).

The qualitative traits observed are as follows:

Wattle: On the basis of incidence of wattles (loose fold of bare skin hanging from the throat in goats), animals were categorized into wattled (Wa^W) and non-wattled (Wa^+) goats.

Beard: The goats were scored on the presence (Ho^+) or absence (Ho) of beards.

Horn: The goats were scored on the presence (Br^b) or absence (Br^+) of horn.

Table 1. Descriptive Statistics of Morphometric Traits of WAD Goats.

Characteristics	No	Mean (±SE)	CV(%)	MIN	MAX
BW	499	21.72±0.29	30.11	10.00	49.00
BL	499	56.47±0.26	10.16	35.00	79.00
HG	499	55.70±0.47	18.83	13.00	89.00
HW	499	46.36±0.43	20.75	30.00	95.00
BD	499	65.35±0.39	13.29	35.00	95.00
RH	499	51.74±0.33	14.42	32.00	74.00

BW=Body weight, BL= Body length, HG=Heart girth, HW=Height at wither, BD=Body depth, RH= Rump height, MIN=minimum, MAX=Maximum.

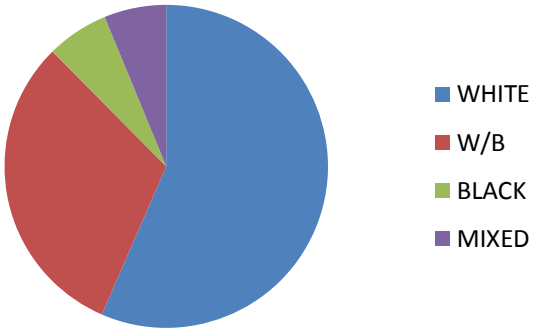

Figure 1. Frequency (%) Distribution of Coat Colour of WAD Goats.

Coat colour: The coat colour was observed and noted as white, black, black/white and mixed colours (mixture of white, black and brown).

Sex: The sex of the goats was observed and noted and this was determined by the presence of the testes for males and the presence of udder for females.

Statistical analysis

The data collected were analyzed using the General Linear Model procedure of SAS (2001) and the significant means were separated by Duncan Multiple Range Test (Steel and Torrie, 1980). Factors considered include; sex, wattle, beard, horn. The statistical analysis for production traits was based on the general linear model below:

$$Y_{ijklm} = \mu + S_j + W_k + B_i + H_m + e_{ijklm}$$

Where; Y_{ijklm} = Measured variable or value of any observation; μ = Overall mean; S_j = Effect of j^{th} sex; W_k = Effect of k^{th} wattle; B_i =Effect of i^{th} beard; H_m= Effect of m^{th} horn and e_{ijklm} = Residual effect/error term.

The distributions of the various qualitative traits were expressed in percentages.

RESULT AND DISCUSSION

Table 1 shows the summary statistics of morphometric characteristics of West African dwarf goat. The average body weight (BW), body length (BL), heart girth (HG), height at wither (HW), body depth (BD) and rump height (RH) were 21.72 kg, 56.47 cm, 55.70 cm, 46.36 cm, 65.34 cm and 51.74 cm respectively. All the morphometric characteristics were moderately variable (18.83 to 30.11) except for body length (BL) which was less variable (10.16).

Figure 1 shows the frequency distribution of coat colour in West African goat. Four coat colour pattern (white, black/white, black and mixed colour) were observed in the goat population studied. Majority of goats in the population were white in colour (56.51%) followed by black/white (31.06%), the black and mixed colour had equal representation and constituted 6.21% each in the population. However, Bemji et al. (2012) observed lower frequency of white coat colour 4.1% in the population of WAD goat sampled. Frequency of occurrence of coat colour variations could differ from place to place, however, this depends largely on cross breeding (Akpa et al., 1998; Yakubu et al., 2010 and Asuku, 2010). The basic coat colours of white, white/black, black and mixed colour (white, black, brown) were also observed by other authors (Odubote, 1994, Ozoje and Mgbere 2002).

The frequency distribution of qualitative traits of West African Dwarf goat as affected by coat colour and sex is shown in Table 2. The occurrence of wattle was of low frequency 0.40% in WAD goat and this was observed only in female goats. The distribution of wattle according to coat colour showed that it occurs only in white goats. Odubote (1994) and Oseni and Ayaji, (2008) had earlier reported frequencies of 69.10% and 64.30% respectively for presence of wattle in WAD. The disparity probably may be due to number of animals sampled in the present study.

Possession of beard in these goats was evident in both sexes, although this is a male trait; a preponderance of the females (56.84%) possessed it. Its occurrence was evenly spread in accordance with distribution of goat in the location and coat colour studied. Yakubu et al. (2010) stated that the occurrence of beard is due to a locus

Table 2. Frequency (%) of the qualitative traits of West African Dwarf goats according to Coat colour and sex.

Trait	Alleles	No	Coat Colour				Sex	
			White	Black/white	Black	Mixed colour	Female	Male
Wattle	Wa^{w}	2	100	0	0	0	100	0
	Wa^{+}	497	56.34	31.19	6.23	6.23	76.68	20.32
Beard	Br^{b}	93	40.86	46.23	8.60	4.30	56.84	43.16
	Br^{+}	406	60.10	27.59	5.67	6.65	85.15	14.85
Horn	Ho^{+}	441	56.46	30.61	6.12	6.80	91.96	8.04
	H^{o}	58	56.89	34.48	6.89	1.72	74.23	25.74

Wa^{w} = wattled; Wa^{+} = non wattled; Br^{b}= presence of beard; Br^{+}= absence of beard; Ho = polled; Ho+ = horned.

Table 3. Mean values **(±SE)** of morphormetric traits according to wattle, beard and horn.

Factor	N	BWT	BL	HG	HW	BD	RH
Wattle	ns	ns	ns	ns	Ns	ns	ns
Wattled	2	21.00±1.00	51.50±5.50	50.50±10.50	40.00±4.00	56.50±12.50	43.00±0.01
Non- wattle	497	21.72±0.93	56.44±0.25	55.72±0.47	46.39±0.43	65.37±0.39	51.77±0.33
Beard		ns	ns	**	**	**	ns
Beard	93	22.45±0.72	55.96±0.53	54.45±1.31	44.20±0.92	64.97±0.84	53.09±0.74
Non- beard	406	21.55±0.32	56.59±0.29	55.99±0.49	46.86±0.48	65.42±0.43	51.43±0.37
Horn		ns	ns	**	**	**	**
Horned	441	21.72±0.32	56.57±0.28	56.17±0.51	46.83±0.47	65.55±0.43	51.52±0.36
polled	58	21.64±0.72	55.69±0.62	52.09±0.92	42.79±0.78	63.67±0.73	53.41±0.81
Sex		**	**	**	**	**	ns
male	113	20.56±0.51	54.51±0.54	51.61±0.95	45.81±0.76	62.25±0.66	51.74±0.70
female	386	22.05±0.34	57.05±0.28	56.89±0.52	46.53±0.51	66.24±8.92	51.76±0.38

BW=Body weight, BL= Body length, HG=Heart girth, HW=Height at wither, BD=Body depth, RH= Rump height, ** = $p<0.05$ significant, ns= not significant.

which is dominant in males and recessive in females. It is a secondary sexual characteristic under male hormonal action; females displaying the traits are likely to have threshold levels of androgenic hormone. However, Rodero et al. (1996) stated that beard is sex independent. The higher frequency of beard in females in this study may be due to the number and ages of male sampled. The occurrence of horns in the studied population was high, 88.37% of the goat sampled possessed horn, and the frequency of females with horn was 91.96% while the males were 8.04%. The higher frequency of horn in females than male in this study could be due to the fact that most females sampled were more matured than males, more so only few mature males were seen in the entire herd sampled. However the phenotypic frequency of horned (88.37%) is higher than the 75% reported in Botswana (Katangole et al., 1996), but differs from reports of Ijomanta (2012) and Yakubu et al. (2010) who reported 100% presence of horn in Red Sokoto goats.

The influence of wattle, beard, horn and sex is shown in Table 3. The result indicates that the incidence of wattles was very low and had no significant effect on any of the morphometric traits measured. This agrees with reports of Asuku (2010) and Ijomanta (2012) who observed low incidence of wattle gene in Red Sokoto goats, but contrary to reports Ozoje and Kadri (2001) who observed that goats with wattle were superior to those without wattle in all the morphometric traits measured.

Beard had significant ($p<0.05$) effect on HG, HW and BD. Goats with beard had wider heart girth, longer height at wither and larger body depth. This finding is in agreement with reports of Ijomanta (2012). Horn similarly had significant ($p < 0.05$) effect on all morphometric traits measured except BWT and BL. Goats with horn were superior to polled in all the traits measured except BW and BL. Horn generally is used by goats for defense, scratch itches and play with other goats. However, little or no information is available on influence of horn on morphometric traits.

The effect of sex on morphometric traits was significant ($p <0.05$) except RH. The female goats were superior to males in all the traits measured except RH which were similar. The results obtained in this study were similar to the work of Asuku (2010) and Ijomanta (2012) who also reported superiority of females over males. Sex has been shown to be important source of variation for body weight

and morphometric traits of goats. This was related to the presence and absence of androgenic hormones in both sexes (Fajemilehin and Salako, 2008). However, Akpa et al. (1998) and Osuhor et al. (2002) reported significant effect of sex on morphometric traits, with the males being superior to the females. The superiority of females in morphometric traits over the males in this study could be due to small population of males that was sampled; only few males were allowed in the herd for breeding purposes, most males were sold out at yearling.

Conclusion

The study has shown that the white coat colour is predominant, the presence of wattle is low, beard and horn present in both sexes. Whereas goats with beard and horn were superior in body length, heart girth and height at wither; wattle had no influence on morphometric traits. Therefore, the significant effect of beard and horn on morphometric traits in this study indicates that beard and horn may be important factors to consider in making selection and culling decisions in WAD goats.

CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

REFERENCES

Akpa, G. N., Duru, S., & 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 measurement. *Tropical Agricultural (Trinidad),* 74, 462-467.

Asuku, O. I. (2010). Haemoglobin Polymorphism and body mensuration characteristics of Red Sokoto goats. *M.Sc. Thesis ABU, Zaria*, Pp. 90-92.

Bemji, M. N., & Popoola, S. A., (2011). A note on the incidence of udder abnormalities in West African Dwarf goat in South Western Nigeria. *Livestock Research for Rural Development*. 23(3), 1-8.

Dossa, L. H., Wollny, C., & Gauly, M. (2007). Spatial Variation in Goat Populations from Benin as Revealed by Multivariate Analysis of Morphological Traits. *Small Ruminant Research,* 73,150-159.

Fajemilehin, O. K. S., & Salako, A. E. (2008). Body measurement characteristic of the West African dwarf (WAD) goat in deciduous forest zone of South Western Nigeria. *African Journal of Biotechnology*, 7(14), 2521-2526.

Horst, H. (1988). Parasite interaction in goats: Is immunoregulation revolved in the control of gastro-intestinal nematodes*? Parasite Immune,* 30, 79-88.

Ijomanta, O. E. (2012). Genetic profile of morphological traits and their association with production capacity of the Red Sokoto Goat in Katsina State of Nigeria. *M.Sc. Thesis ABU, Zaria*, Pp. 90-92.

Jansen, C., & Burg, K. V. D. (2004). Goats keeping in the Tropics. *Agromisa Foundation Wageningen*, Pp. 119-129.

Katangole, J. B. D., Sebolai, B., & Madimabe, M. J. (1996). Morphological characterization of the Tswana goat. In: S.H.B. Lebbie and E. Kagwaini.(ed). *Small Ruminant Research and Development in Africa*- Proc. 3rd Biennial Conference of the African Small Ruminant Research Network, UICC, Kampala, Uganda, 5-9 Dec., 1994. Pp. 43-46

Odubote, I. K. (1994). Characterization of the West African Dwarf goats for certain qualitative traits. *Nigerian Journal of Animal Production,* 21, 37- 41.

Oni, O. O. (2002). Breeds and genetics improvement of small ruminants (goat and sheep). *Proceedings of the Manual for small ruminants' production in Nigeria complied for a training workshop at shika Zaria*, January 13-18, 2002, Pp. 1-7

Oseni, S., Sonaiya, B., Omitogun, G., Ajayi, A., & Muritala, I. (2006). West African Dwarf Goat Production under village conditions: *In: Characterization and the establishment of breed standards. Conference on International Agricultural Research for Development,* University of Bonn, Tropentag. 11 – 13 October.

Oseni, S. O. & Ajayi, B.A. (2008). Body weight and morphological characteristics of WAD goats under backyard units in south western Nigeria. *In proceeding of the 13th annual conference of the Animal Science Association of Nigeria (ASAN),* September, 15-19. 2008, ABU Zaria.

Osinowo, O. A., Olorunju, S. A. S., Otchere, E. O., & Ariji, L.A. (1989). Development of a weight band for Yankasa sheep and Red Sokoto Goats. *14th Annual conference of the Nigerian Society for Animal production* Makurdi, 2nd – 6th April, 1989.

Osuagwuh, A. L. A. (1985). Incidence and control of preweaning mortality and abortion in small ruminants. *In: Small Ruminant Production in Nigeria, Proceedings of National Conf. on Small Ruminant production*, Zaria, Nigeria, October 6-10, 1985, Pp. 239-262.

Osuhor, C. U., Alawa, J. P., & Akpa, G. N. (2002). Research note: Manure production by goat grazing native pasture in Nigeria. *Tropical Grasslands,* 36, 123-125.

Ozoje, M. O., & Kadir, O. A. (2001). Effects of coat colour and wattle genes on body measurement traits in the West African Dwarf Sheep. *Tropical Agriculture* (Trinidad), 78, 118-122.

Ozoje, M. O., & Mgbere O. O. (2002). Coat pigmentation effect in WAD Goats. Live weights and body dimensions. *Nigerian Journal of Animal Production*, 29, 5-10.

Rodero, E., de la Haba, M. R., Rodero, A. Y., & Aterrera, M. (1996). Genetic and phenotypic profiles of Endangered Andalusia Sheep and Goat breeds. *Animal Genetic Resources Information*, 19, 81-85.

Sam, I. M., Ekpo, J., Ukpanah, U., Eyoh G., & Warrie, M. (2016). Relationship between Linear Body Measurement and Live Body Weight in West African Dwarf Goats in Obio Akpa. *Journal of Biology, Agriculture and Healthcare,* 6, 118-124.

SAS Package (2001). SAS user's guide: Statistical Analysis System Institute, Inc. Cary, NC, USA.

Shongjia, L., Xiangmo, L., Gangyl, X., & Shenov, C. (1992). Relationship between physical traits, litter size and milk yield in Saanen, Guanzhong and Crossbred goats. *In Proceedings of the International Conference on Goats,* 1, 83.

Steel, R. G. D., & Torrie, J. H. (1980). *Principles and procedure of statistics: A Biometric Approach*, 2nd Edition.Mc Graw-Hill Book Coy. Inc. New York.

Yakubu, A., Raji, A. O., & Omeje, J. N. (2010). Genetic and phenotypic differentiation of qualitative traits in Nigerian indigenous goat and sheep populations. *Journal of Agriculture and Biological Science,* 5, 58-66.

Wikipedia (2017). The free Encyclopedia. *http*.s:// *en.wikipedia*.org/ wiki/ Akwa – Ibom.