

INFLUENCE OF QUALITATIVE TRAITS ON MORPHOMETRIC TRAITS IN WEST AFRICAN DWARF GOAT IN ORUK ANAM L.G.A. OF AKWA IBOM STATE

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ABSTRACT

A 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). 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 presence in both sexes although a higher frequency was observed in males (56.88%), horn was equally presence 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 indicates that beard and horn may be important factors to consider in making selection and culling decisions in WAD goats.

Keywords: Qualitative traits, morphometric traits, WAD goats.

INTRODUCTION

The West African Dwarf goat (WAD) is the most predominant trypanotolerant breed widely distributed across the rainforest belt of Southern Nigeria. Nigeria's total goat population has been estimated at 53.8 million (FAOSTAT, 2008). They WAD goat are dwarf animals with short legs weighing between 22-26kg adult weight (Ozoje and Mgbere, 2002). The WAD goat shows great differences in conformation, coat colour, presence and absence of horn and beard. As early indicated by Odubote (1994) it exhibit great variation in coat colour, ranging from black, brown, white, pied and mixed colours.

Qualitative traits have been studied as possible indicators of genetic superiority or adaptability with more emphasis on WAD goats (Odubote, 1994; Ebozoje and Ikeobi, 1998; Ozoje and Mgbere, 2002; Adedeji *et al.*, 2011; Bemji *et al.*, 2012). There have been a lot of conflicting reports on relationship between qualitative traits and morphometric traits in small ruminant, Ijomanta (2012) indicated that beard goats had

higher height at wither and body length in Red Sokoto goats. However, Yakubu (2010) reported insignificant differences in live weight and heart girth in the same breed of goats. Colour is known generally to adapt animals in different climatic zones and has been reported to have positive effect on performance of various livestock (Odubote, 1994; Ebozoje and Ikeobi, 1998).

A good number of work have been publish on influence of qualitative traits and performance of WAD goat (Odubote, 1994; Ebozoje and Ikeobi, 1998; Ozoje and Mgbere, 2002; Adedeji *et al.*, 2011; Bemji *et al.*, 2012), most of these work emanated from University farms and Research stations without taking into consideration the large population of goats managed semi-intensively by rural households. Therefore, the aim of this work was to study prevalence of qualitative trait and their influence on productive traits of WAD goat managed by rural households

MATERIALS AND METHOD

Study Area

The study was carried out in the three districts that make up Oruk Anam L.G.A in Akwa Ibom State. Akwa Ibom is located between latitudes 5^o17'N and 5^o27'N and between longitudes 7^o27'N and 7^o58'E with an annual rainfall ranging from 3500mm-5000mm and average monthly temperatures of 25^oC. Akwa Ibom State is a coastal state lying between latitudes 4^o28'N and 5^o3'N and between longitudes 7^o27'E and 8^o20'E with a relative humidity between 60-90%. It is a tropical rain forest zone of Nigeria (Wikipedia, 2017).

Animal Management

The goats which were managed under semi-intensive system were fed supplemental feed such as kitchen wastes, cassava peels, yam peels, cocoyam peels, seed cakes in the mornings (8.00am) before being released to scavenge for the bulk of feed. During the day, the animals were allowed to roam about without any form of shelter except when the animals decided on their own to rest under shade. 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 four months (September 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 obtained includes:

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.

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

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

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

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

Qualitative Traits

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

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:

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

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_l = Effect of l^{th} beard; H_m = Effect of m^{th} horn; e_{ijklm} = Residual effect/error term.

The distributions of the various traits were expressed in percentages

RESULTS AND DISCUSSION

Table 1 shows the frequency distribution of qualitative traits of West African goat as affected by coat colour and sex. 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, Benji *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 (Ozoje and Mgbere 2002, Odubote, 1994).

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 *et al.* (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 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 study revealed the presence of horn in both sexes, with a higher frequency in females (91.96). 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 (Katongole *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 2. 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 are 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 of goats, this was related to the presence and absence of androgenic hormones in both sexes (Fajemilehim 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 sample, 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.

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Table 1: 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 2: Mean values of morphometric 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	**	**	**	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	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

** = P<0.05 significant, ns= not significant