PHENOTYPIC DIFFERENTIATION OF QUALITATIVE TRAITS IN WEST AFRICAN DWARF GOAT CROSS RIVER STATE, NIGERIA

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ABSTRACT
Characterization of livestock breeds using their morphological traits differences is the first step towards the utilization of the available animal genetic resources. Therefore, the study was conducted to evaluate the phenotypic expression of qualitative traits in West African Dwarf goat in Cross River State. Cross River North, Central and South were used for the study. A total of 630 goats (bucks and does) were monitored, comprising 210 goats from each location marked out for the study. Each study location was extended to cover three Local Government Areas and seven villages. Experimental animals were weighed using a 200kg scale while body parts were measured using a 100cm measuring tape. Traits collected were analyzed using Generalized Linear Model (GLM) procedures of GENSTAT 2011 statistical package. The result showed that higher (P<0.05) quantitative traits average values were recorded for goats from the Central compared to those from other zones. Similar values were obtained for goats in the Northern and Southern zones of C.R.S, although those in the South consistently recorded the lowest (P>0.05) values. From the study, there were distinct phenotypic differences among relationships that existed between goat populations in the northern central and southern zones.
Key words: phenotypic, qualitative, traits, dwarf and goat.

INTRODUCTION

Goats (*Capra hircus*) are important livestock in rural communities of Nigeria. The goat flocks in Nigeria is dominated by West Africa Dwarf (WAD) (Kosgey and Okeyo, 2007). Their morphological (external) and production characteristics within a given production environment differ and have important socio-cultural and economic values in Nigeria (FAO, 2012); consequently, majority of the farmers have specific consideration and choices for goat coat colours and body sizes. Characterization of livestock breeds using their morphological traits differences is the first step towards the utilization of the available animal genetic resource (AnGRs) (Muhammed *et al*., 2012). Morphometric measurements have been used to assess the characteristics of different breeds of animals, and could provide direct information on the suitability of animals for selection (Yakubu *et al*., 2010) and for more characterization studies using modern molecular procedures. Body weight and linear body measurements are pertinent parameters to describe growth (Henry *et al*., 2014). Okpeku *et al*. (2011) stated that body measurements in addition to body weight, can give a complete description of an individual or a population. In breed classification and identification, phenotypic characteristics are of great importance. Determination of differences in morphological traits is the first step of the characterization of local genetic resources (Okpeku *et al*. 2011).

MATERIALS AND METHODS

The experiment was carried out using goat populations in three agro-ecological zones of Cross River State in Nigeria namely, North, Central and South. The Local Governments Areas (LGAs) that made up North included: Yala, Obudu and Ogoja. Central include: Abi, Ugep and Ikom, while those in the South include: Akpabuyo, Odukpani and Calabar South LGAs. 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 gamba grass (*Andropogon gayanus*), stylo (*Stylosanthes gracilis*) and leucaena (*Leucaena leucocephala*). Occasionally, feed supplements such as cassava and yam peels, cereal offal and crop residues were provided prior and/or after grazing of natural pastures. Measuring tape was used to take the length and girth measurements and weight of the individual animal was measured using suspended weighing balance having 200 kg capacity with 0.2 kg precision in the morning by the same person to avoid human error and effect of feeding and watering on the animal's size (FAO, 2012). Height measurements were taken using graduated stick.

Prior to taking measurements of various parameters, the animals were restrained and guarded to remain stable.

RESULTS AND DISCUSSION

The results for does (Table 1) showed that body weight, length, rump width, heart girth, cannon bone circumference, sacral pelvic width, ear and neck lengths were influenced (P<0.05) by location while height at wither, rump height, rump length, sternum length, chest depth, paunch girth, cannon bone length, shoulder width, head length, head width and tail length of does were not influenced by the location. Comparisons of averages of traits between populations showed that Cross River South does showed significantly (P<0.05) higher weight with an average of 35.16 ± 1.59 kg and measuring highest heart girth (65.34 ± 2.85 cm) among the different populations. It was observed from the results of the study that goats in Cross River south when compared with Cross River North and Cross River Central does, differed (P<0.05) in eight (body weight, length, rump width, heart girth, cannon bone circumference, sacral pelvic width, ear and neck lengths) of the twenty measured traits. Mean body weight, body length, withers height and chest girth for WAD does in the present study for all locations were not comparable to those reported by Okpeku *et al*. (2011). The differences may be attributed to variation in age of animals used in various studies compared. The results for bucks (Table 2) showed that body weight, rump width, rump length, heart girth, chest depth, paunch girth, cannon bone length, cannon bone circumference, sacral pelvic width, shoulder width, head length, head width, neck length and tail length were influenced (P < 0.05) by location while body length, height at wither, rump height, sternum length and ear length were not significantly (P>0.05) influenced by the location of bucks. The results of quantitative variation indicated higher average values for most of the traits in the Southern bucks, differences observed within bucks from the North showed no differences (P>0.05) for majority of the traits measured but sacral pelvic width and neck length showed differences (P<0.05) between the bucks. Majority of the linear body measurements for Central bucks had lower (P<0.05) values, while those in Northern and Southern Cross River had higher values. The mean values of body length, height at withers, rump height, sternum length and ear length in the three populations were not significantly (P>0.05) different (Table 2).

TABLE 1: Phenotypic traits of does from Cross River North, Central and Southern agro-ecological zones

	Agro-ecological zones								
	North			Central			South		
Traits	Mean	CV (%)	SD	Mean	CV (%)	SD	Mean	CV (%)	SD
BW	34.40^{b}	4.74	1.63	34.36^{b}	5.49	1.89	35.16^{a}	1.59	4.52
BL	52.20^{ab}	8.20	4.28	53.18^{a}	9.77	5.19	51.99^{b}	4.51	8.67
HAW	43.66	7.94	3.46	43.17	8.81	3.80	43.24	4.24	9.94
RH	46.80	7.14	3.34	46.45	9.11	4.23	45.98	3.97	8.63
RW	12.71^{a}	11.18	1.42	13.09^{a}	14.38	1.88	12.25^{b}	1.64	13.43
RL	17.43	7.44	1.30	17.59	10.18	1.79	17.42	1.77	10.18
HG	63.94^{b}	4.60	2.94	64.03^{b}	5.20	3.32	65.34^{a}	2.85	4.36
Sternum	19.68	6.89	1.36	19.61	7.72	1.51	19.80	1.40	7.09
CD	13.77	67.24	9.26	13.05	5.24	1.49	12.91	1.67	4.99
PG	73.53	5.77	4.25	73.58	11.45	3.85	73.18	3.65	12.92
CBL	11.03	13.02	1.44	11.01	14.49	1.60	11.09	1.68	15.20
CBC	8.04^{b}	13.02	1.05	8.50^{a}	12.36	1.05	8.20^{b}	1.03	12.62
SPW	8.69^{a}	19.22	1.67	7.69^{c}	14.89	1.15	8.10^{b}	1.60	19.71
SW	10.30	16.39	1.69	10.10	16.65	1.68	10.10	1.55	15.37
EL	8.80^{a}	11.00	0.97	8.47^{b}	12.53	1.06	8.34^{b}	1.23	14.81
HL	16.92	13.97	2.36	16.61	15.82	2.63	16.87	2.71	16.15
HDW	8.58	10.27	0.88	8.58	9.91	0.85	8.42	1.02	12.12
NL	16.72^{b}	9.10	1.52	17.15^{a}	8.98	1.54	16.98^{ab}	1.44	8.47
TL	10.08	14.46	1.46	9.87	13.20	1.30	9.83	1.38	14.05

BW= Body Weight, BL=Body Length, HAW=Height at Wither, RH=Rump height, RW=Rump Width, RL=Rump Length, HG=Heart Girth, CD=Chest Depth, PG= Paunch Girth, CBL= Cannon Bone Length, CBC=Cannon Bone Circumference,

SPW=Sacral Pelvic Width, SW=Shoulder Width, EL=Ear Length, HL=Head Length, HDW=Head Width, NL=Neck Length, TL=Tail Length, SD=Standard Deviation and CV=Coefficient of Variations. Different superscripts for mean on the same row showed significant (P < 0.05) differences.

TABLE 2: Phenotypic traits of bucks from Cross River North, Central and Southern agro-ecological zones

	Agro-ecological zones								
	North			Central			South		
Traits	Mean	CV (%)	SD	Mean	CV (%)	SD	Mean	CV (%)	SD
BW	29.65[a]	4.55	0.17	28.94[b]	6.04	0.22	29.86[a]	4.72	0.18
BL	48.17	10.23	0.61	47.16	10.14	0.59	46.46	9.62	0.56
HAW	39.72	9.85	0.48	39.93	7.76	0.38	39.21	10.80	0.53
RH	42.92	10.06	0.53	42.96	7.00	0.37	42.04	10.15	.053
RW	11.72[a]	12.98	0.19	10.08[b]	12.13	0.16	11.34[a]	11.27	0.16
RL	16.60[a]	11.06	0.23	15.89[b]	11.71	0.23	17.03[a]	9.05	0.19
HG	58.36[a]	5.35	0.38	57.27[b]	6.31	0.44	58.69[a]	4.21	0.31
Sternum	18.55	9.82	0.22	18.56	12.72	0.29	19.20	8.47	0.20
CD	12.36[ab]	11.88	0.18	11.88[b]	14.26	0.21	12.69[a]	13.13	0.21
PG	68.81[a]	8.24	0.70	66.48[b]	8.66	0.71	69.28[a]	5.66	0.49
CBL	10.78[a]	16.32	0.22	9.54[b]	11.43	0.13	10.50[a]	12.63	0.17
CBC	7.53[b]	10.18	0.09	8.34[a]	12.23	0.13	7.84[b]	12.22	0.12
SPW	8.34[a]	17.47	0.18	7.18[b]	6.35	0.06	7.42[b]	13.78	0.13
SW	9.18[b]	14.38	0.16	9.91[a]	15.52	0.19	9.39[b]	15.30	0.18
EL	8.67	14.43	0.14	8.39	13.25	0.14	8.00	17.11	0.17
HL	15.32[b]	15.32	0.29	16.69[a]	13.83	0.28	15.65[b]	17.34	0.34
HDW	8.34[ab]	12.32	0.13	8.47[a]	11.77	0.12	8.04[b]	9.84	0.10
NL	15.68[c]	11.03	0.21	17.39[a]	8.28	0.18	16.41[b]	8.32	0.17
TL	9.36[b]	13.67	0.16	9.82[a]	13.86	0.17	9.32[b]	12.74	0.15

BW= Body Weight, BL=Body Length, HAW=Height at Wither, RH=Rump height, RW=Rump Width, RL=Rump Length, HG=Heart Girth, CD=Chest Depth, PG= Paunch Girth, CBL= Cannon Bone Length, CBC=Cannon Bone Circumference, SPW=Sacral Pelvic Width, SW=Shoulder Width, EL=Ear Length, HL=Head Length, HDW=Head Width, NL=Neck Length, TL=Tail Length, SD=Standard Deviation and CV=Coefficient of Variations. Different superscripts on the mean values on the same row showed significant (P < 0.05) different.

CONCLUSION

The study showed that there were distinct phenotypic differences among relationships that existed between goat populations in the northern, central and southern locations. Thus, it would be useful to include performance data into characterization studies to understand which locations have comparative advantages within an agro-ecological zone.

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