



EFFECT OF AGE AND SEX ON MORPHOMETRIC MEASUREMENTS OF SAHELIAN GOATS IN FASKARI LOCAL GOVERNMENT AREA OF KATSINA STATE

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ABSTRACT

This research was conducted to determine the effect of age and sex on morphometric measurements and estimate correlation between body weights and morphological traits of Sahelian goat in Faskari Local Government Area, Katsina state. Experimental animals aged from 1-5 years were used for this study and were identified using physical appraisal. Physically healthy of both sexes and non-pregnant goats were sampled. The pairs of permanent incisors in the dentition of the goat were used to determine age, body weight by using bathroom weighing scale (kg), linear measurements using flexible tailor's measuring tape and sex using physical observations. The results obtained, showed that age had significant ($P < 0.05$) effects on RH, EL, HoL and TL, non-significant ($P > 0.05$) effect was found on BW, NL and BL. Sex had significant effect on BW, BL, HG and HoL and non-significant effect ($P > 0.05$) was found on RH, EL, TL and NL. Correlation coefficient between body weight and linear measurement shows that BW was highly correlated ($P < 0.01$) with BL, HG and NL. BW was slightly correlated with RH and it was negatively correlated EL and HoL.

Keywords: Age, Sex, Morphometric Measurements, Sahelian Goat and Faskari Local Government.

INTRODUCTION

Small ruminants are important genetic resources and play a predominant role in the sustenance of the livelihoods of impoverished families especially in the rural areas of tropical countries. Caprine species specifically goats play an important role in the social life of many Africans and supply human population with meat, milk, skin, manure and other products. The Red Sokoto goat (RSG) or Maradi is the most predominant breed and accounts for about 70% of Nigeria's total goat population (Ademosun, 1994). It is commonly found with the agro pastoralist mainly within the northern sub humid and semi-arid zones of the country (Akpa *et al.*, 2001). The Sahel goat is an extant meat and milk type goat in Nigeria (Otoikhian and Orheruata, 2010). It is large in size, predominantly white colour, pied with black or white and brown spots around the ear, nose and udder. Morphometric characteristics are important in breed identification and classification. (Gizaw *et al.*, 2007) stated that morphostructural description of traits remained essential component of characterization that can be used to physically identify, describe and recognize a breed. It also helps in the classification of livestock breeds. The knowledge of morphometric traits aids in appropriate breeding design, feeding and health management (Thiruvankadan, 2005).

MATERIALS AND METHODS

Study location

This study was conducted in Faskari Local Government Area of Katsina State, North-western part of Nigeria. The study area is located within latitudes $11^{\circ} 30' N$ and $11^{\circ} 50' N$ and longitudes $6^{\circ} 50' E$ and $7^{\circ} 20' E$. The sampling villages includes: Mairua, SHEME, Dakamawa, Kanonhaki and Daudawa. The study area has an average annual rainfall of 198mm with an average annual

temperature of $28^{\circ} C$. (Wikipedia, 2020).

Experimental animals and management

Goats were randomly sampled across the selected towns in Faskari LGA. They were sampled based on sex and age. Goats were grouped into age using their dentition (Wilson and Durkin, 1984). The experimental animals were managed under semi-intensive system. The goat houses were made using corn stalk for fencing and thatched roofing for protection against heat and rainfall. There was no organized health care provision in terms of vaccination and deworming. They were allowed to roam in search of feed and water along with their kids.

Data Collection

Body weight was measured in kg using bathroom weighing scale (kg) as described by Akpa *et al.*, (1998), age was measured using dental formula as described by (Wilson and Durkin, 1984), sex and linear body measurements were recorded; they include: Body weight (BW) kg, body length (BL), heart girth (HG), rump height (RH), tail length (TL), ear length (EL), horn length (HoL) and neck length (NL). All linear measurements were done using flexible tailor's measuring tape and sex using physical observations i.e. presence or absence of udder or scrotum as described by Akpa *et al.* (1998).

Data Analysis

Data collected were managed in Microsoft excel and analysed using SPSS statistical package (version 20.0). Results were presented as mean and standard error. Where there is significant

difference between means, the means are separated using Duncan Multiple Test Range. Pearson correlation coefficients between parameters were calculated using SPSS statistical package (version 20.0).

The linear model used is shown below:

$$Y_{ijk} = \mu + S_i + A_j + e_{ijk}$$

Where,

- Y_{ijk} = Observations of dependent variable,
 μ = Overall mean of all observations,
 S_i = Fixed effect of i^{th} sex ($I = 1, 2$)
 A_j = Fixed effect of j^{th} age ($J=1,2,3,4$ and 5)
 e_{ijk} = Random error associated with each record.

RESULTS AND DISCUSSION

Table 1 shows the effects of age on the body weight (kg) and body linear measurements (cm). Age had significant ($P < 0.05$) effects on EL, HoL and TL, no significant ($P > 0.05$) effect on

BW, BL, HG and RH. The results obtained revealed that the average BW, RH, BL, HG, EL, TL, HoL and NL of Sahelian goat is 17.52-31.52 kg, 52.40-61.42 cm, 49.95-60.55 cm, 40.90-50.16 cm, 9.33-18.38 cm, 14.91-22.70 cm, 8.10-10.54 cm and 13.90-19.57 cm respectively. This is in agreements with report of Akpa *et al.* (1998) who reported that Sahelian does and bucks between the age one through two years are lower than values of 20-40 kg. It's in disagreement with values reported by Katongole *et al.* (1996) mean live weight of less than one year are within the range of 12-18 kg for indigenous goats in Kenya. This is probably due to differences in location, breed and age. It's in disagreement of the report of Sam *et al.* (2016) result indicates average body weight of yearling west African dwarf goat (WAD) to be 18.042kg while linear body measurements were 23.993cm, 27.735cm, 24.466cm and 19.374cm for HG, BD, BL, RH and HW respectively. This is due to breed and age differences.

Table: 1 Effects of age on the body weight (kg) and body linear measurements (cm) in Sahelian goats in Faskari Local Government Area.

Parameters	Age (Years)	Mean	Standard deviation	Standard Error of Mean
BW(kg)	1	18.50	0.707	0.500
	2	17.52	6.945	1.736
	3	27.04	1.804	0.682
	4	29.51	1.945	0.648
	5	31.52	2.717	1.358
RH (cm)	1	32.40	1.131	0.800
	2	56.16	1.641	0.410
	3	55.07	2.319	0.876
	4	60.36	0.829	0.276
	5	61.42	0.784	0.392
BL (cm)	1	49.95	3.040	2.150
	2	50.70	6.099	1.524
	3	55.61	3.728	1.409
	4	53.23	1.212	0.404
	5	60.55	1.138	0.569
HG (cm)	1	40.90	7.071	5.000
	2	41.03	6.827	1.706
	3	40.60	1.806	0.682
	4	44.68	10.35	3.453
	5	50.16	2.696	1.348
EL (cm)	1	09.33 ^e	0.848	0.600
	2	10.33 ^d	1.645	0.411
	3	11.43 ^b	1.439	0.544
	4	11.37 ^c	0.979	0.326
	5	18.38 ^a	0.613	0.306
TL (cm)	1	15.15 ^d	1.343	0.950
	2	14.91 ^e	1.752	0.438
	3	20.26 ^e	0.778	0.294
	4	20.83 ^a	0.857	0.285
	5	22.70 ^b	0.316	0.158
HoL(cm)	1	8.10 ^e	1.697	1.200
	2	9.08 ^c	1.536	0.384
	3	10.54 ^a	2.411	0.911
	4	8.93 ^d	4.005	1.335
	5	10.15 ^b	1.873	0.936
NL (cm)	1	13.90	0.424	0.300
	2	15.54	1.915	0.478
	3	18.64	1.089	0.411
	4	19.57	2.491	0.830
	5	19.20	1.478	0.739

BW= Body weight, RH= Rump Height, BL= Body length, HG= Heart girth, EL= Ear length, TL= Tail length, HoL= Horn Length, NL= Neck length. ^{abc}Mean values in a row with different letter superscripts are significantly (P<0.05) different.

Table 2 shows the effect of sex on body linear measurements. The results showed that sex had significant ($p < 0.05$) effect on the BW, RH, BL and HG, no significant ($P > 0.05$) on EL, TL, HoL and NL in Sahelian goat. The results obtained revealed that the average BW, RH, BL, HG, EL, TL, HoL and NL of Sahelian does and bucks were 22.47 and 25.39 kg, 55.66 and 60.55 cm, 42.33 and 53.12 cm, 66.44 and 60.22 cm, 15.05 and 13.06, 21.26 and 22.22, 13.64 cm and 12.77 & 25.57 and 24.74 cm respectively. This is in disagreement with report of Adam *et al.* (2020) who reported that goats were sexually dimorphic in favour of males. Sahel goats had longer body and higher wither height than Red Sokoto (23.88 ± 0.43 and 24.55 ± 0.41 cm vs 22.45 ± 0.50 and 22.93 ± 0.44). This is in disagreement with report

of Sam *et al.* (2016) result indicates average body weight of yearling West African dwarf goat (WAD) to be 18.042kg while linear body measurements were 23.993cm, 27.735cm, 24.466cm and 19.374cm for HG, BD, BL, RH and HW respectively. This is due to breed and age differences. The results obtained were in conformity with report of Rotimi *et al.* (2016). Results showed that average body weight was significantly ($P < 0.05$) affected by sex. Body weight was higher in female WAD goats than males compared to their male counterparts in the three locations (18.93 ± 5.50 and 18.49 ± 2.60 , 17.82 ± 4.30 and 15.67 ± 6.00 and 18.42 ± 5.70 and 14.39 ± 4.70 respectively).

Table 2: Effects of sex on the body weight (kg) and body linear measurements (cm) in Sahelian goats in Faskari Local Government Area.

Parameters/Traits	Sex	N	Mean	Standard Deviation	Standard Error
BW(kg)	Male	9	22.47 ^b	8.116	2.705
	Female	29	25.39 ^a	9.553	1.774
RH (cm)	Male	9	55.66 ^b	1.224	0.408
	Female	29	60.55 ^a	3.397	0.631
BL (cm)	Male	9	42.33 ^b	7.741	2.580
	Female	29	53.12 ^a	3.205	0.595
HG (cm)	Male	9	66.44 ^a	7.218	2.406
	Female	29	60.22 ^b	6.727	1.249
EL (cm)	Male	9	15.05	1.454	0.484
	Female	29	13.06	1.727	0.320
TL (cm)	Male	9	21.26	1.724	0.574
	Female	29	22.22	1.540	0.286
HoL(cm)	Male	9	13.64	1.292	0.430
	Female	29	12.77	2.822	0.524
NL (cm)	Male	9	25.57	2.903	0.967
	Female	29	24.74	3.023	0.561

BW= Body weight, RH= Rump Height, BL= Body length, HG= Heart girth, EL= Ear length, TL= Tail length, HoL= Horn Length, NL= Neck length.

Table 3 shows the correlation coefficients values between body weight and linear measurements. The correlation values were positive and highly significant ($p < 0.01$) in the body weight of Sahelian goats except between BW and TL, BW and TL ($r = -0.201$ and -0.742) where negative correlation. Highest value was obtained between RH and TL ($r = 0.909$; $P > 0.01$), lowest value was obtained between BW and HG ($r = 0.257$; $p > 0.01$). Highest value was obtained between BL and TL ($r = 0.947$; $p < 0.05$), lowest value was obtained between HG and TL ($r = 0.055$;

$p > 0.05$). This result is similar with the report of Adamu *et al.* (2020) who reported that coefficient values observed were in general high, positive and significant except between WH and TL in male and between BW and UC, BCS and BL, WH, UL and UC in female. He also reported that highest observed in this study when BW is predicted from HG conform the report of Tsegaye *et al.* (2013) that this trait (HG) is positively correlated with live weight (LW) and can indicate it with high precision ($R^2 = 0.94$).

Table: 3 General phenotypic correlation coefficient between body weight (kg) and body linear measurements (cm) for Sahelian goats in Faskari Local Government Area

	RH	BL	HG	EL	TL	HoL	NL
BW	0.233*	0.831**	0.257**	0.848*	-0.201	-0.742	0.717**
RH	1	0.491**	0.662**	0.337*	0.909**	0.101*	0.146*
BL		1	0.353*	0.947**	0.412*	0.647**	0.645**
HG			1	0.294*	0.566**	0.237*	0.055*
EL				1	0.051*	0.179*	0.481**
TL					1	0.838**	0.299*
HoL						1	0.491**
NL							1

BW= Body weight, RH= Rump Height, BL= Body length, HG= Heart girth, EL= Ear length, TL= Tail length, HoL= Horn Length, NL= Neck length. **Correlation is significant ($P < 0.01$), *Correlation is significant ($P < 0.05$).

CONCLUSION

Age in Sahelian goat had significant influence on RH, EL, HoL and TL but it has no significant influence on BW, BL and HG. It can also be concluded that sex of Sahelian goats had an influence on BW, RH, BL and HG. Sex had no influence on EL, HoL and NL. It implies that age cannot be used as a determining factor for body measurements in Sahelian goat but sex could in favour of does. The correlation coefficient showed that BL and HG predicted BW with high precision.

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