BREED VARIATION IN REPRODUCTIVE CHARACTERISTICS OF RED SOKOTO AND WEST AFRICAN DWARF GOATS IN MUBI ADAMAWA STATE NIGERIA

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Abstract
This study was undertaken to determine breed variation in reproductive characteristics of Red Sokoto (RS) and West African Dwarf (WAD) goats in Mubi a northern guinea savannah climatic zone. Two hundred goats comprising 50 bucks and 50 does of each breed between the ages of twelve and forty-eight months were randomly sampled at the Mubi slaughter house between May and July 2012. Live weight, age and body condition score were determined. Gonadal and epididymal sperm reserves were determined using homogenate and histological methods. Ovaries were examined for mature follicles and or corpus luteum using magnifying lens. Data collected were analyzed. Result shows significant ($p<0.05$) effect of breed and age on epididymal weights and volume between the breeds, Red Sokoto had higher (15.57g) epididymal weight and volume (15.17cm^3) as compared to WAD which had 13.19g and 12.70cm^3 for epididymal weight and volume respectively. There were significant ($p<0.01$) correlation between weights and volume of all segments of right and left epididymis. No significant breed difference was observed between Red Sokoto and WAD does on the reproductive parameters examined.

KEY WORDS: Goat, Breed, Variation, Reproduction.

Description of Problem

Nigeria is a country of environmental diversity, mainly, due to variations in rainfall, altitude and soils. Thus, production options are linked to the ecological zones that have been categorized mainly on climatic data (13). Goat is a domestic animal with extremely broad habitat spectrum, which accounts for its unique ability to adapt and maintain itself even in harsh environments, a feature that makes it superior in comparison to other ruminants. (8), indicated that goats distribution tend to favor arid and semi-arid zones of tropical Africa. According to report published recently, Nigeria has an estimated goat population of 88 million representing 8% of the world goat population (4).

The average protein intake among Nigerians is low, more especially among the low income earners who constitute the majority (4). Improper or non-application of research findings on small ruminants by farmers and inconsistent government policies might have resulted in underdeveloped livestock industry in the country (3); hence, low per capita meat consumption of 7.61 kg/year reported by (5). Efforts to bridge this gap by increasing the number of cattle have failed due to high cost, low productivity and long generation interval of the local breeds. Goat production in Nigeria is predominantly subsistence serving as source of livelihood for the poor. There is no defined breeding program, indiscriminate mating is the common practice and Performance of the indigenous breed types in their eco-niche is partly documented; hence more information is necessary for improvement and conservation program. The objective of this study is to determine breed variation in reproductive characteristics of Red Sokoto and West African Dwarf goats in Mubi area which is characterized as a Sudan savannah belt.

MATERIALS AND METHODS

Experimental Area: Adamawa state is located in the North Eastern part of Nigeria, laying between latitude 9º20' N and longitude 12º30' E of the Greenwich meridian. Mubi lies betwween10º16' and 13º16' E. Annual rainfall ranges from 100cm to 150cm.

Experimental Animals and Materials

Experimental animals were sampled from Mubi slaughter house. Red Sokoto and West African Dwarf goats were assessed. For each of the two

breeds, four animals comprising of two males and females were sampled randomly as they enter the slaughterhouse. This was repeated twice a week giving a total of sixteen animals per week. Preliminary data collection was carried out between April 29th and May 4th 2012 in order to familiarize with the procedure and also to ascertain the availability of experimental materials. Actual data were collected from 6th May to 30th July 2012, a period coinciding with the beginning of rainy season. Two hundred animals were sampled altogether. Animal with abnormalities and physical defects were not used. The weights of the animals were determined using clinical scale (man weight + goat – man weight). The ages of the animals were between one and three years. Age of animals were determined using dentition method as described by (7) and (9): Thus an age classification of 12-13 months is ≤ 1 year; 14-35 months is ≤ 2 years and 36-48 months is ≥ 3 years was adopted for this experiment.

Body condition score was determined using the scale 0 to 5 also described by (7) and (10). Scoring or assigning the animal a numerical value was based on feeling the level of muscling and fat deposition over and around the vertebrae in the loin region for this experiment, 3 to 5 grades were available. Testes, and ovaries were collected on slaughter, all samples collected were preserved (in cool chain) from the abattoir and taken to animal physiology laboratory for immediate analysis

Prior to slaughter, scrotal circumference was determined using flexible metric tape. On arrival at the laboratory, the testes adhering tissue and fat covering were carefully trimmed off. The lengths (cm) were measured using flexible metric tape, whereas weight (g) and volume (cm^3) were determined using digital electronic scale and water displacement method (Archimedes's principle) respectively. Epididymis were separated using scalpel blade and its weight (g), length (cm) and volume (cm^3) were determined using sensitive scale, plastic ruler and water displacement respectively.

Gonadal spermatids and epididymal sperm reserves were determined by using homogenate and histological methods as described by (13). Each testes was trimmed off of tunica albuginea using razor blade and homogenised in 50 ml of physiological saline containing streptomycin (1000 IU/ml) using a high speed blender operated at full speed for about 4 minutes. The volume of the testicular homogenate was determined after rinsing the blender container with 20 ml of physiological saline and adding the effluent. 5 ml of the homogenate was diluted further with 80 ml of saline in a conical flask and stored in a refrigerator at 5^{o}c for 24 hours. This allow for the separation of the spermatids and spermatozoa from other cells. The homogenate samples were set up into a neubeur haemocytometer counting chamber and allowed to settle for 2 minutes. The spermatozoa in the four large square of the chamber were counted twice and the mean used in the analysis using the formula $C= N \times D \times 50000$ where C= concentration of spermatozoa per ml, N= number of spermatozoa counted and D= dilution factor.

The caput, corpus and caudal epididymides were separated using a pair of scissors and minced separately in 20 ml of physiological saline. Minced samples were stored at 5^{o}c for 24 hours. Refrigerated samples were then filtered through wire gauze and the filtrate volume measured using measuring cylinder. One ml of the sample filtrate was diluted further with two ml of saline and the sperm number in the diluted epididymal filtrate determined using neubeur haemocytometer as described earlier, using same formula.

Ovaries were collected post mortem, preserved and transported to the laboratory for immediate examination. The ovaries were examined using magnifying hand lens to identify and obtain mature follicles and or corpus luteum (CL). Length (cm), weight (g) and volume (cm^3) of ovaries were also determined using flexible metric tape, digital weighing scale and water displacement respectively.

Statistical Analysis

Data collected were analysed using general linear model (GLM) procedure as contain in Statix 9.1 statistical package USA 2011 with breed, age and body condition score as factors. Analysis of variance, mean and standard error as well as interaction effects were calculated. Correlations between parameters were determined and significant means were separated using Fisher's least significant difference (LSD) procedure. The statistical model used was $Y_{ijk}=\mu+B_i+A_j+C_k+E_{ijk}$

Results and discussion

Significant ($p<0.05$) breed and age variations were observed for all epididymal parameters. Red Sokoto had higher values (table 1). This study confirms the report by (12). It means that WAD bucks in this study have lower sperm count since epididymis is responsible for sperm maturation and storage. Testicular biometry also differ significantly ($p<0.05$) with age. Body weight increased significantly ($p<0.001$) with advancement in age. The two breeds did not differ statistically in sperm reserve counts, this is because apart from differences in breed and age, sperm reserve counts vary with frequency of ejaculation especially under free range system of production. This result also accords with the findings of (2) who observed same in bulls. There was significant ($p<0.001$) correlation between left and right sperm reserve counts. Significant ($p<0.01$) correlation also exist between weight and volume of all segments of the right and left epididymis. There were no significant breed difference between Red Sokoto and WAD does for all parameters observed except for live weight and weight of right ovaries that differed significantly ($p<0.05$) with age (table 2).

Conclusion and Application

The goats in Mubi only differ in morphology, but exhibit similar weight and reproductive parameters because of extensive management system which have resulted to mixed offspring from one generation to another. Comparative studies indicate significant differences in live weight considering sex and age.

A well-coordinated breeding programme should be instituted in order to conserve the most cherished traits of goat breeds in Nigeria. More research is needed to adequately characterize the indigenous goat breed-types in their habitat.

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Table 1: Means ± SE of some Testicular and epididymis parameters of buck

Breed	N	LTV (cm^{3-})	RTV (cm^{3-})	PTV (cm^{3-})	LTL (g)	RTL (g)	LEW (g)	REW (g)	PEW (g)	LEV (cm^{3-})	REV (cm^{3-})	PEV (cm^{3-})
RS	50	41.42±3.16	41.29±3.06	41.36±3.07	6.21±0.17	6.14±0.17	7.85±0.44^{a}	7.72±0.48^{a}	15.57±0.89^{a}	7.61±0.40^{a}	7.55±0.42^{a}	15.17±0.82^{a}
WAD	50	35.55±2.30	34.68±2.23	35.11±2.2	5.84±0.13	5.77±0.12	6.78±0.32^{b}	6.40±0.35^{b}	13.19±0.65^{b}	6.38±0.29^{b}	6.31±0.31^{b}	12.70±0.60^{b}
Age												
1	60	35.17±1.29^{b}	35.02±1.25^{b}	35.10±1.26^{b}	5.79±0.07^{b}	5.75±0.07^{b}	6.37±0.18^{b}	6.22±0.20	12.60±9.36^{b}	6.24±0.16^{b}	6.13±0.17^{b}	12.38±0.34^{b}
2	34	43.19±1.98^{a}	40.58±1.92^{a}	41.89±1.92^{a}	6.28±0.11^{a}	6.13±0.10^{a}	7.34±0.28^{a}	6.93±0.30	14.28±0.56^{a}	6.95±0.25^{a}	6.96±0.26^{ab}	13.92±0.51^{a}
3	6	37.09±5.82^{ab}	38.36±5.64^{ab}	37.72±5.65^{ab}	6.00±0.32^{ab}	5.99±0.31^{ab}	8.24±0.82^{a}	8.03±0.90	16.27±1.64^{a}	7.80±0.75^{a}	7.69±0.78^{a}	15.50±1.52^{a}
BCS												
3	41	37.29±3.97	36.49±3.84	36.89±3.85	6.00±0.22	5.93±0.21	7.45±0.56	7.31±0.61	14.77±1.12	7.07±0.51	7.05±0.53	14.13±1.04
4	59	39.67±1.79	39.48±1.73	39.58±1.73	6.05±0.10	5.99±0.09	7.18±0.25	6.81±0.27	13.99±0.50	6.92±0.23	6.81±0.24	13.75±0.36

RS=Red Sokoto; WAD=West African Dwarf; BCS=Body condition score; LTV=left testis volume; RTV=right testis volume; PTV=paired testis volume; LTL=left testis length; RTL=right testis length; LEW=left epididymal weight; REW=right epididymal weight; PEW=paired epididymal weight; LEV=left epididymal volume; REV=right epididymal volume; PEV=paired epididymal volume.

Table 2: Means ± SE of follicular and corpus luteum numbers and some reproductive parameters of does

	N	LOWT	ROWT	POWT	LNMFOL	RNMFOL	LNCL	RNCL
Breed								
RS	50	0.92±0.09	0.95±0.10	1.87±0.16	0.74±0.13	0.63±0.13	0.34±0.08	0.50±0.10
WAD	50	0.97±0.10	1.05±0.11	2.02±0.18	0.64±0.14	0.82±0.15	0.27±0.09	0.59±0.11
Age								
1	24	0.76±0.12^{b}	0.96±0.13^{ab}	1.72±021^{b}	0.50±0.17	0.71±0.17	0.24±011	0.31±0.13^{b}
2	18	0.96±0.17^{ab}	0.80±0.18^{b}	1.76±0.30^{ab}	0.90±0.24	0.55±0.25	0.23±0.16	0.79±0.19^{a}
3	58	1.10±0.07^{a}	1.24±0.08^{a}	2.35±0.13^{a}	0.67±0.10	0.93±0.11	0.45±0.07	0.53±0.08^{ab}
BCS								
3	39	0.85±0.09	0.94±0.09	1.80±0.16	0.46±0.12^{b}	0.75±0.13	0.34±0.08	0.39±0.10
4	61	1.03±011	1.05±0.12	2.09±0.21	0.92±0.16^{a}	0.71±0.17	0.27±0.11	0.70±0.13

RS=Red Sokoto; WAD= West African Dwarf; LOWT=left ova weight; ROWT=right ova weight; POWT=paired ova weight; LNMFOL=left number of mature follicle; RNMFOL=right number of mature follicle; LNCL=left number of corpus luteum; RNCL=right number of corpus luteum, Means ± SE between groups and variables with different superscripts are significantly different.