

A Study of Semen Characteristics As Influenced By Body Weight and Scrotal Circumference in Red Sokoto Bucks

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Abstract: This study entitled “A study of Semen Characteristics as influenced by Body weight and Scrotal Circumference in Red Sokoto Bucks” was conducted at Research and Teaching farm of the Department of Animal Science, Bayero University Kano, Nigeria, to determine the influence of body weight, scrotal circumference on semen characteristics and correlation between body weight and scrotal circumference in relation to semen characteristics. The total of eighteen (18) Red sokoto Bucks were used in this study, and divided into three (3) groups with different number of Buck for each group: G1 with 8 animals, G2 with 4 animals and G3 with 6 animals and they were grouped according to initial body weight in kilograms (KG) as; 17.00- 18.57, 81.58-20.15 and 20.16- 21.73 respectively. Their Scrotal circumferences were measured in centimeter (CM) using flexible measuring tape and they were grouped into three also as G1 with 5 animals, G2 with 6 animals and G3 with 7 animals with following measurements 17.00- 18.57 , 81.58-20.15 and 20.16-21.73 respectively. Semen samples were collected on two weeks interval for the period of ten (10) weeks; early in the morning by using Electric Ejaculator (design for sheep and goat, lane manufacturing Inc., USA). The correlation between body weight and scrotal circumference was positive ($P < 0.05$) in terms of semen colour, semen motility, semen concentration and semen volume . While semen P^H , live and dead ratio is negatively correlated ($P > 0.05$). The effect of body weight on semen parameters are significant ($P < 0.05$) in terms of Semen live & dead ratio and semen concentration. While Semen colour, semen volume, semen P^H and semen motility were not significant ($P > 0.05$). Scrotal circumference are significant ($P < 0.05$) in terms of semen volume and live & dead ratio. While semen colour, semen P^H , semen motility and semen concentration were not significant ($P > 0.05$).

Keywords: Semen Characteristics, Body Weight, Scrotal Circumference and red Sokoto Bucks.

I. Introduction

Goats are important domestic farm animals in the world as a source of meat, milk, skin and wool (Onakpa et al., 2010). In Nigeria, it has been estimated that there are about 34.5 million goats and this population makes it the second most important livestock specie (Onakpa et al., 2010). Three main varieties of goats are recognized in Nigeria: The Sahel, Desert or West Africa long-legged goats, the Red sokoto goats and the west African Dwarf goat (Onakpa et al., 2010). The Red Sokoto goat is also called Maradi, Red skin, Sokoto red, Katsina light brown, Mambilla, Borno White, or Damagian Dapple Gray. They are mainly distributed in Northern Nigeria (Sokoto, Katsina, Kaduna and Kano states) and Southern Nigeria where the climate is semi-arid with a single rainfall season of 4-6 months, They are owned by Hausa speaking tribes (Wilson, 2012). Assessments can be made on the quality of semen that the bucks produces, which is, in turn, related to physical characteristics of its genitalia. The reproductive performance is a function of both doe and buck fertility. Therefore, all aspects related to semen evaluation are important in management practices, especially for AI in a breeding program. Male fertility is an important factor in caprine reproduction since numerous does are generally bred to a single buck. Hence, evaluation of male fertility prior to breeding is of paramount importance to achieve breeding success (Kridliet al., 2005). The potential fertility of breeding males can be evaluated in the field by assessment of mating ability; physical examination and a genital tract examination of both the external and internal genitalia (including a scrotal circumference measurement), and semen quality evaluation (Hoflack et al., 2006).

II. Materials And Methods

Experimental Location

This Research work was conducted at Research and Teaching farm of the Department of Animal Science, Bayero University Kano, Nigeria. Kano State is located within the longitude $9^{\circ}30'$ and $12^{\circ}30'$ North and the latitude $9^{\circ}30'$ and $8^{\circ}42'$ East in Sudan Savannah region of Nigeria. The annual temperature ranges between 33°C to 18.85°C and relative humidity is between 40 to 51.3% (Olafin, 2007). The region is characterized by tropical wet and dry climate, wet season (May to September) and dry season (October to April) with annual

rainfall that ranges between 787-960mm evenly distributed all over the year (KNARDA 2001).

Experimental Animals and Their Management

Eighteen male Red Sokoto bucks with different initial body weight were used for this study. The testis and scrotum for each buck are visualized, palpated and carefully inspected before the selection of experimental animals, to rule out any form of abnormalities. The general health status of experimental animals is examined. The animals were under the management practices of the Department of Animal Science, Bayero University Kano. The bucks were reared under semi-intensive system. The animals were released daily for grazing at 8.00am and another shift by 2.00 pm. Supplemental feed (concentrates) were provided. Animals received routine inspection and dipping (ectoparasite), as well as anti-helminthic drenching (deworming) and vaccination against endemic diseases. Drinking water was provided ad libitum.

Treatments Combinations

i. Treatment combinations for Body Weight (KG)

8 animals in treatment 1 with body weight ranged from 17.0-18.75, 4 animals in treatment 2 with body weight ranged from 18.78-20.15, 6 animals in treatment 3 with body weight ranged from 20.16-21.73.

ii. Treatment combinations for scrotal circumference (CM)

5 animals in treatment 1 with scrotal circumference ranged from 17.18-18.57, 6 animals in treatment 2 with body weight ranged from 18.58-20.15. 7 animals in treatment 3 with body weight range from 20.16-21.73

Data Collection

1. Body weights (KG):

This was measured by using bathroom scales (Camry®). The procedure was such that, an individual carries the buck, stands on the bathroom weighing scale, then the total weight was recorded. Thereafter, the individual's weight was then deducted from the total weight measured after putting the buck down. This gave the actual weight of the buck.

Buck body weight $BW = (\text{Individual BW} + \text{Buck BW}) - \text{Individual BW}$ (Akpa et al., 2006).

2. Scrotal Circumferences (CM):

Scrotal Circumference (SC):- This is measured in centimeter with a flexible measuring tape when bucks are placed in the experimental facility and this will be done at the onset of the experiment and subsequently on two weeks basis before semen collection. This is the maximum dimension around the pendulous scrotum after pushing the testes firmly into the scrotum (Akpa et al., 2006).

3. Semen Collection:

Semen samples were collected from each buck using electro-ejaculator (design for sheep and goat, lane manufacturing Inc., USA) are coded and labeled accordingly and this will be done at the early of the day throughout the experimental period. The semen samples will be evaluated immediately for colour, volume, motility, concentration and pH as describe by Zemjanis (1970).

Semen Parameters:

- Semen volume was determined using graduated tubes in centimeter (CM).
- Semen colour of the ejaculate, was determined by visual observation immediately after semen collection and coded as 1 = bloody, 2 = watery, 3 = milky and 4 = creamy.
- Semen p^H was determined by the use of p^H paper.
- Determination of sperm concentration:- Sperm concentration can be determined by using formaldehyde.
- Determination of live/dead ratio using eosin nigrosin:- The proportion of live to dead cells can be estimated by supravital staining with stain mixture such as nigrosin- eosin.
- Sperm motility is determine by placing a drop of semen on pre warmed (34°c to 37°c) slide glass and covered with 22 X 32mm cover slip and examined at X 40 eye piece objective magnification.

Statistical Analyses

The correlation between body weight and scrotal circumference was made by using software IBM SPSS STATISTICS version 20.

Data obtained during research were coded and subjected to analysis of variance (ANOVA) one way (CRD) and where significant difference was observed, the means were separated using critical difference (CD).

Table 1: Correlation between Body weight (B.W.) and Scrotal Circumference (S.C.) with regards to Semen characteristics of Red Sokoto Bucks

Parameters	EC	SV	SP	SCN	SM	SL
0	.07**	.37**	.10*	.09*	.44**	.48**
EC	0					
SV		0				
SP			0			
SCN				0		
SM					0	
SL						0

**Correlation is significant (P < 0.05), * Correlation is no significant (P>0.05). B.W. (Body Weight), S.C. (Scrotal Circumference), E.C.(Ejaculate Colour), S.V (Semen Volume), S.P. (Semen P^H), S.C.N (Semen Concentration) and S.L. (Semen Live and Dead Ratio).

Table 2: ANOVA for Body Weight B.W. (KG) and Scrotal Circumference S.C. (CM).

Source of Variation	B.W. DF	EC M.S.S	S.C. D.F.	EC M.S.S	B.W. DF	SV M.S.S	S.C. D.F.	SV M.S.S
Between Treatment	2	0.33	2	0.03	2	0.05	2	8.09
Within Treatment	87	0.12	87	0.70	87	0.01	87	1.51**
Total	89	0.45	89	0.73	89	0.06	89	9.60

**Mean is significant (P>0.05), B.W. (Body Weight), S.C. (Scrotal Circumference), DF (Degree of Freedom), M.S.S (Mean sum of square), E.C. (Ejaculate Colour), SV (Semen Volume).

Table 3: ANOVA for Body Weight B.W. (Kg) and Scrotal Circumference S.C. (CM).

Source of Variation	B.W. DF	SP M.S.S	S.C. D.F.	SP M.S.S	B.W. DF	SCN M.S.S	S.C. D.F.	SCN M.S.S
Between Treatment	2	3.75	2	0.02	2	1226396.44	2	1585053.62
Within Treatment	87	1.73	87	0.01	87	294994.23**	87	411009.36
Total	89	5.48	89	0.03	89	1521390.67	89	1792459.42

**Mean is significant (P>0.05), B.W. (Body Weight), S.C. (Scrotal Circumference), DF (Degree of Freedom), M.S.S. (Mean sum of square), S.P. (Semen P^H), S.C.N. (Semen Concentration).

Table 3: ANOVA for Body Weight B.W. (Kg) and Scrotal Circumference S.C. (CM).

Source of Variation	B.W. DF	SM M.S.S	S.C. D.F.	SM M.S.S	B.W. DF	SL M.S.S	S.C. D.F.	SL M.S.S
Between Treatment	2	709.91	2	0.50	2	855.49	2	0.11
Within Treatment	87	182.74	87	0.60	87	181.75**	87	0.01**
Total	89	892.65	89	1.10	89	1037.24	89	0.12

**Mean is significant (P>0.05), B.W. (Body Weight), S.C. (Scrotal Circumference), DF (Degree of Freedom), M.S.S. (Mean sum of square), S.M. (Semen Motility), S.L. (Semen Live and Dead Ratio).

III. Results

The correlation between body weight and scrotal circumference in relation to semen parameters revealed the following results; 0.75, 0.09, 0.44 and 0.48 (P<0.05) that is, there is positive correlation in terms of semen colour, semen concentration, semen motility and semen live and dead ratio respectively. While 0.37 and 0.10 (P>0.05) are negatively correlated in terms of semen volume and semen P^H respectively. The result of (BW) was significant (P<0.05) in terms of semen concentration and live & dead ration, while colour, volume, P^H and motility were not significant (P>0.05). The (SC) revealed that, Semen volume and live & dead ratio were significant (P<0.05) while colour, P^H, motility and concentration were not significant (P>0.05).

IV. Discussion

The study of correlation between Body Weight (BW) and Scrotal Circumference (SC), semen colour yielded 0.07 MSS and this is almost similar with report of (Bongos et al 1986) whose reported MSS 0.09 and is higher with 0.03 when compared with the report of (Bezerra, F.Q.G. et al 2009). Semen volume MSS is 0.37 and is lower 0.98 with the value of (Bongos et al 1986) and is similar 0.37 with that of (Bezerra, F.Q.G. et al 2009). The P^H value of 0.10 is lower 0.33 with report of Bongos et al (2009) and is higher 0.06 MSS with that of (Shoyombo, A. 2012). The MSS value of semen concentration is 0.09 and is lower 0.12 with that of (Shoyombo, A. 2012). The semen motility MSS is 0.44 which is almost similar 0.46 with that of (Bezerra, F.Q.G. et al 2009). The live & dead ratio MSS is 0.48 and is lower 0.98 with report of (Bezerra, F.Q.G. et al 2009). The Body Weight (BW) MSS of semen colour is 0.01 which similar to the report of (Ugwu 2009) who reported 0.02 and is in agreement of (Raji A.O. et al. 2008) Who reported higher MSS of 0.05. The MSS of semen volume with regard to (BW) is 0.12 and this is in line with the report of (Das et al., 2006) whose reported higher MSS between 0.16 to 0.18 in Black Bengal buck, while (Ugwu 2009), reported lower MSS of 0.10-0.11. The

MSS of semen P^H is 1.73, which is similar with the report of (Ugwu 2009) 1.55 and (Raji A.O. et al. 2008) reported higher MSS of 2.10. The MSS of semen concentration is 294994.23 which is higher 196652.28 with report of (Rege, J.E. 2000). The MSS of semen motility is 182.74 and is similar with report of (Rege J. E. 2000) who reported 180.10. The MSS of live & dead ratio is 181.75 and is lower with value 171.10 reported by (Ugwu, 2009) and (Raji A.O. et al 2008) whose reported higher MSS 201.10.

The Scrotal Circumference (SC) MSS of semen colour is 0.70 and is similar of 0.69 with report of (Jerimaiah and Osuagwuh 2014) and (Raji 2008) reported higher MSS value of 1.20. The semen volume MSS with value of 1.51 and is relatively higher 0.95 with report of (Jerimaiah and Osuagwuh 2014). The semen P^H MSS is 0.01 and is lower 1.01 with report of (Keith et al 2009) and higher value of 2.30. The MSS value of semen concentration is 411009.36.23 is higher 325678.11 reported by Keith et al (2009) and lower 123453. 59 values were reported be (Jerimaiah and Osuagwuh 2014). The MSS value of motility is 0.60 and is almost similar with report of (Ugwu 2009) who reported 0.65 and (Jerimaiah and Osuagwuh 2014) reported lower value of 0.45. The MSS value of live & dead ratio is 0.01 and is similar with reported 0.01 by (Keith et al 2009).

V. Conclusions

It can be concluded that, the correlation between Body Weight (BW) and Scrotal Circumference (SC) are positively correlated in terms of Semen Colour, semen volume, semen motility and live & dead ratio while semen P^H and semen concentration are negatively correlated. The semen parameters in relation to Body Weight (BW); semen colour, semen volume, semen P^H, semen motility were not significant while semen concentration and live & dead ratio are significant. The semen parameters in relation to Scrotal Circumference (SC); semen colour, semen P^H, semen motility, semen concentration were not significant while semen volume, semen live & dead ratio are significant.

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