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Scrotal Circumference as a Parameter of Breeding age for West African Dwarf Bucks.

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A B S T R A C T

This study evaluated the correlation between scrotal circumference (SC), body weight (BW) and body condition score (BCS) in relation to breeding age in West African Dwarf (WAD) bucks. A total of 320 WAD bucks from birth to 15 months of age from various farms in Ibadan, Nigeria, were studied. They were grouped as A-birth to 3, B-4 to 7, C-8 to 11 and D-12 to 15 months old respectively, comprising of 80 bucks per group. Semen was collected from 10 randomly selected bucks in each group and analysed. Results showed positive correlation between SC and age; SC increased with age; and at about 8 months of age and over, a consistent SC of 17 cm–18 cm was observed. BW also increased with age; BW significantly affected SC. Also, at 8 months of age and over, SC of 17 cm-18 cm was observed from 9 kg BW and above. However, the correlation between SC and BCS was low and not significant. Semen analysis revealed the best semen quality for groups C and D bucks. In conclusion, we suggest that WAD bucks of 8 months and above, with at least SC between 17 cm–18 cm and of over 9 kg BW, could be used to breed does successfully on the farm.

Introduction

The West African Dwarf (WAD) goats serve as good sources of readily available protein as well as income especially during emergency needs (Devendra, 1999). They have diversified socio-economic values and the demand for their product is high (Oyeyemi et al, 2002; Adebayo and Chineke, 2011). Hence, there is need for improved WAD goat production; not only to meet up with the prevailing and future challenges but also to increase the nutritional and enormous economic values and potentials for small ruminants. For this aim, WAD goats to be used for breeding should be properly examined for reproductive soundness or fitness. This is particularly important in the bucks as they can be used to serve many does on the farm (Nolte, 2012).

The Breeding Soundness Examination (BSE) of WAD bucks is valuable and represents the most practical and economic tool with which to select potentially the best sires for breeding (Petherick, 2005). It involves general physical examination, palpation of external genitalia, measurement of the scrotal circumference (SC), semen collection and analysis. An important but relatively easy parameter that does not require serious expertise to be taken during BSE of bucks especially on the farm is the SC (Pezzanite et al, 2013). Research has shown that SC is highly related to improved semen quality and reproductive soundness in bucks (Bongso et al, 1982; Bezerra et al, 2009). Bucks with larger SC, that is, bigger testicles have been reported to sire does with relatively better results (Raji et al, 2008). However, there are closely related factors such as age and body weight that significantly affect SC in bucks (Rege et al, 2000; Karakus et al, 2010). Shoyombo et al, (2012) reported increase in SC with age and that SC can be influenced by BW in Savanah brown bucks. Presently in Nigeria, there are no base-line data or guidelines for evaluating SC of WAD bucks for breeding soundness examination (BSE) purposes. Also, the appropriate age to introduce these bucks for breeding is yet to be fully established. Therefore, this study was carried out to evaluate SC in different age groups of WAD bucks and to investigate the feasibility of using the correlations of SC with age and BW (with specific emphasis on SC) measures for the assessment of the breeding age of WAD bucks.

Materials and Methods

Animals

A total number of 320 WAD bucks from birth to 15 months of age, raised under semi-intensive system from different small and large scale farms in Ibadan, Oyo state, South-western Zone of Nigeria, were studied. Most of the

breeders kept records especially on the date of deliveries of their animals. The study was carried out from September, 2013 to October, 2014. The bucks were grouped into four as follows: A–birth to 3, B–4 to 7, C–8 to 11, D–12 to 15 months old respectively, comprising of 80 bucks per group.

Parameters measured

The characteristic parameters taken were as follows:

Age: The bucks' ages were determined by records or history from the breeders and by dentition using the method specified by Wosu (2002).

Body weights: These were 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 this weight after putting the buck down. This gave the actual weight of the buck.

Buck BW= (Individual BW+Buck BW)–Individual BW

Body Condition Score: This was evaluated subjectively as described by Ford et al, (2009) and Okere et al, (2011). The scores ranged from 1=emaciated to 5=obese.

Scrotal Circumference: The largest diameter of the scrotum using a flexible tape was measured while ensuring the testes lie side by side to each other. Before measuring SC, scrotal shape, scrotal anatomy, scrotal content and testicular consistency were examined. Bucks with ovoid and long ovoid scrota which are undivided and split were considered normal. Scrotal content were palpated to observe freely moving testes. Testicular consistency was scored as 1=very soft, 2=soft, 3=normal, 4=hard and 5=very hard (Keith et al, 2009; Philip and Okere, 2011).

Semen collection

Semen samples were collected from 10 randomly selected bucks from each group by the electro-ejaculation method. Briefly, the prepucial hairs of the bucks were clipped using a sharp sterile scissors and then cleaned gently with tissue paper. Vaseline (lubricant) was applied on the probe of the battery operated electro-ejaculator. The bucks were then restrained and the hind limbs were elevated from the ground at an angle of 45° and the lubricated probe was inserted into the rectum touching the mucous membrane. Stimulation is done by alternately increasing and decreasing the voltage until full erection and ejaculation is achieved. The ejaculate was then collected into a clean sterilized warm graduated semen collection vial through a funnel with a handle brought over the glans penis around the prepucial area (Bitto et al, 2000).

Semen analysis

The parameters observed or analysed were as follows:

Colour: The appearance or colour of the semen collected were observed and recorded.

Volume: The volume of the semen was observed avoiding error due to parallax and recorded.

Mass activity: This was done by putting a drop of semen on a warm slide using a pipette, covered with cover slip and then observed under microscope. Scoring was as follows: 0=immotile sperm cells and no wave motion (very poor semen); 1=weak oscillatory sperm cells movements with no wave motion (poor semen); 2=less than 50% progressively motile or oscillatory sperm cells movements with little or no wave motion (fair semen); 3=more than 50% progressively motile sperm cells with apparent wave motions and eddies (good semen); 4=80% and above progressively motile sperm cells with distinct dark wave motion and eddies (very good semen); 5=About 100% very vigorous progressively motile sperm cells with distinctly dark and extremely rapid wave motion and eddies (excellent semen).

Motility: To study this, a drop of normal saline was added to semen on a warm slide, covered with cover slip and observed under microscope. This was scored in percentage.

Live-dead ratio: One to two drops of eosin-nigrosin stain was added to semen on warm slide, mixed gently using the edge of a slide, then a smear was made with the a slide at an angle of 45 degrees on another slide, air dried and observed under microscope. Scoring was in percentage.

Morphology: Same process as described for live-dead ratio but Wells and Awa stain was used in this case. This was also scored in percentage.

Concentration: This was determined by the use of Haemocytometer which contained improved Neuber counting chamber with 25 squares and a red blood cell pipette. Semen was sucked up to 0.5ml mark and then filled up to 1.01 mark with formal saline on the pipette. This mixture was shaken gently and the formal saline at the top of pipette was discarded. A cover slip was fixed on the counting chamber and then filled up with the diluted semen carefully. Sperm cells in 5 squares were counted diagonally (ensuring sperm heads were within the square), added up, multiplied by 5, then by 10,000 and the dilution factor (Zemjanis, 1977; Bitto et al, 2000).

Data analysis

Selected characteristic measures in this study were analyzed using Pearson Product Moment Correlation (PPMC) and Student t-test analyses at 5% level of significance using SPSS version 20.

Results

Results revealed that SC increased with age from birth to eight months after which SC remained constant with average values between 17cm–18cm. It was also observed that, for WAD bucks of groups A and B (Table 1), there was a significant difference between the BW ($P \leq 0.05$) and SC ($P \leq 0.01$) while the difference between BCS for these groups was not significant (P=0.13). For groups B and C (Table 2), the differences between SC was significant ($P \leq 0.01$) while those of BW (P=0.06) and BCS (P=0.22) were not significant. For groups C and D (Table 3), there were no significant differences in BW (P=0.07), BCS (P=0.12) and SC (P=0.10). Correlation analysis showed that, generally, there were positive correlations amongst the parameters taken (Table 4). The relationship between SC and age was strong (r=0.81,

P≤0.01), older bucks had bigger SC compared with younger bucks; while that of SC and BW was not as strong (r=0.63, P≤0.01) compared with that of SC and age. However, the positive correlation between SC and BCS was low and not significant (r=0.05, P=0.66). Age had a very strong relationship with BW (r=0.89, P≤0.01), heavier weights were observed in older bucks. BW had a strong relationship with BCS; heavier bucks had higher BCS (r=0.78, P≤0.01). The results of the semen analysis of selected bucks in the groups are as presented on Table 5. There was significant increase in semen volume, motility, morphology, live-dead ratio and concentration in group C compared with group A (P≤0.01; P≤0.01; P≤0.01; P≤0.01; P≤0.01) and group B (P≤0.01; P≤0.01; P≤0.01; P≤0.01; P≤0.01) respectively. Also similarly, in group D compared with group A (P≤0.01; P≤0.01; P≤0.01; P≤0.01; P≤0.01) and group B (P≤0.01; P≤0.01; P≤0.01; P≤0.01; P≤0.01) respectively.

Table 1 Body weight, body condition score and scrotal circumference of group A and B bucks.

Parameter	Group	N	Mean	±SEM	P-Value
BW	A	80	5.37	±1.44	0.04
	B	80	8.53	±0.70	
BCS	A	80	3.65	±0.14	0.13
	B	80	3.78	±0.17	
SC	A	80	9.43	±2.54	0.01
	B	80	14.52	±1.17	

Significant at 0.05 (2-tailed); N: number of bucks; SEM: standard error of mean

Table 2 Body weight, body condition score and scrotal circumference of group B and C bucks.

Parameter	Group	N	Mean	±SEM	P-Value
BW	B	80	8.53	±0.70	0.06
	C	80	11.47	±0.82	
BCS	B	80	3.78	±0.17	0.22
	C	80	3.77	±0.09	
SC	B	80	14.52	±1.17	0.01
	C	80	17.61	±0.06	

Significant at 0.05 (2-tailed); N: number of bucks; SEM: standard error of mean

Table 3 Body weight, body condition score and scrotal circumference of group C and D bucks

Parameter	Group	N	Mean	±SEM	P-Value
BW	C	80	11.47	±0.82	0.07
	D	80	13.15	±0.10	
BCS	C	80	3.77	±0.09	0.12
	D	80	3.60	±0.08	
SC	C	80	17.61	±0.06	0.10
	D	80	17.71	±0.09	

Significant at 0.05 (2-tailed); N: number of bucks; SEM: standard error of mean

Discussion

In this study, we found out that the WAD bucks' scrotal circumference (SC) were significantly correlated with age and BW. SC increased with age, especially between one and eight months. At eight months and over, SC remained constant (between 17cm–18cm) with no further significant increase. Also, BW increased with age especially from birth to 4 months but at 8 months and beyond, bucks of 9kg BW and over, had SC between 17cm–18cm. Younger bucks with the same weight or even heavier weights, had smaller SC. Shoyombo et al, (2012) similarly reported that in Savanah brown bucks, SC can be influenced by age and BW. We also observed that the semen characteristics of the youngest group (group A) were very poor. The colour was clear and there were no evidences of sperm cells. But there were evidences of sperm cells in the ejaculate of bucks between the ages of 4-7 months (group B) with the semen appearing greyish. Other semen characteristics of the bucks in these groups (i.e groups A and B) were similar to those reported by Daramola et al, (2007) for immature bucks with little or no fertilizing capacity. However, the semen characteristics that we observed in bucks of 8 months and over (i.e groups C and D respectively) were similar to those earlier reported in sexually matured WAD bucks with full fertilizing capacity (Oyeyemi et al, 2011; Jerimaiah and Osuagwuh, 2014). The color of the semen of these bucks was cream. The mass activity of the sperm cells also showed gross progressive motility and high concentration with distinct dark rapid wave motions and eddies. Other semen characteristics results also revealed semen picture for matured WAD bucks for these groups of bucks. As far as we know, these findings stand as the first specific report on SC and its correlation with age and quality of semen production in WAD bucks of 8 months and above. This can be corroborated with earlier reports that SC is an important correlate of fertility (Bezerra et al, 2009). Ugwu (2009), also reported that size of testes (that is, SC), determines the amount of sperm-producing tissue. Bucks with bigger testicles can sire does at younger age (Raji et al, 2008). Increase in testicular size was also reported as an indicator of onset of spermatogenesis and SC that is highly related to semen quality and reproductive soundness (Bongso et al, 1982). We suggest that full fertilizing capacity starts at 8 months in WAD buck goats. This implies that this breed of bucks can be introduced for breeding at this age with maximum output expectations on the farm all other things being equal.

In conclusion, we suggest that quality semen production starts at 8 months and over in WAD buck goats. We also suggest that WAD bucks of 8 months of age and over, with at least SC between 17cm–18 cm and of over 9 kg BW, can be used to breed does successfully on the farm. Taking this recommendation as baseline, further studies should be carried out to corroborate these findings. This will fill the missing gap in BSE examination of WAD bucks which is an integral part of WAD goat production. Also, reproductive wastage in terms of keeping together potentially good semen buck producers with poor producers on goat herds will be reduced. Adoption and use of these findings will lead to improved goat production and greater socio- economic gains not only to farmers but also to other stakeholders in the goat livestock production in Nigeria and elsewhere in the world.

Table 4 Correlation of scrotal circumference, age, body weight and body condition score of group A to D bucks.

	Parameters	N	Mean±SEM	1	2	3	4
1	Scrotal circumference (cm)	320	14.8±2.85	-	0.81*	0.63*	0.05
2	Age	320	8.0±5.48		-	0.89*	0.21*
3	Body weight (Kg)	320	9.9±4.03			-	0.78*
4	Body condition score	320	3.8±0.47				-

Significant at 0.05 (2-tailed); N: number of bucks; SEM: standard error of mean

Table 5 Semen analyses for selected bucks in groups A to D.

Groups	N	Color	Volume (ml)	Mass activity	Motility (%)	Morphology (%)	Live-dead ratio (%)	Concentration (10^9cells/ml)
A	10	Clear	0.06±0.03	0	0	0	0	0
B	10	Grey	0.16±0.05	2	34±1.02	28±0.83	27±0.69	0.8±0.02
C	10	Cream	0.3±0.06	4	71±3.16	80±2.12	76±1.42	1.86±0.04
D	10	Cream	0.3±0.08	5	80±4.08	82±1.29	84±1.71	2.10±0.07

N: number of bucks. Data were expressed in mean ± standard deviation.

References

Adebayo O, Chineke C A. 2011. Evaluation of West African Dwarf goats for some qualitative traits in Southwestern Nigeria. Afric. J. of Agric. Res., 6: 6204-6207.

Bezerra FQG, Aguiar Filho CR, Freitas Neto LM, Sanos Junior LR, Chaves R M, Azevedo EMP. 2009. Body Weight, Scrotal Circumference and Testosterone Concentration in Young Boer Goat Males Born during the Dry rainy seasons. S. Afric. J. of Anim. Sci., 39: 301-306.

Bitto II, Akusu MO, Egbunike GN, Akpokodje JU. 2000. The physical characteristics of ovine-caprine ejaculate mixtures and the survival of their spermatozoa in cow's milk extender in the humid tropics. Trop. J. of Anim. Sci., 3: 147-152.

Bongso TA, Jainudeen MR, Zahrah AS. 1982. Relationship of scrotal circumference to age, body weight and onset of spermatogenesis in goats. Theriog., 18: 513–524.

Daramola JO, Adeloye AA, Fatoba TA, Soladoye AO. 2007. Induction of puberty in West African Dwarf Buck-kids with exogenous Melatonin. Liv. Res. for Rur. Dev., 19: 9-14.

Devendra C. 1999**.** Goats: Challenges for increased productivity and improved livelihoods. Outl. on Agric. 28: 215-226.

Ford Jr. D, Okere C, Bolden-Tiller O. 2009. Libido Test Scores, Body Conformation and Traits in Boer and Kiko Goat Bucks. ARPN J. of Agric. and Bio. Sci., 4: 54-61.

Jerimaiah K, Osuagwuh U. 2014. Semen Characteristics of West African Dwarf Bucks following the administration of Ethanolic Extract of Carica papaya seed. W. J. of L. Sci. and Med. Res., 3: 75-80.

Karakus K, Eyduran E, Aygun T, Javed K. 2010. Appropriate growth model describing some testicular characteristics in norduz male lambs. J. of Anim. and Plt. Sci., 20: 1–4.

Keith L, Okere C, Solaiman S, Tiller O. 2009. Accuracy of Predicting Body Weights form Body Conformation and Testicular Morphometry in Pubertal Boer Goats. Res. J. of Anim. Sci. 3: 26–31.

Nolte M. 2012. "Buck Information". Fias Co. Farm, United States of America. http://fiascofarm.com/goats/buck-wether-info.htm, Accessed 8 – 11 - 2012.

Okere C, Bradley P, Bridges ER, Bolden-Tiller O, Ford D, Paden A. 2011. Relationships among body conformation, testicular Traits and semen output in electro-ejaculate Pubertal kiko goat bucks. ARPN J. of Agric. and Bio. Sci., 6: 43-48.

Oyeyemi MO, Oke AO, Ajala OO, Idehen CO. 2002. Differences in testicular parameters and morphological characteristics of spermatozoa as related to age of West African Dwarf goat. Trop. J. of Anim. Sci. 5: 99-107.

Oyeyemi MO, Leigh OO, Fakayode MO. 2011. Spermiogram and Changes in Body Parameters of West African Dwarf Bucks Fed with Dussa-poultry Waste Combination. Glo. Vet. 6: 136-139.

Petherick JC. 2005. A review of some factors affecting the expression of libido in beef cattle and individual bull and herd fertility. Apl. Anim. Behav. Sci. 90: 185-205.

Pezzanite L, Bridges A, Neary M, Hutchens T. 2013. Breeding Soundness Examinations of Rams and Bucks. Animal Science Purdue Extension, Purdue University. www.extension.purdue.edu/extmedia/AS/AS-599-Wpdf Accessed 8 - 22 - 2013.

Phillip DA, Okere C. 2011. Precision Breeding in Kiko and Boer Female goats using Bucks Fitted with A marking harness. Int. J. of Sci. & Nat., 2: 11-15.

Raji AO, Kwebuike JU, Aliya J. 2008. Testicular Biometry and its Relationship with Body Weight of Indigenous Goats in a Semi-arid Region in Nigeria. J. of Agric. and Bio. Sci. 39: 6–9.

Rege JE, Toe F, Mukasa-Mugerwa E, Tembely S, Anindo D, Baker RI, Lahlou-Kassi A. 2000. Reproductive characteristics of Ethopian highland sheep.II Genetic parameters of semen characteristics and their relationships with testicular measurements in ram lambs. S. Rum. Res. 37: 173-187.

Shoyombo A, Fasanya O, Bunjah U, Yakubu H. 2012**.** On- Farm Prediction of Testicular Characteristics in Bucks at Specific Ages. W. J. of L. Sci. and Med. Res. 2: 114-117.

Ugwu SOC. 2009. Relation between SC in-situ testicular measurements and sperm reserves in the WAD bucks. Afric. J. of Biotech. 8: 1354-1357.

Wosu LO. 2002. Ageing of sheep and goats. In: The Veterinarian's handbook. Nsukka, Nigeria: Mike Social Press. pp: 44-45.

Zemjanis R. 1977. Collection and evaluation of semen. In: Diagnostic and Therapeutic Technique in Animal Reproduction, 2nd edition. Baltimore:The Williams and Wilkins Company. pp 242-24