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RELATIONSHIPS BETWEEN BODY AND SCROTAL MEASUREMENTS, AND SEMEN CHARACTERISTICS IN YANKASA RAM

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ABSTRACT
The study was conducted to determine the relationships between body measurements, scrotal and seminal characteristics using 62 Yankasa rams at the Teaching and Research Farm of the Department of Animal Science, Ahmadu Bello University, Zaria, Nigeria. Body measurements related positively with testicular measurements (0.40-0.83). Body (0.27-0.48) and testicular (0.25-0.48) measurements were positively related to semen characteristics. However, the relationship between semen pH and sperm concentration was negative (-0.29 to -0.38), with testicular dimension (-0.30 to -0.38) and with body measurements (-0.29 to -0.38). The study revealed that efficient fertility of Yankasa rams and subsequent conception rate in ewes would depend on the interactions of these variables.

KEYWORDS: scrotal measurements, semen, yankasa rams

INTRODUCTION

The most important factor in determining profitability in sheep enterprise is production rate. General body growth and development are pre-requisite for the initiation of sexual function in males and females (Salisbury and VanDemark (1961). Testicular size may be useful as a selection criterion for improvement of the reproductive ability in both sexes. Body size on the other hand, is one of the primary factors to consider in any improvement measures for livestock. A quantitative measure for animal conformation is desirable, as it will enable reliable genetic parameters for traits to be estimated and permit its inclusion in breeding (Ibe, 1989). Linear body measurement is important in prediction of carcass weight and determination of certain body conformation traits that can be taken into consideration in selecting animals for genetic improvement.

Any quantifiable physical parameters that directly correlate with the fertilization capacity of semen could be potentially used as a measure of semen quality. Sperm production and quality can be affected by both animal size and physiological status. The ram, like other male farm animal, has two testicles which are suspended outside the body, but enclosed in a sac or scrotum (Derek, 1971). Any factor that influences the functioning of the scrotum would invariably affect the reproductive efficiency of the ram.

Therefore, the objective of this study is to evaluate the relationship between body measurements, scrotal and seminal characteristics in Yankasa ram.

MATERIALS AND METHODS

The study was conducted at the Teaching and Research Farm of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University,Zaria. Sixty-two Yankasa rams were used for this study. The linear measurements were measured in centimeters (cm) using flexible tape as described by Alphonsus *et al.* (2009). The body conformation traits are; heart girth(HG), stature(ST), chest width(CW), withers height(WH), body depth(BD), body length(BL) and rump width(RW). The body weights (BW) of the animals were determined as described by Akpa *et al*, (1998). Body condition score (BCS) was taken on a scale 1 to 5 as described by Allen, (1990). Testicular length (TL) was measured with flexible tape in centimeters as the distance along the caudal surface of the scrotum, from its point of attachment to the tip of the scrotum, and testicular circumference (TC) was taken as the point of maximum dimension around the pendulous scrotum (Akpa *et al.*,2006). The testicular width (TW) was taken as the division of the testicular circumference by two. The weight of the testicle known as testicular weight (TWT) was determined using Bailey et al. (1996) formulae: $TWT = 0.5533 \times TL \times TW^2$
Semen samples were collected from each animal using electro-ejaculator and labeled accordingly. This was done in the morning hours within the duration of experiment. The collected semen samples were immediately evaluated for colour, volume, motility, pH as described by Zemjanis, (1970). Smear of each semen sample was

prepared, air-dried, labeled and kept for further examination to determine sperm concentration using formaldehyde, sperm morphology using oil immersion and live/dead ratio using eosin nigrosin.

DATA ANALYSIS

Correlation analysis procedure of SAS (1998) was used to assess the relationship between the measured variables.

RESULT

Table 1 shows the correlation analysis between body measurements and testicular measurements in Yankasa ram. The result showed that the correlations between BW, BCS and body conformation traits with testicular measurements were positive and highly significant ($P<0.01$;r=0.40-0.83).

The correlation analysis between semen characteristics and body measurements is presented in Table 2. Semen volume was positively and significantly correlated with BW and linear body measurement (r=0.37-0.48; $P<0.01$) except BCS (r=0.24; $P>0.05$). The semen pH was negatively and significantly correlated with BW and body measurements ($P=0.01$-0.05; r=-0.29 to-0.38). Sperm concentrations were positively and significantly correlated with BW and linear body measurements ($P<0.01$-0.05; r=0.27-0.35) except BCS, ST and WH ($P>0.05$; r=0.12-0.21). Live/dead ratio was positively and significantly correlated with CW, BD and BL (($P<0.01$-0.05; r=0.27-0.30) but not with BW, BCS, HG,ST,WH and RW ($P>0.05$; r=0.15-0.24). Sperm motility, though positive, showed no significant correlations with body weight and body conformation traits in Yankasa rams ($P>0.05$; r= 0.16-0.25).

The result of the correlation analysis between semen characteristics and testicular measurement is presented in Table 3. The semen characteristics were positively and significant correlated with testicular measurements ($P<0.01$-0.05; r=0.25-0.39) except semen pH which was negatively and significantly correlated with testicular measurements ($P<0.01$; r= -0.30 to -0.38).

DISCUSSION

Sperm production and quantity can be affected by both animal size and physiological status. This explains the positive and significant correlation between testicular dimensions and body measurements. These suggested that males with larger scrotal size might possess larger body size and good reproductive ability. Testicular length and circumference are measures of testicular size which had been found to be significantly correlated with body weight (Adedeji and Gbadamosi, 1999; Bratte *et al*, 1999). The strong positive correlation between body condition score and scrotal circumference indicated that an increase in body condition would increase testicular measurement; particularly scrotal circumference which may invariably improved the fertility of the animal. This result was in agreement with other work conducted on stallions (Naden *et al.,* 1990; Blanchard *et al.,* 2001). However, Adedeji and Gbadamosi (1999) reported lower value (70) but this study reported a range of 40 to 83. The differences could be attributed to breed, genotype and environmental factors. A significant correlation between testis weight and body weight could be used in selection of animals for breeding program such as when artificial insemination is used.

Information on body measurement and semen characteristics helps in the possibility of improving fertility of animals generally. The present study showed a positive relationship between semen volume and body measurements except body condition score. This signified that rams with good body size may have higher semen volume, likewise, sperm concentration and live/dead ratio. The result showed that higher body measurement could make semen to revolve around neutral pH (6.0 and 9.0).

In the present study, it had been shown that a positive relationship existed between semen quality attributes and testicular dimension, giving an indication that an improvement in one would lead to improvement in the other. However, semen pH related negatively with testicular dimension; thus indicating that larger dimensions would probably lead to lower pH of semen in rams. This study confirms that testicular weight and sperm concentration were positively correlated (0.25) as reported by Prudy (2005) and Vidament *et al.* (2007). Results on stallions also confirmed that testicular size is a good indicator of sperm production capability as indicated in the values obtained in this study between testicular measurements and sperm concentration (0.25-0.35). Testicular size was ultimately correlated with capacity for sperm production, number of sperms ejaculated and sperm reservoirs (Palasz *et al.,* 1994). Testicular size and circumference had a direct correlation with spermatozoa output as

observed by several researchers (Willet and Ohms, 1955; Osinowo, 1979). Testicular size strongly correlated with sperm count (Shinobu and Kiyimi, 2006). The findings of this study were consistent with these reports.

CONCLUSION

Judging from the relationship between the variables, it can be concluded that efficient fertility of Yankasa rams and subsequent conception rate in ewes depend on the interaction of these variables.

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Table 1: Correlation Analysis between Body Measurements and Testicular Measurements in Yankasa Ram

	TL	TC	TW	TWT
Weight	0.68**	0.73**	0.73**	0.83**
BSC	0.40**	0.44**	0.45**	0.47**
Heart girth	0.68**	0.73**	0.73**	0.83**
Stature	0.68**	0.72**	0.72**	0.78**
Chest width	0.61**	0.65**	0.65**	0.74**
Wither height	0.67**	0.74**	0.74**	0.81**
Body depth	0.68**	0.72**	0.72**	0.79**
Body length	0.67**	0.74**	0.74**	0.81**
Rump width	0.57**	0.60**	0.59**	0.72**

** = P<0.01

Table 2: Correlation analysis between body measurement and semen characteristics in Yankasa ram

	Volume	Motility	pH	Concentration	Live/dead ratio
Weight	0.44**	0.21	-0.38**	0.27*	0.21
BSC	0.24	0.19	-0.29*	0.12	0.15
Heart girth	0.45**	0.21	-0.38**	0.27*	0.21
Stature	0.43**	0.24	-0.33**	0.16	0.24
Chest width	0.37**	0.21	-0.37**	0.35**	0.27*
Wither height	0.48**	0.25	-0.36**	0.21	0.24
Body depth	0.40**	0.25	-0.35**	0.32**	0.30**
Body length	0.38**	0.19	-0.32**	0.30**	0.27*
Rump width	0.40**	0.16	-0.29*	0.31**	0.21

** = P<0.01, * = P<0.05.

Table 3: Correlation analysis between testicular measurements and semen characteristic in Yankasa ram

	TL	TC	TW	TWT
Volume	0.39**	0.40**	0.40**	0.48**
Motility	0.38**	0.37**	0.37**	0.29**
Ph	-0.30**	-0.36**	-0.36**	-0.38**
Concentration	0.33**	0.25*	0.25*	0.35**
Live/dead ratio	0.39**	0.36**	0.36**	0.30**

** = P<0.01, * = P<0.05.

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