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Correlation between Body and Testicular Biometric Characteristics of West African Dwarf Rams

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Abstract

This study was undertaken to examine the correlation between body weight, and testicular biometric characteristics of West African Dwarf rams. Body weight and three (3) testicular biometric parameters (testicular length, testicular diameter and scrotal circumference) were taken from a total of one hundred (100) West African Dwarf rams aged between 24-30 months old reared extensively by different smallholder farmers in Keffi Local Government Area of Nasarawa State, Nigeria. Age determination of the rams were carried out by examination of the presence or absence of temporary and permanent teeth and the degree of tear and wear of the molars following standard procedure.

The data obtained were expressed as means, standard deviation and standard error of mean, while the phenotypic relationship between body weight (BW) and testicular length (TL), testicular diameter (TD) testicular, and scrotal circumference (SC) were estimated by Pearson's Correlation Coefficient using the Statistical Package for the Social Sciences (SPSS) version 20.0, keeping the BW as the dependent variable and the different testicular biometric measurements as the independent variables. The mean values and the Standard error of mean of the West African Dwarf rams for body weight (BW), testicular length (TL), testicular diameter (TD) and scrotal circumference (SC) were 30.7kg ± 0.28, 15.8 cm ± 0.13, 6.68cm ± 0.06 and 25.0cm ± 0.15. The Standard deviation of BW, TL, TD and SC were 2.78, 1.26, 0.57 and 1.48 respectively. The result of Pearson's correlation indicate that body weight correlates positively with all the testicular biometric traits ($P < 0.05$; $P < 0.01$) measured. Correlation coefficient between BW and TL ($r = 0.47$), BW and TD (0.46) as well as BW and SC (0.48) at ($P < 0.05$; $P < 0.01$) were observed. The highest positive correlation was seen between BW and SC. Scrotal circumference measurements can be a valuable tool in making selection decisions because it has shown to favorably relate to body weight. The result of this finding provide the basis in selection of rams for genetic improvement specifically, fertility.

Keywords: *Association; Measurements; Traits; Sheep; Age determination*

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Introduction

Body weight is often the most common informative measure of animal performance and it has been found very effective in assessing the reproductive efficiency and performance in rams providing readily obtainable measure for selection and feeding. Testicular biometric characteristics such as testicular diameter, testicular length, scrotal circumference and scrotal length are used as indirect selection criteria for improving fertility (Koyuncu., *et al*. 2005). Testicular biometric traits are important variables closely associated with sperm feature sand animal fertility. The shape and content of the scrotum are associated with fertility parameters (Coulter and Foote 1977). Scrotal circumference and testicular consistency have been widely used in predicting productive capacity of domestic animals and are associated with fertility parameters (Coulter and Foote 1977). The West African Dwarf sheep is the predominant breed of the humid tropics from Southern West Africa through Central Africa. Their coat colours are generally black piebald on white. Rams weighs approximately 37kg (Fitzhugh and Bradford 1983).

The testes are the primary organs of reproduction in the male because they produce male gametes (spermatozoa) and male sex hormones (androgen). The outer layer of the testes, the tunica albuginea is a thin white membrane of elastic connective tissue. As a duct leading from the testes, the epididymis serves to transport, concentrate, store and mature spermatozoa including the acquisition of progressive motility and fertility ability (Cornwall 2009). According to Schoenian (2012) and Neary (2014), scrotal circumference (SC) measurement can be taken along with the palpation of the testicle area as part of breeding soundness evaluation.

As reported by Leal., *et al*. (2004) and Hassan., *et al*. (2009) testicular parameters should suggest the level of sexual activity and semen production from the daily sperm production potential. Testicular measurements and body weight have been reported to generally indicate the production of viable spermatozoa by the male (Agga., *et al*. 2011). The morpho-biometrical analysis of testicular development is of great importance since it is significantly correlated with reproductive activity (Emsen 2005). Testicular sizes of animals are some good indicators for identification of those with adequate sperm production. Therefore this study examine the correlation between body weight, and testicular biometric characteristics of West African Dwarf rams.

Materials and Methods

Experimental site

This research was carried out within Keffi Metropolis of Nasarawa State which is located in the middle-belt of Nigeria. It is geographically situated on the latitude 8°50'N and longitude 7°52'E. Keffi town is about 850m above the sea level and it is the North-West of Lafia, the state capital. It is 53km away from Abuja (Capital of Nigeria) in the Guinea Savannah region of Nigeria (Obiekezie., *et al*. 2012).

Experimental animal and data collection

Body weight and three (3) testicular biometric parameters (testicular length, testicular diameter and scrotal circumference) were taken from a total of One hundred (100) West African Dwarf rams aged between 24-30 months reared extensively by different smallholder farmers in Keffi Local Government Area of Nasarawa State, Nigeria. Age estimates of the ram were carried out by examination of the presence or absence of temporary and permanent incisors and the degree of tear and wear of the molars following standard procedure of (Matika., *et al*. 2004).

Body weight (kg) of each animal was taken by carrying it individually and standing on a weighing scale. The difference between this weight and individual weight was taken as the weight of the animal (Akpa., *et al*. 1998). Body and scrotal biometric parameters were measured in centimeters (cm) with a flexible measuring tape (Tailor's tape rule). Testicular length was measured as the distance along the caudal surface of the scrotum, from its point of attachment to the tip of the scrotum as described by (Bratte., *et al*. 1999). Testicular diameter was measured from the widest anterior – posterior distance of the scrotum. Scrotal circumference was measured as the maximum dimension around the pendulous scrotum after pushing the testes firmly into the scrotal sac (Akpa., *et al*. 1998).

Statistical analysis

The data obtained were expressed as means, standard deviation and standard error of meanwhile the phenotypic relationship between BW and testicular biometric measurements were estimated by Pearson's Correlation Coefficient using the Statistical Package for the Social Sciences (SPSS) version 20.0, keeping the BW as the dependent variable and the different testicular biometric measurements as the independent variables.

Results and Discussion

Results

Figure 1 showed the picture of the West African dwarf ram used for this study. The result of table 1 showed the descriptive statistics of body weight and testicular biometric traits of the West African dwarf rams studied. The mean and the standard error of the body weight and testicular biometric traits are BW (30.7 ± 0.28), TL (15.8 ± 0.13), TD (6.68 ± 0.06) and SC (25.9 ± 0.15) while the standard deviation are BW (2.78), TL (1.26), TD (0.57) and SC (1.48) respectively.

Figure 1: *West African Dwarf ram of the experimental site (keffi).*

Parameters	Mean	Minimum	Maximum	STD	SEM
BW	30.7	25.0	37.0	2.78	0.28
TL	15.8	13.0	19.0	1.26	0.13
TD	6.68	6.00	8.00	0.57	0.06
SC	25.9	20.0	29.0	1.48	0.15

BW = Body weight, TL = Testicular length, TD = testicular diameter, SC = Scrotal circumference
STD = Standard deviation, SEM = Standard error of mean

Table 1: *Body Weight and Testicular biometric parameters of West African Dwarf Rams.*

Table 2 showed the Pearson correlation coefficient between body and testicular biometric characteristics of West African Dwarf rams. The results indicated that though correlation BW and TL (0.47), BW and TD (0.46), BW and SC (0.48) were all positive, the highest correlation was observed between BW and SC. Scrotal circumference has been shown to favorably relate to body weight of the rams and scrotal circumference is measured as it gives a good indication of rams breeding ability.

Parameters	TL	TD	SC
BW	0.47**	0.46**	0.48**
TL		0.05NS	0.46**
TD			0.27*

** P < 0.01 * P < 0.05

Table 2: *Pearson Correlation between Body Weight and Testicular biometric parameters of West African Dwarf Rams.*

Discussion

Body weight is often the most common informative measure of animal performance and it has been found very effective in assessing the reproductive efficiency and performance in rams providing readily obtainable measure for selection and feeding. Scrotal circumference is measured as it gives a good indication of rams breeding ability.

The scrotal circumference of the WAD rams of this study (25.87 ± 0.15) is in agreement with the work of Soderquist and Hulten (2006) who reported same for mature rams of (17-54 months old). More so, it was reported that males with larger testes tend to sire daughters that reach puberty at an earlier age and ovulate more ova during each oestrus period.

The result of Pearson's correlation indicate that body weight and measurement correlates positively with all the testicular biometric traits (P < 0.05; P < 0.01) measured. Correlation coefficient between BW and TL (r = 0.47), BW and TD (r = 0.46), and BW and SC (r = 0.48) at (P < 0.05; P < 0.01) was observed. The highest positive correlation was seen between BW and SC and scrotal circumference measurements can be a valuable tool in making selection decisions.

Scrotal circumference has been shown to favorably relate to body weight from birth to adulthood of the rams and this result is in agreement with the report of Faith., *et al*. (2016) who reported positive correlation between BW and SC (r = 0.281) in Yankasa rams of 12-24 months age.

Body weight and testicular measurements have been found to be important parameters for evaluating breeding soundness. Similarly, Karakus., *et al*. (2010) reported that BW significantly influenced TL and TD, respectively.

Thus rams with larger testes are assumed to have higher reproductive success than other with small testes in species with sperm competition. It has been shown that testicular diameter along with scrotal circumference are excellent indicators of spermatogenic function, while body weight either alone or in combination with other variables, have been found to be related to semen volume (Mekasha., *et al*. 2008). The positive association between BW and SC is an indication that improvement in both traits is possible through selection procedures, assuming there is high genetic correlations (Pourlis 2011). This is an indication that genes that contributed to BW had an influence in the reproductive ability of rams. Scrotal circumference is a simple repeatable method of measurement of testicular size which highly correlated with testicular weight, semen quality and fertility (Waldner., *et al*. 2010).

Conclusion

Based on this finding, scrotal circumference of WAD ram best correlate with body weight followed by TL and TD. Therefore scrotal circumference and body weight as well as testicular length and diameter could jointly be useful traits in evaluating breeding soundness of WAD rams.

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