RELATIONSHIP BETWEEN BODY WEIGHT AND TESTICULAR INDICES OF MUSCOVY AND KHAKI CAMPBELL DRAKES IN A SEMI-ARID AREA OF NIGERIA

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ABSTRACT
The study was conducted at the Livestock, Teaching and Research Farm, Department of Animal Science, University of Maiduguri, Borno State. The growth traits of Nigerian domestic ducks have not been studied intensively like poultry chickens which hampered their production improvement in Nigeria especially sahelian zones and therefore, the study was aimed to determine the association between body weight and linear body measurements of two ducks. A total of 200 sexually matured Muscovy and Khaki Campbell ducks were used for the study. Data obtained were body weight (BW), body length (BDL), breast circumference (BTC), Drumstick circumference (DSC), neck length (NKL) and total leg length (TLL) using weighing balance and simple measuring tape calibrated in centimeters. Correlation test was used to analyze the association between body weight and among testicular measurements. The results revealed a high and positive and significant (P<0.05, P<0.01) correlation among all the testicular parameters measured (0.73 – 0.99) in Muscovy and (r = 0.85 – 0.99) in Khaki Campbell Drakes. There were generally low, negatively correlated and not significant correlation between body weight and all the testicular morphometric traits in Muscovy Drakes while in Khaki Campbell Drakes there were some moderate correlation. The correlations were generally high, positive and significant (P<0.05, P<0.01) among the testicular measurements. The relationship among the testicular weight and morphometric traits were very high in both strain. The study concluded that Body weight had no association with testicular morphometry in Muscovy drakes. However, in Khaki Campbell drake's body weight had moderate association with some testicular morphometry.
Keywords: Correlation; Body Weight; Testes Measurements; Drakes and Semi Arid Regions.

INTRODUCTION

Information on body size and testicular traits of various breeds at constant age is of great importance in the selection of genetically superior animals for production and reproduction purposes (Tariq *et al*., 2012). Among testicular characteristics, testicular length and diameter (which are influenced by age, body weight and seasonal changes) are considered to be indirect selection criteria for more genetic progress in fertility (Karakus *et al.,* 2010; Khan *et al.,* 2010). Quantitative analysis has been utilized in assessing testicular structure and function under various physiological and pathological conditions (Omeke and Igboeli, 2000). Testicular size is the main factor determining the number of sperm and volume of ejaculate in males. The testicular measurements indicate reproduction potentials in males (Lanna *et al*., 2013). The basis for testicular asymmetry is said to remain unknown but may be due to an unequal number of primordial germ cells incorporated into the embryonic gonads (Tyler and Gous, 2008). It has been reported by several authors that body weight has a relationship with testicular morphometry in several species of livestock and poultry. These relationships were used in determining the reproductive ability and quantity of semen. The morphobiometrical analysis of testicular traits is of great importance since it is significantly correlated with reproductive activity (Emsen, 2005).

Several factors may affect the relationship between body weight and testicular morphometry and they include genotype, age, seasons, sample size and methods of analyses of the relationship such as partial correlation, correlation matrix and genetic correlation. Orlu and Egbunike (2010) reported that genotype had significant and positive correlations between the body weight and testicular weight as well as with other morphometric parameters in Barred plymouth Rock and Nigerian indigenous breeds of fowls. Pochron and Wright (2002), showed the significant positive relationship between body size and testes of animals in non-breeding season. Therefore, the study was aimed to estimate the relationship between body weight and testicular morphometry of drakes.

MATERIALS AND METHODS

The study was conducted at the Livestock Teaching and Research Farm of the Department of Animal Science, University of Maiduguri, Borno State. Maiduguri is located at the North Eastern corner of Nigeria and situated between Latitudes of 11º15' and 12º North and Longitudes 31º 05' and 14º East and at an average altitude of 345 m above sea level (Raji *et al*., 2014). The area falls within the semi-arid zone of West Africa which is characterized by short rainy season (3 to 4 months per annum) and a long dry season (8 to 9 months). The ambient temperature is as low as 20º C during the dry cold season in December- January and as high as 44º C during the dry hot season in April and May. Relative humidity is 45% in August which usually lowers to about 5% in December and January (Adamu *et al.,* 2008; Raji *et al.,* 2010 and Aliyu, 2012). Fifty four (54) Drakes were used for testicular morphometry. A total of eighteen drakes were slaughtered in each season (nine from each strain). The testes were removed and preserved in a plain bottle containing formalin and immediately taken to the Laboratory. While in the Laboratory, the adhering connective tissues and fats were carefully removed using scalpel and scissors and the epididymis was separated carefully from the testes. The testes length and diameter (mm) were measured with vernier caliper to the nearest 0.01 mm. Testes weight (g) were taken with a digital electronic weighing scale, while testes volume (cm^3) was determined by water displacement, using Archimedes's principle.

Correlation test was used to determine the association among body weights, and testicular morphometry for the different strain. The formula is as follows:

$$r = \frac{n\sum X_iY_i - \sum X_i\sum Y_i}{\sqrt{(n\sum x_i^2 - (\sum X_i)^2(n\sum Y_i^2 - (\sum Y_i)^2}}$$

Where:

r = Pearson's correlation coefficient

X_i = is the morphometric measurements of ducks

Y_i = is the body weight of ducks

RESULTS AND DISCUSSION

Table 1 diagonal shows the relationship between body weight and testicular morphometry of Muscovy drakes. The results revealed a high and positive and significant (P<0.01, P<0.001) correlation among all the testicular parameters measured (0.73 – 0.99).

There were generally low, negatively correlated and not significant correlation between body weight and all the testicular morphometric traits. The highest positive correlations (r =0.86 to 0.99) were observed between testes weight and other testicular measurements.

The results of correlation coefficient values in this study are in agreement with those of Saleh *et al*. (2020) in Muscovy drakes. They reported correlations among testicular measurements to range from 0.51 to 0.99 and also found non significant correlation between body weights and most testicular measurements. Highly significant and very strong positive correlation observed among testicular weights and morphometric measurements suggests high sperm reserve in the testes. These organs play an important function in spermatogenesis (Steinberger *et al*., 1973), maintenance of sperm maturation as well as development and stimulation of optimal sperm movement such as rapid forward progression (Adeyemo *et al*., 2007).

More so, high and significant correlations which exist between paired testes weights, left and right testicular weights, length, width, and volume indicates that drakes may have a high propensity for sperm production. Therefore, from the result of this study, body weights cannot be used to determine the testicular traits in Muscovy drakes.

The correlation coefficients of body weight and testicular measurements of Khaki Campbell drakes are presented in Table 1 above diagonal. The correlations were generally high, positive and significant (P<0.01, P<0.001) among the testicular measurements. The relationship among the testicular weight and morphometric traits were very high (r = 0.85 – 0.99). Thus, an increase in any of the testicular morphometric traits will bring about significant and positive increase in some other testicular traits. However, the results revealed that the correlation between body weights and testicular weight and measurements were low and non significant, while testes weights were high, positive and significantly correlated with all the testicular traits. Body weight had moderate relationship (P<0.01) (0.34 - 0.49)

with some testicular traits such as left testes, left testes length, left and right testes width and testes volume indicating that body weight can be used to some extent to predict these testicular traits in Khaki Campbell drakes.

The results of our present study are similar to those of Aliyu (2012) who reported positive, high and significant relationship among testicular traits (0.61 to 0.99) in indigenous chicken cocks. Orlu and Egbunike (2010) also reported moderate, positive and significant correlation between body weight and testicular traits in Phymouth rock and indigenous domestic fowl. Similarly, Orlu and Egbunike (2009, 2010) recorded similar values for indigenous and exotic roosters, respectively. These results were also similar to those reported by Togun (2006) who observed that the correlations between paired testes weights were not high enough to predict body weight.

Table 1: Phenotypic Correlation Between Body Weight and Testicular Morphometry of Muscovy Drakes

Traits	BW	PTW	LTW	RTW	LTL	RTL	LTWd	RTWd	LTV	RTV	PTV
BW		0.37^{ns}	0.40**	0.34^{ns}	0.49**	0.38^{ns}	0.45**	0.43**	0.40**	0.37^{ns}	0.43**
PTW	0.03^{ns}		0.99*	0.99*	0.87*	0.88*	0.90*	0.93*	0.94*	0.98*	0.97*
LTW	0.04^{ns}	0.99*		0.97*	0.87*	0.88*	0.91*	0.93*	0.94*	0.96*	0.96*
RTW	0.01^{ns}	0.98*	0.96*		0.85*	0.86*	0.88*	0.91*	0.92*	0.98*	0.96*
LTL	0.12^{ns}	0.94*	0.92*	0.94*		0.95*	0.97*	0.96*	0.93*	0.90*	0.92*
RTL	0.17^{ns}	0.86*	0.83*	0.89*	0.92*		0.96*	0.96*	0.92*	0.89*	0.91*
LTWd	0.19^{ns}	0.93*	0.94*	0.89*	0.94*	0.87*		0.99*	0.95*	0.92*	0.94*
RTWd	0.08^{ns}	0.95*	0.94*	0.95*	0.97*	0.89*	0.96*		0.94*	0.94*	0.94*
LTV	-0.01^{ns}	0.93*	0.92*	0.91*	0.80*	0.73*	0.80*	0.82*		0.95*	0.98*
RTV	-0.001	0.94*	0.94*	0.93*	0.83*	0.77*	0.80*	0.84*	0.98*		
PTV	-0.01^{ns}	0.94*	0.93*	0.92*	0.82*	0.75*	0.81*	0.84*	0.99*	0.99*	0.97*

(Below diagonal) Khaki Campbell (Upper Diagonal)

BW = Body Weight, PTW = Paired Testes Weight, LTW = Left Testes Weight, RTW = Right Testes Weight, LTL = Left Testes Length, RTL = Right Testes Length, LTWd = Left Testes Width, RTWd = Right Testes Width, LTV = Left Testes Volume, RTV = Right Testes Volume and PTV = Paired Testes Volume, * = P<0.05, ** = P<0.01 and ns non significant.

CONCLUSION AND RECOMMENDATIONS

Body weight had no association with testicular morphometry in Muscovy drakes. However, in Khaki Campbell drake's body weight had moderate association with some testicular morphometry such as left testicular weight and length, left and right testicular widths and testicular volume, respectively.

Further studies should be carried out in the physiological aspect of the testicular traits and the association of testosterone with body weight.

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