

LIVE WEIGHT, TESTICULAR MORPHOLOGY AND HISTOLOGY OF DOMESTIC PIGEONS (*COLUMBIA LIVIA DOMESTICA*) IN A SEMI -ARID ENVIRONMENT

Saleh, B.*, Duwa, H. and Abdullahi, I. A.

Department of Animal Science, Faculty of Agriculture, University of Maiduguri, Maiduguri, Borno State

*Corresponding Author: Saleh, B. Mobile – 08185927245, email - bbsaleh@unimaid.edu.ng

ABSTRACT

Thirty mature male pigeons of similar age were bought from households around Maiduguri and quarantined for two weeks. The birds were weighed with a digital weighing balance to obtain their live weights after which they were slaughtered. The paired testes were excised for morphological measurements. Testes weights, length and width were measured. The volume of the testes was obtained using the Archimedes principle. Testes were randomly taken from ten birds and used for histological study. The results obtained reveal that pigeons had mean live weight of 295 ± 12.13 g. Average paired testicular weight was 0.79 ± 0.15 g while the mean right and left testicular weights were 0.38 ± 0.08 g and 0.40 ± 0.08 g respectively. The result obtained shows that there was moderate correlation between live weights and all the testicular parameters measured. It was concluded that pigeons in the semi-arid region of Nigeria show testicular features that are similar to those already reported in literature and hence can be used for any breeding programme to enhance pigeon productivity in the region.

Key words: Histology, Pigeons, sperm reserve, Testes

INTRODUCTION

Pigeons have been raised for centuries, especially in North Africa and the Middle East (National Research Council [NRC], 1991). According to Bolla (2007), rearing pigeons for meat is an established industry in Europe and the United States. In Nigeria, however, pigeons are generally raised for household consumption and only a small number are either sold for meat or as breeding stock (Fajemilehin, 2017). It was noted by Kabir (2013), that squab meat is very lean, easily digestible, and richer in protein compared to beef, mineral and vitamin. They are also produced as a delicacy for the gourmet market (NRC, 1991). Fajemilehin (2017) further noted that squab is often sold at much higher prices than other poultry. NRC (1991) noted that farmed pigeons are particularly promising as urban microlivestock because they require little space and thrive in cities. Despite these attributes, pigeon had been largely neglected as a potential genetic resource in all fields of agricultural researches.

In a breeder flock, fertility rates are often related to the male performance. According to Ewuola (2013), two important factors that guide breeders in selecting breeding males include the quantity of good quality spermatogenic cells with good livability produced by the testis, and its ability to effectively store the produced spermatozoa. Several studies on the male reproductive tract have been conducted with the aim of establishing a correlation with shape, testicular size, age and sexual maturity of farm animals (Razi *et al.*, 2010). According to Oyeyemi *et al.* (2002), having adequate information on the morphometric traits of the testis and other reproductive organs of a particular breeding male is a vital pointer to its breeding value and fecundity. This is due to the fact that the spermatozoa-storing ability of the testis of a male animal determines its fertility level (Emmanuel *et al.*, 2019).

There is limited published information (Kigir *et al.*, 2010) on the testicular morphometry of pigeons in Maiduguri, Nigeria. This study was therefore designed to generate baseline information on testicular morphometry and histology of domestic pigeons in Maiduguri, Nigeria.

MATERIALS AND METHODS

The study was conducted at the Poultry Unit of the Teaching and Research Farm of the Department of Animal Science, University of Maiduguri, Borno state, Nigeria. Maiduguri is located between latitude

11° 15 and 12 ° north, longitude 30° 05 and 14° east and at an altitude of 345m above sea level (5). Thirty mature male pigeons of similar age (7 - 8 months) were bought from households around Maiduguri during the harmattan (January and February). They were quarantined for two weeks. The birds were weighed with a digital weighing balance to obtain their live weights to the nearest gram. After which they were slaughtered by severing the jugular vein. The paired testes were excised for morphological measurements. The testes were weighed to the nearest grams using an electronic weighing balance. Testis length and width were measured using a digital Vernier calliper to the nearest millimetre. The volume of the testes was obtained using the Archimedes principle. Testes were randomly taken from ten birds and used for histological study according to the method described by Bancroft and Steven (1972) and Baker and Silverton (1985).

The data obtained from the testicular morphology measurements were analysed as mean plus or minus the standard error of mean and Pearson’s correlation coefficient between the parameters were computed using SPSS (2011).

RESULTS AND DISCUSSION

Table1 shows the descriptive statistics of body weight and testicular morphometry of pigeon in semi-arid environment. The results obtained reveals that the live weight of pigeons ranged 242.00g to 390.00g with average mean live weight of 295g which is similar to the 300g and 267.17g reported by Kigir *et al.* (2010) and Kalla *et al.* (2020) for the feral pigeons in Maiduguri and Bauchi respectively. It also falls within the lower range of 340 - 680g reported by NRC (1991) for pigeons.

Results for average paired testicular weight ranged from 0.09 - 1.66g with an average 0.79 ± 0.15 g while the mean right and left testicular weights were 0.38 ± 0.08 g and 0.40 ± 0.08 g respectively. The upper range of the paired testicular weight was similar to the 1.2g reported by Slimani *et al.* (2014) for domestic pigeon in Algeria. The mean was however, higher than 0.22g reported by Kigir *et al.* (2010) for pigeons in Maiduguri. It is a known fact that the weight of testes is largely dependent on the mass of differentiated spermatogenic cells (Slimani *et al.*, 2014). The mean for gonadal sperm reserve obtained ranged from 1.50×10^6 to 3.50×10^6 with an average of $2.59 \pm 0.19 \times 10^6$.

Table 2 shows the correlation of testicular morphometry of pigeon in semi-arid environment. The result obtained shows that there were moderate correlation between live weights and all the testicular parameters measured. This means that as the body weight increase the testicular weight and length of the pigeon also increase. The correlation between the testicular measurement and gonadal sperm reserve were all negative. Live weight ($r = -0.40$) and left testicular width ($r = -0.41$) had moderate relationship with gonadal sperm reserve. The negative values observed in pigeons in this study is contrary to reports in other animals (Orlu and Egbunike, 2010; Emmanuel *et al.*, 2019). Further study is required to ascertain this negative relationship in pigeons.

Plates I and II shows histological sections of the pigeon testes and epididymis. Pigeons in the semi-arid zone of Nigeria had normal testicular features with no pathological defects. This is an indication that the birds have normal processes of sperm formation.

Table 1: Descriptive statistics of live weight and testicular morphology of pigeons

| Paramaters | Minimum | Maximum | Mean (SE±) |
|---|---------|---------|--------------|
| Live weight (g) | 242.00 | 396.00 | 295.82±12.13 |
| Paired testicular weight (g) | 0.09 | 1.66 | 0.79±0.15 |
| Right testicular weight (g) | 0.05 | 0.93 | 0.38±0.08 |
| Left testicular weight (g) | 0.04 | 0.73 | 0.40±0.08 |
| Left testicular length (mm) | 7.25 | 19.45 | 13.02±1.27 |
| Right testicular length (mm) | 8.33 | 20.15 | 12.74±1.11 |
| Left testicular width(mm) | 2.55 | 8.93 | 5.51±0.64 |
| Right testicular width (mm) | 1.74 | 9.29 | 5.64±0.77 |
| Gonadal sperm reserve ($\times 10^6$) | 1.50 | 3.50 | 2.59±0.19 |

Table 2: Correlation of testicular morphometry gonadal sperm reserve of pigeon

| | LWT | PTWT | LTWT | RTWT | LTL | RTL | LTWD | RTWD | GSR |
|------|-------|--------|--------|--------|--------|--------|--------|-------|-----|
| LWT | 1 | | | | | | | | |
| PTWT | 0.48 | 1 | | | | | | | |
| LTWT | 0.45 | 0.95** | 1 | | | | | | |
| RTWT | 0.47 | 0.95** | 0.81** | 1 | | | | | |
| LTL | 0.35 | 0.73* | 0.71* | 0.69* | 1 | | | | |
| RTL | 0.40 | 0.86** | 0.85** | 0.80** | 0.94** | 1 | | | |
| LTWD | 0.39 | 0.55 | 0.59 | 0.49 | 0.93** | 0.88** | 1 | | |
| RTWD | 0.35 | 0.58 | 0.54 | 0.58 | 0.95** | 0.84** | 0.92** | 1 | |
| GSR | -0.40 | -0.12 | -0.14 | -0.11 | -0.38 | -0.22 | -0.41 | -0.37 | 1 |

LWT- Live weight, PTWT – Paired testicular weight, LTWT- Left testicular weight, RTWT- Right testicular weight, LTL- Left testicular length, RTL-Right testicular length, LTWD- Left testicular width, RTWD- Right testicular width, GSR- Gonadal sperm reserve

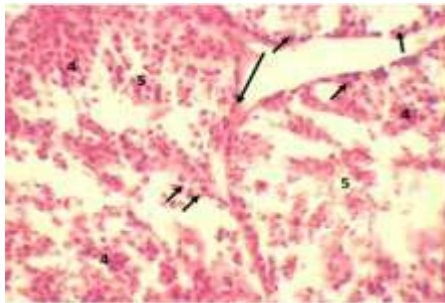


Plate I: Photomicrograph of pigeon testis showing normal matured features. Connective tissue (long arrows), spermatogonia (short arrows), spermatocytes (4), spermatids (5) and seminiferous tubules H&E x400



Plate 2: Photomicrograph of epididymis of pigeon showing spermatozoa within the lumen (XB), blood vessel (V) and interstitial connective tissue (arrows) H&E x400

CONCLUSION

It was concluded that pigeons in the semi-arid region of Nigeria show testicular features that are similar to those already reported in literature and hence can be used for any breeding programme to enhance pigeon productivity in the region.

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