HAEMOGLOBIN TYPE, HAEMATOLOGY AND MORPHOMETRIC CHARACTERISTICS OF MUSCOVY DUCKS REARED IN CALABAR, NIGERIA

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ABSTRACT. This study determined the haemoglobin polymorphism, haematology and morphometric characteristics of Muscovy ducks. A total of 80 adult Muscovy ducks (40 per sex) respectively were used for the study which lasted 60 days Blood samples of the ducks were collected and analysed for haemoglobin type and haematological traits while body weight (BWT) and body parts such as body girth (BG), wing length (WL), keel length (KL), shank length (SL), body length (BL) and thigh length (TL) were taken and subjected to one –way ANOVA. Drakes exhibited significantly ($P<0.05$) higher values in body girth, body length and thigh length than the ducks. Average values recorded were BWT (2040 g), BC (30.43cm), KL (25.75cm), BL (25.78cm) and TL (4.85cm). Haemoglobin types found were Hb AA, AB and BB, males being predominantly of Hb BB and females of Hb AA. Genotype frequencies were AA (39.14%), AB (30.43%) and BB (30.43%). Some average haematological values recorded were Packed Cell Volume (29.86%), Erythrocytes Sedimentation Rate (ESR) (7.34mm/hr), Haemoglobin Concentration (11.93g/dl), Red Blood Cell Counts (2.4×10^6/L) and White Blood Cell (1.98×10^3/L). Results of body morphometry from this research can serve as important foundation for characterization, conservation and improvement of the duck in Calabar. Establishment of the haemoglobin types is a precursor to the determination of its relationship(s) with economic traits in the birds. Haematological values indicated that the ducks were in normal condition of health and growth.

KEYWORDS: Characterization**,** genetic, conservation, traits, improvement

INTRODUCTION

Duck rearing is very popular in Asian countries and the USA. In Africa, the two countries whose production level is of marked importance are Egypt and Madagascar (Evans, 2003). Duck production in Nigeria is at a very rudimentary level, carried out by few numbers of individuals in the rural areas under free range system. There is a general high level of ignorance about duck meat and eggs and outright apathy towards it by some individuals (Ebegbulem *et al.,* 2011).

Ducks have rapid growth rates and lay more eggs than chicken layer breed. They are hardy and resistant to harsh environmental conditions and disease infestations. Ducks do very well under free range and are very good scavengers and foragers. They can as well be reared in combination with rice and fish farming (Minh *et al.,* 2002 In: Ebegbulem *et al.,* 2011). In spite of the meritorious qualities of this poultry species, it has remained largely ignored by researchers, consumers and marketers in Nigeria.

Characterization of local Muscovy ducks in Calabar will yield information which will serve as basis for the conservation of their genetic resources and subsequent improvement especially when complemented with genetic markers research. The understanding of the physiology of an animal is germane to improvement of its productivity. Okeudo *et al.* (2003) were of the opinion that haematological studies are under taken to establish diagnostic baselines for health management of animals, as they

reflect the physiological response of the animals to their internal and external environments.

The present study therefore determined the haemoglobin polymorphism and body morphometry of Muscovy ducks reared in Calabar, Nigeria, in addition to evaluating their haematological profile. The results of the study yielded information that will help in making genetic decisions as to conservation of the Calabar duck genetic resources and subsequent improvement.

MATERIALS AND METHODS

Eighty (80) Muscovy ducks (40 per sex) of 7 – 8 months of age were purchased from duck keepers in Calabar South Local Government Area of Cross River State and were used for the study which lasted 60 days. Blood was collected from the prominent wing vein of each bird by brachial veni puncture using 5ml hypodermic syringe and 20 SWG needle. About 2 mls of whole unsedimented blood samples were placed in a centrifuge and 10mls of cold 0.155m NaCl was added to wash the red cells. The samples were centrifuged and haemoglobin was released after haemolysis of the sedimented cells by addition of cold water to the cells (Salako and Ige, 2006). Haemoglobin typing was done using cellulose acetate electrophoresis. Resulting haemoglobin bands after electrophoresis were scored using direct gene counting. A single faster band was noted as AA homozygous allele, single slower band was noted as BB homozygous allele and when both bands were present concurrently, it was noted as AB heterozygous allele (Ebegbulem and Asanga, 2018).

Blood samples for haematological determinations were dispersed into EDTA bottles and were analysed within 3 hours of their collection for total haematocrit (PCV), Haemoglobin concentration (Hb), Erythrocyte Sedimentation Rate (ESR) and Differential Leucocyte Counts (Dein, 1984). Haemoglobin concentration was measured by the cyanmethemoglobin method.

Body weights of individual birds were taken using a top loader scale (*Diamond*®) calibrated in grammes. Linear body parameters were measured as described by Ebegbulem and Asanga (2018) using tailors tape calibrated in centimetres and they include: Body girth (BG), Wing length (WL), Keel length (KL), Body length (BL), and Shank length (SL).

Data obtained were subjected to one – way Analysis of Variance using Completely Randomised Design and significant means were separated using Duncan's Multiple Range Test (Steel and Torrie, 1980).

RESULTS AND DISCUSSION

Body morphometry characteristics of Calabar Muscovy ducks are presented in Table1. Body weight of the ducks was not significantly ($P>0.05$) affected by sex, with average values 2295g and 1785g for males and females respectively. The finding of the present study is at variance with the report of Raji *et al.* (2009) that reported 2710 g and 1460 g for males and female ducks (reared in Bornu, Nigeria) respectively; but is within the range of values 2.0 -2.2 kg reported by Yakubu *et al* (2011) for ducks in Guinea Savannah and Rain forest zones of Nigeria respectively. Similarly, Etuk *et al.* (2006) obtained values 2.507 kg and 1.734 kg for drakes and ducks respectively, comparable to

this research finding. Sexual dimorphism was however recorded in all other morphometric traits measured except thigh length, the drakes being consistently statistically ($P<0.05$, $P<0.01$) superior to the ducks. The values were for drakes and ducks respectively; Body girth: 31.45 cm and 29.40 cm, Keel length: 26.00 cm and 25.45cm, Body length: 26.10 and 25.45cm, Shank length: 6.40cm and 5.70cm, Thigh length: 14.85cm and 14.85cm. The observation of sexual dimorphism in favour of drakes is in agreement with previous reports (Etuk *et al.*, 2006; Taguia *et al.*, 2007; Raji *et al*., 2009).The dimorphism might be attributed to the associated hormonal (androgens) effect on growth as reported by Deeb and Cahaner (2001).

Table 1

Body morphometry characteristics of Calabar Muscovy ducks

Parameter	Pooled	Male: mean ± SEM	Female: mean ± SEM
Body weight(g)	2040±96.33	2295±136.01	1785±112.69
Body girth (cm)	30.43±0.54	31.45±0.83	29.40±0.61**
Keel length (cm)	25.75±0.14	26.00±0.68	25.45±0.15**
Body length (cm)	25.78±0.43	26.10±0.69	25.45±0.51*
Shank length (cm)	6.05±0.11	6.40±0.11	5.70±0.15**
Thigh length (cm)	14.85±0.23	14.85±0.37	14.85±0.28

SEM= Standard error of mean
**P<0.01
*P<0.05

Haemoglobin polymorphism distribution of ducks reared in Calabar is presented in Table 2. Haemoglobin variants among the ducks were AA, BB and AB; Hb AB was present only among the females but absent among males while Hb BB were present only among males and absent in females. This disparity could be because migrant genes became diffused and lost in the population since there was no selection in a specific direction. Hb AA was however common between both sexes. When the birds were pooled irrespective of sex, Hb AA genotype had the highest frequency (39.14%) above 30.43% recorded for Hb AB and BB respectively. Result of this study implied that the ducks are heterogeneous and there is no pure breed of Muscovy ducks among the population. Using Chi Square test, a deviation from the Hardy-Weinberg equilibrium was established as the observed genotype frequencies (Table 3) differed significantly ($P<0.05$) from the expected frequencies at the haemoglobin locus. This deviation could be due to the small population size and possible migration of genes in the population as it was not a closed one. Yakubu and Aya (2012) reported that frequencies of Hb AA and Hb BB were higher in male than female poultry birds. The higher percentage of Hb AA is advantageous as it has been implicated to confer disease resistance ability on the birds (Ajayi, 2013).

Table 2

Genot ype frequency of Muscovy ducks in Calabar

Sex	Genotype			Total
	AA (%)	AB (%)	BB (%)	
Male	33.33	0	66.67	100
Female	46.43	55.57	0	100
Pooled	39.14	30.43	30.43	100

Table 3
Gene frequency of Muscovy ducks in Calabar

Sex	Genotype		Total
	A	B	
Male	0.3333	0.6667	1
Female	0.6786	0.3214	1
Pooled	0.5435	0.4565	1

Result of the haematological parameters of the ducks is presented in Table 4. Sex was shown to have significantly ($P<0.05$) affected ESR, PCV, PLT, MCV and Neutrophils; males being superior to females in all the afore mentioned parameters except ESR. This observation is in tandem with the report of Chauve *et al.* (1994). Similarly, Okeudo *et al*. (2003) and Pavlak *et al*. (2005) reported higher PCV and HBC values in males than females. Packed Cell volume (PCV) and HBC values obtained in the present study (27.93 – 31.69 % and 11.21 – 12. 71 g/dl respectively) are lower than 41.17 – 46.00% and 14.17 – 15 67g/dl respectively reported by Okeudo *et al*. (2003) in ducks. They were however close to the range reported by Adeyemo *et al.* (2018). In a research carried out in ducks by Okeudo *et al*. (2003) under intensive system of management, the haematological values reported by the authors were better than values obtained in the present study. The authors reported overall value for RBC as 3.22×10^6/L, PCV: 43.59%, HBC: 14.92% and WBC: 24.53×10^3/L; this reflected the beneficial effects of better nutrition, housing and health status of the ducks. The lower WBC values recorded in the present study ($1.66 – 1.94 \times 10^3$/L) in comparison with the normal range ($4.07 – 4.32 \times 10^3$/L) is an indication of good health status of the birds. Increase in WBC above normal range indicates presence of exogenous substances and foreign bodies in the body of the animal. The ESR and HBC recorded in this study are within the normal ranges recommended for healthy birds, while PCV, WBC and MCH were below the normal ranges. The observed disparities could be as a result of inadequate nutrition and environmental status of the ducks used for the study.

Table 4

Haematological parameters of Muscovy ducks in Calabar

Parameters	Pooled	Male ± SEM	Female ±SEM
ESR(mm/hr)	7.25±0.27	5.98±0.16[b]	8.56±0.16[a]
HBC (g/dl)	11.96±0.19	12.71±0.14	11.21±0.20
PCV (%)	29.81±0.48	31.69±0.31[a]	27.93±0.57[b]
RBC($\times 10^6$/L)	2.41±0.04	2.55±0.03	2.26±0.04
WBC($\times 10^3$/L)	1.8±0.04	1.94±0.03	1.66±0.04

PLT(×10g/l)	605.11±9.09	640.21±6.17[a]	570.00±10.75[b]
MCH (pg)	50.64±0.38	50.00±0.33	51.29±0.67
MCHC (%)	39.96±0.09	40.10±0.07	39.83±0.15
MCV(fl)	124.74±0.42	125.36±0.47[a]	124.11±0.68[b]
MONO (%)	0.29±0.09	0.29±0.13	0.29±0.13
EOSI (%)	10.50±0.25	10.36±0.37	10.64±0.34
BAS (%)	0.04±0.01	0.038±0.02	0.07±0.02
NEU (%)	24.04±0.54	24.21±0.83[a]	23.86±0.71[b]
LYM (%)	65.61±0.57	66.14±0.78	65.07±0.82

[a,b] Means with different superscripts are significantly different ($p<0.05$)
SEM=standard error of mean, ESR= Erythrocytes sedimentation rate, HBC= Haemoglobin concentration, PCV= Packed cell volume, RBC= Red blood cell, WBC= White blood cell, PLT= Platelets, MCH= Mean corpuscular haemoglobin, MCHC= Mean corpuscular haemoglobin concentration, MCV= Mean corpuscular volume, MONO= Monocytes, EOSI= Eosinophils, NEU= Neutrophills, LYM= Lymphocytes

Effect of haemoglobin polymorphism on haematological parameters of ducks reared in Calabar is presented in Table 5. Information on effect of haemoglobin type in Muscovy ducks is scarce in extant literature. The values recorded in this research are however within the range reported by Ajayi *et al*. (2013) on haemoglobin genotype in Nigerian chickens. The overall mean values (when the birds were pooled together irrespective of Hb type) were PCV (29.86 %), ESR (7.34 mm/hr), RBC (33.6×10^6/L , and WBC (1.99×10^3/L) . Generally, haematological parameters are affected either by fluctuation or changes in daily physical and metabolic activities.

Table 5

Effect of haemoglobin type on haematological parameters of ducks

	Hb Type			
Parameters	AA	BB	AB	Pooled
ESR (mm/hr)	7.23±0.46[b]	6.07±0.80[b]	8.73±0.14[a]	7.34±0.26
HBC (%)	11.75±0.56	12.56±0.15	11.40±0.15	11.93±0.81
PCV (%)	29.30±0.01[b]	31.57±0.36[a]	28.70±0.05[b]	29.86±0.46
RBC($\times 10^6$/L)	2.35±0.08	2.55±0.03	2.87±0.05	29.86±0.46
WBC($\times 10^3$/L)	1.74±0.08	1.93±0.03	2.30±0.04	1.98±0.07
PLT (×10g/l)	594.1±20.39[b]	636.9±7.01[a]	574.7±7.22[b]	601.9±8.77
MCH (pg)	50.70±0.87	50.10±0.28	51.00±0.35	50.60±0.35
MCHC (%)	40.00±0.05	40.05±0.03	39.76±0.10	39.97±0.08
MCV(fl)	124.55±0.99	125.30±0.26	123.90±0.66	124.58±0.41
MONO (%)	0.30±0.15	0.50±0.05	0.45±0.06	0.27±0.08
EOSI (%)	10.20±0.39	10.05±0.5	10.60±0.37	10.43±0.24
BAS (%)	0.00	0.00	0.1±0.1	0.02±0.03
NEU (%)	23.40±0.69	24.20±1.05	24.30±0.83	23.10±0.84
LYM (%)	66.10±0.82[a]	66.20±1.02[a]	64.40±0.80[b]	65.57±0.53

[a,b] Means on the same row with different superscripts are significantly different ($P<0.05$)
SEM=Standard error of mean, HBC= Haemoglobin concentration, ESR= Erythrocytes sedimentation rate, PCV=Packed cell volume, RBC= Red blood cell, WBC= White blood cell, PLT= Platelets, MCH= Mean corpuscular haemoglobin, MCHC=Mean corpuscular haemoglobin concentration, MCV= Mean corpuscular volume, MONO= Monocytes, EOSI=Eosinophils, BAS=Basophils, NEU=Neutrophils, LYM=Lymphocytes.

CONCLUSION

Results of body morphometry from this research could serve as an important basis for characterization, conservation and improvement of this duck breed in the study location. The establishment of the haemoglobin types of ducks in Calabar is a precursor to the determination of its relationship(s) with economic traits in the birds. Haematological values recorded in this study showed that the ducks were in normal condition of health and growth.

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