Journal of Agriculture and Ecology Research International

21(2): 39-44, 2020; Article no.JAERI.46400
ISSN: 2394-1073

Morphological Diversity of Muscovy Duck in Humid Zone of Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/JAERI/2020/v21i230131
Editor(s):
(1) Dr. Noha Khalifa, Assistant Professor, Ain Shams University, Abassia, Cairo, Egypt.
(2) Dr. G.Mohan Narasimha Rao, Assistant Professor, Andhra University, Visakhapatnam, India.
Reviewers:
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(2) P. P. Dubey, Guru Angad Dev Veterinary and Animal Sciences University, India.
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(5) Augusto Florisvaldo Batisteli, Federal University of São Carlos, Brazil.
Complete Peer review History: http://www.sdiarticle4.com/review-history/46400

Short Communication

Received 12 March 2019
Accepted 16 May 2019
Published 06 April 2020

ABSTRACT

The study is aimed to assess live weight and some morphometric traits to serve as the basis for documentation and utilization in improvement programme of the locally-adapted ducks. This study observed five phenotypic characteristics and assessed live weight, and seven morphometric traits in 200 adult domestic ducks (105 drakes and 95 ducks) in the humid zone of Nigeria between February and August 2012. The observed characteristics were plumage colour, shank colour, eye colour, incidence and colour of caruncle. The seven morphometric traits included; body length, breast circumference, bill length, neck length, wing length, shank length, and foot length. Data collected were analysed using descriptive statistics, correlation and regression coefficients. Plumage colour was predominantly pied (black/white) with a relative prevalence of 69.0%. Shank colour was mainly yellow with a relative proportion of 62.5%. About 62% of the study ducks were yellow-eyed; the remaining ones had black eyes (38%). One-half (50%) of the study sample had caruncle; the remaining half had no caruncle. Red caruncle was predominant with the relative prevalence of 58.5%. The mean live weights of drakes and ducks were 3.16±0.814 kg and

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2.05±0.449 kg, respectively. Coefficients of the phenotypic correlation between live weight and morphometric traits both in ducks and drakes ranged from 0.914 to 0.987 (P<0.01). The correlation coefficients showed that body length had the strongest relationship with live weight followed by wing length (r = 0.987 and 0.984). Regression analysis showed that body length and wing length had the highest coefficients of determination (R^2 = 0.974 and 0.969), indicating that they were the best predictors of live weight. Also, the sampled Muscovy ducks showed a substantial level of variation in live weight and some morphometric traits, thereby pointing to probable gainful selection efforts. The regression equations in this study could serve as useful practical tools by livestock farmers, researchers and rural development workers for weight estimation in the field and for selection purposes.

Keywords: Muscovy duck; live weight; morphometric traits; humid zone; Nigeria.

1. INTRODUCTION

Animal genetic resources (AnGRs) in developing countries are being eroded through the rapid transformation of the agricultural system in which the main cause of the loss of indigenous AnGRs is the indiscriminate introduction of exotic genetic resources before proper characterization, utilization, and conservation of indigenous genetic resources [1]. The need for characterization comes from the potential rate of decrease in genetic variation. The loss of genetic variation within and between breeds is detrimental not only from the perspectives of culture and conservation but also utility, since most genes may be of future economic importance [2].

The aim of characterization is to obtain better knowledge about genetic resources, their present and potential future uses for food and agriculture in defined environments and their current state as distinct breed populations [1]. The information provided through the characterization process enables a range of interest groups, including farmers, government and regional as well as global bodies to make informed decisions on priorities for the management of AnGRs, [3].

Village poultry makes a significant contribution to poverty alleviation and household food security in many developing countries [4]. The poultry sector is considered the fastest growing and flexible of all the livestock sectors. Over the past decade, its dramatic expansion, consolidation and globalization have been driven by very strong demand [5].

In spite of the high population of ducks, not much-recorded effort has been put into improving their performance in Nigeria. This can, however, only be possible if the present production status is known. A recent ranking of poultry species revealed that the domestic duck is the third most commonly reared winged animal in Nigeria [6,7]. Nevertheless, very little attention has been paid to genetic improvement as well as improved husbandry practices to raise the performance of the domestic duck in Nigeria.

The bulk of ducks reared in Nigeria are the Muscovy ducks [8]. This might adduce to its hardiness, which enables it to adapt to different climate, and habitats. Very little information is available about the phenotypic characterization of the duck in Nigeria, particularly in the warm wet humid zone of Nigeria [9,10,11,12]. This study was, therefore, designed to assess live weight and some morphometric traits to serve as the basis for documentation and utilization in improvement programme of the locally-adapted ducks.

2. METHODOLOGY

2.1 Source of Data

This study area is located on latitude 07°23N and longitude 03°54'E and has semi-hot equatorial climate characterized by seven or more uninterrupted humid months and one to three dry months. The adult Muscovy ducks covered in this study were those found at six markets in the humid zone, Nigeria. These markets (Akinyele, Molete, Oja-Oba, Oje, Onidundu and Sasa) were chosen due to the availability of relatively high populations of muscovy ducks at the places at all times.

2.2 Collection of Data

The study was conducted on 200 adult Muscovy ducks comprising 105 drakes and 95 ducks. The birds were individually observed for phenotypic expression of shank colour, plumage colour, eye colour, incidence and colour of caruncle. For

each duck, the traits measured were: Live weight (total weight of live duck, LWT), body length (measured as the distance from the tip of bill over the head through body trunk to the tail, BL), breast circumference (measured as the circumference of the breast taken at the top of the pectus (hind breast), BC)), bill length (measured as the distance between the base of the bill and the tip of the bill, BLL), neck length (the length of the axial skeleton from the first to the last cervical vertebrae, NL), foot length (measured as the length between the mid-region of the *regiotarsalis* and the outset of the *digituspedis*, FL), wing length (the length between the scapula and the tip (second digits phalanges) of the wing, WL)), and shank length (measured as the distance between the mid-region of the genus and that of the *regiotersalis*, SL). Measurements were restricted to apparently healthy birds that conformed to the species classification description. A 5-kg measuring scale was used for weight measurement. The length and circumference measurements were effected using a measuring tape calibrated in centimetres (cm). All measurements were taken by the same individual early in the morning before the ducks were fed between February and August 2012.

2.3 Statistical Analysis

The data collected were analyzed using frequency, proportion and descriptive statistics. The interrelationship and predictability among body measurements were estimated by simple correlation and regression analysis [13].

3. RESULTS AND DISCUSSION

The summary of the observed phenotypic traits is presented in Table 1. About 52.5% of the sampled ducks were males (drakes) while 47.5% were females (ducks). The predominant shank colour was yellow (62.5%). Pied (Black/White) and White were observed as the predominant plumage colours with relative proportions of 69 and 31%, respectively. About 62% of the ducks were yellow-eyed, while the rest (38%) were black- eyed. Caruncle was found on one-half of the ducks. About 42% of the study ducks were with black caruncle, while the rest had red caruncles (58%).

The descriptive statistics for live weight, and morphometric traits of ducks and drakes are presented in Table 2. In both sexes, the means for live weight, body length, breast circumference, bill length, neck length, wing length, shank length, and foot length were 2.05±0.449 and 3.16±0.814 kg, 17.59±1.86 and 21.53±3.11 cm, 20.81±2.92 and 25.84±3.10 cm, 3.51±1.24 and 5.83±1.51 cm, 13.34±1.50 and 15.94±1.72 cm, 9.94±1.50 and 13.38±2.47 cm, 3.46±1.39 and 5.94±1.73 cm, and 8.14±1.33 and 10.72±1.80 cm for ducks and drakes, respectively.

Table 1. Distribution of muscovy ducks according to sex, shank colour, plumage colour, eye colour and incidence and colour of caruncle

Traits	Frequency	Proportion (%)
Sex		
Female (Duck)	95	47.50
Male (Darke)	105	52.50
Shank colour		
Yellow	125	62.50
Black	75	37.50
Plumage colour		
White	62	31.00
Pied (Black/White)	138	69.00
Eye colour		
Yellow	123	61.50
Black	77	38.50
Incidence of caruncle		
Present	100	50.00
Absent	100	50.00
Colour of caruncle		
Black	83	41.50
Red	117	58.50

Table 2. Descriptive statistics for live weight and morphometric traits of muscovy ducks (Ducks, n = 95) and (Drakes, n = 105)

Trait	Mean	Standard deviation	Coefficient of variability (%)	Mean	Standard deviation	Coefficient of variability (%)
	Ducks			**Drakes**		
Live Weight (LWT, g)	2048.28	449.302	21.90	3164.53	814.000	25.70
Body Length (BL, cm)	17.59	1.856	10.50	21.53	3.111	14.40
Breast Circumference (BC,cm)	20.81	2.915	14.00	25.84	3.096	11.90
Bill Length (BLL, cm)	3.51	1.236	35.20	5.83	1.507	25.80
Neck Length (NL, cm)	13.34	1.504	11.20	15.94	1.716	10.70
Wing Length (WL, cm)	9.94	1.497	15.00	13.38	2.468	18.40
Shank Length (SL, cm)	3.46	1.389	40.10	5.94	1.732	29.10
Foot Length (FL, cm)	8.14	1.327	16.30	10.72	1.804	16.80

Table 3. Coefficients of correlation between live weight and morphometric traits for ducks and drakes

Correlated traits	Live weight	Body length	Breast circumference	Bill length	Neck length	Wing length	Shank length	Foot length
Live Weight		0.99**	.93**	.94**	.95**	.98**	.95**	.96**
Body Length	0.98 **		.93**	.91**	.96**	.98**	.93**	.94**
Breast Circumference	0.93**	.93**		.96**	.94**	.95**	.94**	.94**
Bill Length	.94**	.91**	.96**		.96**	.95**	.97**	.96**
Neck Length	.95**	.96**	.94**	.96**		.95**	.93**	.96**
Wing Length	.98**	.98**	.95**	.95**	.95**		.95**	.96**
Shank Length	.95**	.93**	.94**	.97**	.93**	.95**		.93**
Foot Length	.96**	.94**	.94**	.98**	.96**	.96**	.93**	

***Significant at 0.01; Upper diagonal: Drakes; Lower diagonal: Ducks*

Table 4. Linear regression equations for predicting the live weight of Muscovy ducks from measurements of morphometric traits

Equation (Y = a + bX)	R^2	SE
Y = -2263.640+207.765BC	0.869	10.579
Y = -2607.539+265.568BL	0.974	5.704
Y = -474.008+451.932BLL	0.876	22.359
Y = -3294.407+401.662NL	0.909	16.658
Y = -1153.662+320.486WL	0.969	7.530
Y = 656.257+409.546SL	0.895	18.407
Y = -1258.891+407.707FL	0.918	16.014

In the drakes, highly significant (P<0.01) association existed between live weight and morphometric traits. The coefficients of correlation ranged from 0.914 to 0.984 (Table 3). A similar trend was observed in the ducks with r-values ranging from 0.914 to 0.985 (P<0.01). Table 4 shows the linear regression equation (model) predicting the live weight of Muscovy ducks. Linear regression of morphometric traits on the live weight of the ducks revealed high coefficient of determination (R^2=0.988) for wing length.

The mean live weights of 2.05 and 3.6 kg recorded for ducks and drakes are close to the 2.3 and 4.0 kg reported birds by Lee, 1997 [14]. Also Yakubu, 2009 [15] reported 2.12 kg for adult Muscovy ducks. However, Hassan and Muhammad [6] reported much lower values of 1.54 and 2.32 kg for ducks and drakes of Muscovy ecotypes in the Northwest of Nigeria. It should be noted, however, that information on the age of the ducks in this study could not be obtained because duck sellers were ignorant of it.

Mean values for body length, breast circumference, bill length, neck length, wing length, shank length and foot length reported in this study are higher in drakes than in ducks. Between the sexes, drakes were generally heavier than ducks. This may be due to sexual dimorphism that exists in favour of the drake.

The high correlation between live weight and all the morphometric traits implies that the body measurements have a high degree of association among themselves for both sexes. The coefficients of correlation ranged from 0.914 to 0.987 in drakes and 0.914 to 0.987 in the ducks. The estimates of correlation in the present study are comparable to those reported by earlier workers [16,17]. The strong relationship existing between live weight and morphometric traits may be useful as selection criteria, thereby providing a basis for the genetic manipulation and improvement of the locally adapted duck diversity. Since there are high coefficients of determination for the morphometric traits, they can be used to predict live weight and other body dimensions. From the regression equations in this study, it can be deduced that body length, wing length, neck length and foot length can be used for predicting live weight. The best predictor in both sexes was body length (R^2 = 0.974).

4. CONCLUSION

Diverse phenotypic characters exist within the Muscovy duck diversity found in the study area. The regression equations in this study could serve as useful practical tools by livestock farmers, researchers and rural development workers for weight estimation in the field and for selection purposes.

DISCLAIMER

This paper is based on the preliminary dataset. Readers are requested to consider this paper as a preliminary research article, as authors wanted to publish the initial data as early as possible. Authors are aware that detailed statistical analysis is required to get a scientifically established conclusion. Readers are requested to use the conclusion of this paper judiciously as very few statistical analyses are done. Authors also recommend detailed statistical analysis for similar future studies.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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