

## Original Research Article

**Effects of Location on Body and Egg Traits of Locally Adopted Muscovy Ducks (*Cairina moschata*) in Nasarawa South Agricultural Zone of Nigeria**

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**Article History**

Received: 16.05.2021

Accepted: 21.06.2021

Published: 28.06.2021

**Journal homepage:**<https://www.easpublisher.com>**Quick Response Code**

**Abstract:** The study was undertaken to determine biometric characterization of locally adapted Muscovy ducks in Nasarawa South Agricultural Zone. Three hundred matured Muscovy ducks were randomly selected from three randomly selected LGAs in the Nasarawa south Agricultural zone and used for the experiment. Body weight and body linear measurements as well egg qualities characteristics were determined across lafia doma and Awe Local Government Area of Nasarawa South. The data collected were analysed using one way analysis of variance (ANOVA) of the SPSS statistical package version 21. The results obtained indicated that, birds from Awe (location 3) had significantly ( $P < 0.05$ ) higher body weight ( $2.22 \pm 0.07$  kg), wing length ( $40.74 \pm 0.73$  cm), tail length ( $18.93 \pm 0.26$  cm), egg weight ( $66.79 \pm 0.64$  g), albumen length ( $10.20 \pm 0.17$  mm) and albumen width ( $6.60 \pm 0.16$  mm) compared to those from locations 1 and 2 (Lafia and Doma). However, birds from Lafia (location 1) had significantly ( $P < 0.05$ ) higher chest circumference ( $14.76 \pm 0.26$  cm) and comb length ( $2.16 \pm 0.46$  cm) compared to birds from Doma and Awe (locations 2 and 3). Similarly, birds from locations 1 and 2 (Lafia and Doma) had significantly ( $P < 0.05$ ) higher shank length ( $5.91 \pm 0.16$  cm and  $5.93 \pm 0.17$  cm, respectively) toe web ( $5.97 \pm 0.14$  cm and  $5.92 \pm 0.14$  cm, respectively) and egg length ( $6.13 \pm 0.02$  mm and  $6.07 \pm 0.02$  mm, respectively) compared to birds from location 3 (Awe). From the finding of this research, it was concluded that location have effect on Muscovy duck as such selection of these birds should be location based and subsequently be cross bred to utilise heterosis.

**Keywords:** Body linear measurement, egg qualities, heterosis, location, sex.

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**INTRODUCTION**

The poultry industry is one of the most important sectors of the Nigerian economy contributing substantially to the sector nation's Gross domestic product (GDP) Ambali et al. (2003). Local poultry are as important to the rural areas as industrial poultry are to the urban regions (Gambo et al., 2019). The genetic resources of local poultry are mainly represented by domestic Local chicken (*Gallus gallus domesticus*), guinea fowl (*Numida meleagris*) and ducks (*cairina spp*) (Youssao et al., 2010). These local avian species are breed under traditional breeding system and constitute a fast means of bridging the protein deficiency gap prevalent in most developing countries (Jibir and Usman, 2013). They also serve as a means of providing additional income to the generally resource – poor small holder farmers (Gueye, 2004). Characterization of animal genetic resources encompasses all activities associated with the identification, quantitative and qualitative description and documentation of breed populations and the natural habitats and production systems to which they are or

not adapted (FAO, 2007). This work attempt to provide relevant information on the variation on traits of the local Muscovy duck that could stimulate interest in its commercial production. The objective of the study is therefore to investigate effects of location on biometric and egg quality characteristics of locally adapted Muscovy ducks in Nasarawa South Agricultural Zone of Nasarawa State.

**MATERIAL AND METHOD****Study Area**

The study was carried out in Nasarawa south Agricultural zones. The zone comprised of five local government areas namely: Awe, Obi, Keana, Lafia and Doma. Nasarawa State is located between latitude  $08^{\circ} 32' N$  and  $08^{\circ} 18' N$  North and longitude  $06^{\circ} 15' E$  and  $08^{\circ} 50' E$  in the central geographical zone of Nigeria.

**Experimental procedure**

Three hundred matured Muscovy ducks were randomly selected from three randomly selected LGAs in the Nasarawa south Agricultural zone and used for

the experiment. 100 birds (50 male and 50 female) were randomly selected from each of the three (3) selected LGAs. 20 birds (10 males and 10 females) were selected from 5 randomly selected villages in each of the Local Government Areas. Similarly, a total of one hundred and fifty eggs were collected in the three local government areas with fifty eggs in each of the Local Government Area and 10 eggs from each of the five selected villages per local government areas.

## DATA COLLECTED

**Body weight and body linear measurements:** The body weight was taken using sensitive weighing scale while the body linear measurements were measured using measuring tape. Body linear measurement measured include: body length, wing length, tail length, shank length, toe length and toe web

**Egg quality characteristics:** External egg qualities such as egg weight, egg length, egg width, egg shape index, egg shell weight and egg shell thickness were measured. The egg and egg shell weights were measured through the use of sensitive scale. Egg length and egg width were measured through the use of vernier calliper. Egg shell thickness was measured through the use of micrometre screw gauge. The internal egg quality characteristics measured include Yolk height (YH), Yolk width (YWD), and Yolk index (YI), Yolk weight (YW), Albumin Length (AL), Albumin Width (AW) and Albumin Height (AH). These were measured through the use of vernier calliper.

### Experimental Design and Statistical Analysis

The design of the experiment was Completely Randomized Design (CRD). Data collected was subjected to one way analysis of variance (ANOVA) of the SPSS Statistical package version 21.

## RESULTS

The effect of location on body weight and body linear measurements of Muscovy ducks are presented in table 1. Location had significant ( $P<0.05$ ) effect on body weight, wing length, chest circumference, tail length, shank length, toe web and comb length. Birds from location 3 (Awe) had significantly ( $P<0.05$ ) higher body weight ( $2.22\pm 0.07$

kg), wing length ( $40.74\pm 0.73$ cm) and tail length ( $18.93\pm 0.26$ cm) compared to birds from Doma and Lafia Local Government Area respectively. However, birds from location 1 (Lafia) had significantly ( $P<0.05$ ) higher chest circumference ( $14.76\pm 0.26$ cm) and comb length ( $2.16\pm 0.46$ cm) compared to birds from Awe and Doma Local Government Area. Consequently, birds from locations 1 and 2 (Lafia and Doma) had significantly ( $P<0.05$ ) higher shank length ( $5.91\pm 0.16$ cm and  $5.93\pm 0.17$ cm) and toe web ( $5.97\pm 0.14$ cm and  $5.92\pm 0.14$ cm) compared to birds from Awe Local Government Area. Birds from the three locations were not significantly ( $P>0.05$ ) different with respect to body length, beak length and comb height.

The effect of location on internal and external egg quality characteristics of Muscovy ducks are presented in table 2. Location had significant ( $P<0.05$ ) effect on all external and internal egg quality characteristics except on albumen height which was not significant. Birds from location 3 (Awe) had significantly ( $P<0.05$ ) higher egg weight ( $66.79\pm 0.64$ g), albumen length ( $10.20\pm 0.17$ mm) and albumen width ( $6.60\pm 0.16$ mm) compared to those from Lafia and Doma Local Government Area. Birds from Awe and Doma (locations 3 and 2) had significantly ( $P<0.05$ ) higher egg width ( $4.46\pm 0.02$ mm and  $4.56\pm 0.02$ mm), egg shape index ( $74.65\pm 0.32$  and  $75.16\pm 0.45$  %) and egg shell thickness ( $69.40\pm 0.97$  and  $67.56\pm 0.45$ mm) compared to birds from Lafia Local Government Area. Similarly, birds from location 2 (Doma) had significantly ( $P<0.05$ ) higher egg shell weight ( $8.08\pm 0.08$  g) compared to birds from location 3 and 1 (Awe and Lafia) Local Government Area. However, birds of location 1 and 2 (Lafia and Doma) had significantly ( $P<0.05$ ) higher egg length ( $6.13\pm 0.02$ mm and  $6.07\pm 0.02$ mm) compared to birds from Awe Local Government Area.

The effect of sex on the body weight and body linear measurements of Muscovy ducks across the agricultural zones are presented in table 3. Males had significantly ( $P<0.05$ ) higher body weight and body linear measurements across the agricultural zones compared to their female counter parts.

**Table-1: Effect of Location on Body Weight and Linear measurements of locally adapted Muscovy ducks in Nasarawa south agricultural zone**

PARAMETERS	LAFIA	DOMA	AWE	LOS
Body weight	1.95±0.05 <sup>b</sup>	2.01±0.06 <sup>b</sup>	2.22±0.07 <sup>a</sup>	*
Body length	59.47±0.81	58.17±0.71	60.05±0.57	NS
Wing length	37.52±1.08 <sup>b</sup>	37.78±0.91 <sup>b</sup>	40.75±0.73 <sup>a</sup>	*
Chest circumference	14.76±0.26 <sup>a</sup>	13.65±0.22 <sup>b</sup>	13.72±0.20 <sup>b</sup>	*
Tail length	17.77±0.28 <sup>b</sup>	16.96±0.39 <sup>b</sup>	18.93±0.26 <sup>a</sup>	*
Shank length	5.91±0.16 <sup>a</sup>	5.93±0.17 <sup>a</sup>	4.70±0.10 <sup>b</sup>	*
Toe length	8.39±0.20	8.33±0.17	7.88±0.15	NS
Toe web	5.97±0.14 <sup>a</sup>	5.92±0.14 <sup>a</sup>	4.73±0.10 <sup>b</sup>	*
Beak length	4.39±0.07	4.17±0.11	4.28±0.55	NS
Comb height	1.03±0.04	0.89±0.07	0.98±0.05	NS
Comb length	2.16±0.46 <sup>a</sup>	1.88±0.09 <sup>b</sup>	1.90±0.08 <sup>b</sup>	*

LOS =Level Of Significant , NS =Not Significant , \* = Significant at 5%

**Table-2: Effect of Location on Egg Qualities of locally adapted Muscovy ducks in Nasarawa south agricultural zone**

Parameters	1	2	3	LOS
Egg weight	55.29±0.45 <sup>b</sup>	54.37±0.92 <sup>b</sup>	66.79±0.64 <sup>a</sup>	*
Egg length	6.13±0.02 <sup>a</sup>	6.07±0.02 <sup>a</sup>	5.98±0.03 <sup>b</sup>	*
Egg width	4.43±0.03 <sup>b</sup>	4.56±0.02 <sup>a</sup>	4.46±0.02 <sup>a</sup>	*
Egg shape index	72.36±0.55 <sup>b</sup>	75.16±0.45 <sup>a</sup>	74.65±0.32 <sup>a</sup>	*
Egg shell weight	7.71±0.15 <sup>b</sup>	8.08±0.08 <sup>a</sup>	7.66±0.11 <sup>b</sup>	*
Eggshell thickness	65.28±0.43 <sup>b</sup>	67.56±0.45 <sup>a</sup>	69.40±0.97 <sup>a</sup>	*
Albumen length	8.80±0.07 <sup>b</sup>	9.02±0.08 <sup>b</sup>	10.20±0.17 <sup>a</sup>	*
Albumen height	0.61±0.01	0.61±0.02	0.62±0.02	NS
Albumen width	5.49±0.05 <sup>b</sup>	5.77±0.07 <sup>b</sup>	6.60±0.16 <sup>a</sup>	*
Yolk height	1.53±0.06 <sup>b</sup>	1.82±0.08 <sup>a</sup>	1.81±0.03 <sup>a</sup>	*
Yolk width	4.83±0.05 <sup>b</sup>	5.19±0.04 <sup>a</sup>	5.12±0.03 <sup>a</sup>	*
Yolk index	31.41±1.20 <sup>b</sup>	35.11±1.49 <sup>a</sup>	35.32±0.64 <sup>a</sup>	*

LOS =Level Of Significant , NS =Not significant , \* =Significant at 5%

**Table-3: Effect Sex on Body Weight and Body Linear Measurements of Muscovy Ducks in Nasarawa South Agricultural Zone**

Parameters	LAFIA			DOMA			AWE		
	MALE	FEMALE	LOS	MALE	FEMALE	LOS	MALE	FEMALE	LOS
Body weight	2.35±0.07 <sup>a</sup>	1.56±0.03 <sup>b</sup>	*	2.44±0.07 <sup>a</sup>	1.58±0.05 <sup>b</sup>	*	2.73±0.07 <sup>a</sup>	1.70±0.05 <sup>b</sup>	*
Body length	65.42±0.75 <sup>a</sup>	53.52±0.81 <sup>b</sup>	*	62.02±1.00 <sup>a</sup>	54.33±0.64 <sup>b</sup>	*	64.14±0.68 <sup>a</sup>	55.97±0.40 <sup>b</sup>	*
Wing length	44.39±0.85 <sup>a</sup>	30.65±1.45 <sup>b</sup>	*	40.70±1.28 <sup>a</sup>	34.85±1.16 <sup>b</sup>	*	43.36±0.85 <sup>a</sup>	38.15±1.07 <sup>b</sup>	*
Chest circumference	16.81±0.25 <sup>a</sup>	12.71±0.22 <sup>b</sup>	*	14.31±0.30 <sup>a</sup>	13.00±0.29 <sup>b</sup>	*	14.25±0.30 <sup>a</sup>	13.19±0.24 <sup>b</sup>	*
Tail length	19.45±0.30 <sup>a</sup>	16.08±0.33 <sup>b</sup>	*	18.56±0.53 <sup>a</sup>	15.37±0.47 <sup>b</sup>	*	19.87±0.42 <sup>a</sup>	18.00±0.26 <sup>b</sup>	*
Shank length	6.95±0.21 <sup>a</sup>	4.87±0.14 <sup>b</sup>	*	6.70±0.28 <sup>a</sup>	5.16±0.11 <sup>b</sup>	*	5.21±0.13 <sup>a</sup>	4.19±0.10 <sup>b</sup>	*
Toe length	9.84±0.20 <sup>a</sup>	6.93±0.19 <sup>b</sup>	*	9.34±0.23 <sup>a</sup>	7.31±0.13 <sup>b</sup>	*	8.66±0.19 <sup>a</sup>	7.09±0.18 <sup>b</sup>	*
Toe web	6.95±0.11 <sup>a</sup>	4.98±0.16 <sup>b</sup>	*	6.86±0.17 <sup>a</sup>	4.99±0.12 <sup>b</sup>	*	5.07±0.14 <sup>a</sup>	4.40±0.13 <sup>b</sup>	*
Beak length	4.38±0.06 <sup>a</sup>	3.94±0.08 <sup>b</sup>	*	4.65±0.13 <sup>a</sup>	3.69±0.14 <sup>b</sup>	*	4.38±0.72 <sup>a</sup>	4.17±0.79 <sup>b</sup>	*

LOS =Level Of Significant , NS =Not Significant , \* =Significant at 5 %

## DISCUSSION

### The effect of location on body weight and body linear measurement parameters

Location had significant effect on body weight and body linear measurements as similarly reported by Gambo et al. (2019) for local chicken. The values obtained for body weight is similar to the reports of Ogah et al. (2011) and Ewunola et al. (2020) The values

obtained in this study for body weight is lower than the value (2691.60±30.70 g) reported by Ogah and Momoh (2014). The chest circumference of Muscovy ducks obtained from all the three locations are lower than 30.01±0.28 g reported by Yakubu (2013). The wing length obtained across locations is higher than the values of 31.02±0.27 cm reported by Yakubu (2013). The differences occurring in the body weight and body

linear measurements occurring in this study and study done by other authors could be due to the ecological zones, type of feeding and the management systems.

### **The effect of sex on body weight and body linear measurement parameters**

The superiority of males over the females observed in this study could be as a result of their ability to feed at greater depth and better feed conversion efficiency. The significant difference in body weight and other body measurements with the males having higher body weight and larger body dimensions than female ducks as noticed in this study strongly agree with the previous studies (Ogah *et al.*, 2009; Yakubu *et al.*, 2011). The mean body weight of males Muscovy ducks across the three locations obtained in this study is closely related to (2.70±0.03kg) reported by Ogah and Momoh (2014) and also related to (2.73±0.58) reported by Yakubu (2013). The wing lengths of the male Muscovy ducks across the three locations are higher than (25.68±3.99cm) and (36.99±0.16cm) reported by Yakubu (2013) and Ogah and Momoh (2014) respectively. The chest circumferences of the male Muscovy ducks across the three locations are lower than (39.33±0.12cm) and (38.83±4.29cm) reported by Ogah and Momoh (2014) and Yakubu (2013) respectively. The shank length of the male Muscovy ducks across the three locations are closely related to (6.59±0.05) reported by Ogah and Momoh (2014).

### **The effect of location on egg quality parameters**

The mean egg weight in this study is slightly lower than (78.49±3.19g), (70.80±0.35g) and 70.45±1.47g reported by Harun *et al.* (2001) and Etuk *et al.* (2012) and Amao and Olugbemiga (2016) respectively. The mean egg length in this study is closely related to (60.56±0.44mm) raised under semi intensive management system reported by Etuk *et al.* (2012) and slightly lower than (61.10±0.40 and 60.89±0.41) raised under intensive with wallow and intensive system without wallow reported by Etuk *et al.* (2012) and slightly lower than (62.34±2.48mm) reported by Amao and Olugbemiga (2016). The egg width in this study is slightly lower than (46.15±0.26mm and 46.15±0.26mm) raised under semi intensive system management and intensive system with wallow reported by Etuk *et al.* (2012) and lower than (7.80±0.03mm) reported by Amao and Olugbemiga (2016) while egg width of location 2 is closely related to (44.89±0.20mm) raised under intensive system without wallow reported by Etuk *et al.* (2012). The egg shape index obtained in in this study is lower than (0.76±0.006%) of ducks raised under semi intensive system management while egg width is closely related to (0.74±0.006mm and 0.74±0.005mm) of ducks raised under intensive system with wallow and intensive system without wallow reported by Etuk *et al.* (2012). The mean valve of egg shell weight in this study is slightly higher than (7.01±0.04mm,

7.02±0.03mm and 7.06±0.03mm) of ducks raised under semi intensive management, intensive system with wallow and intensive system without wallow respectively reported by Etuk *et al.* (2012) higher than (67.35±1.89g) reported by Amao and Olugbemiga (2016). The mean valves of egg shell thickness in this study is higher than (0.417±0.002mm, 0.419±0.002mm and 0.420±0.002mm) of ducks raised under semi intensive system of management, intensive system with wallow and intensive system without wallow reported by Etuk *et al.* (2012). The mean valve of albumen length in this study is higher than (8.95±0.07mm) of ducks raised under semi intensive management and closely related to (9.76±0.12mm and 10.01±0.10mm) of ducks raised under intensive system with wallow and intensive system intensive system without wallow reported by Etuk *et al.* (2012). The mean valve of yolk height in this study is closely related to (1.88±0.01mm, 1.92±0.01mm and 1.96±0.01mm) of ducks raised under semi intensive system of management, intensive system with wallow and intensive system without wallow reported by Etuk *et al.* (2012) and lower than (16.60±0.79mm) reported by Amao and Olugbemiga (2016). The mean valve of yolk index obtained in this study is lower than (41.40±0.04%, 40.70±0.04% and 40.60±0.04%) of ducks raised under semi intensive system of management, intensive system with wallow and intensive without wallow reported by Etuk *et al.* (2012) and slightly higher than (33.89±0.84%) reported by Amao and Olugbemiga (2016). The differences occurring in the effect of location on egg qualities in this study and the previous study by some authors could be due to the different management systems and the geographical zones in which the data were collected.

## **CONCLUSION**

The study on biometric and egg quality characteristics of locally adapted Muscovy ducks in Nasarawa South Agricultural Zone was conducted using three hundred matured Muscovy ducks which were randomly selected from three randomly selected LGAs in the Nasarawa south Agricultural zone and used for the experiment. Data were collected on body weight and body linear measurements as well egg qualities characteristics. The data collected were analysed using one way analysis of variance (ANOVA) of the SPSS statistical package version 21. The results obtained indicated that, birds from Awe (location 3) had significantly ( $P<0.05$ ) higher body weight (2.22±0.07 kg), wing length (40.74±0.73cm), tail length (18.93±0.26cm), egg weight (66.79±0.64g), albumen length (10.20±0.17mm) and albumen width (6.60±0.16mm) compared to those from locations 1 and 2 (Lafia and Doma). However, birds from Lafia (location 1) had significantly ( $P<0.05$ ) higher chest circumference (14.76±0.26cm) and comb length (2.16±0.46cm) compared to birds from Doma and Awe (locations 2 and 3). Similarly, birds from locations 1

and 2 (Lafia and Doma) had significantly ( $P < 0.05$ ) higher shank length ( $5.91 \pm 0.16$  cm and  $5.93 \pm 0.17$  cm, respectively) toe web ( $5.97 \pm 0.14$  cm and  $5.92 \pm 0.14$  cm, respectively) and egg length ( $6.13 \pm 0.02$  mm and  $6.07 \pm 0.02$  mm, respectively) compared to birds from location 3 (Awe). From the finding of this research, it was concluded that location have effect on Muscovy duck as such selection of these birds should be location based and subsequently be cross bred to utilise heterosis.

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**Cite This Article:** Gambo D *et al* (2021). Effects of Location on Body and Egg Traits of Locally Adopted Muscovy Ducks (*Cairina moschata*) in Nasarawa South Agricultural Zone of Nigera. *EAS J Biotechnol Genet*, 3(3), 58-62.