

## EFFECTS OF SEX, AGE AND SEASON ON GROWTH PERFORMANCE OF KHAKI CAMPBELL DUCKS IN A SEMI-ARID AREA OF NIGERIA

\*<sup>1</sup>Lamido, M and Mukaddas, J.

<sup>1</sup>Department of Animal Science, Federal University Dutsin-Ma, Katsina State

<sup>2</sup>Department of Animal Science, University of Maiduguri, Borno State

\*Corresponding author: [lamidogdm@gmail.com](mailto:lamidogdm@gmail.com); +2348036127209

---

### ABSTRACT

The study was conducted at the Livestock, Teaching and Research Farm of the Department of Animal Science, University of Maiduguri, Borno State. The aim was to determine the effects of strain, age and season on body weight and linear body measurements of two ducks. A total of 200 sexually matured ducks comprising of 100 Muscovy and Khaki Campbell ducks were used for the study. The study was conducted in over three different seasons dry cold (October – January), dry hot (February – May) and wet (June – September) season. 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. All the data were analysed using general linear model (GLM) procedure of (SAS) computer package while their means were separated using Duncan Multiple Range Test. The overall means of BW, BDL, BTC, THC, NKL and TLL were 1.78 kg, 40.67, 28.28, 8.48, 16.91 and 11.90 cm, respectively. Strain and age had significant ( $P < 0.05$ ) effect on BW and all body measurements. However, season significantly affect most traits measurements except BDL and NKL. Muscovy ducks (2.31 kg) were significantly heavier than the Khaki Campbell ducks (1.75 kg). Similarly, Muscovy ducks had higher values for all body measurements compared to the Khaki Campbell ducks. Older ducks also had highest values for all measurements compared to the young ones with respect to season, higher values were recorded for body weights and measurements in the dry hot and cold seasons compared to the wet season. The study concluded that sex, age and season significantly affected body weights and linear measurements of ducks. These factors must be considered when selecting for improvement in body weight or linear measurements in ducks.

**Keywords:** Sex, Age, Season, Growth Performance, Ducks

---

### INTRODUCTION

The Khaki Campbell ducks are among the exotic ducks found in Nigeria. Khaki Campbell is one of the best egg producing breed in ducks having fast growth rate and efficient feed converters and are among the duck breeds known to be the highest egg producer in the world (Adzitey and Adzitey 2011). The Khaki Campbell (*Anas platyrhynchos*) is a breed of domesticated duck that originated in England and are kept for its high level of egg production (Metzer, 2012). Body weight plays a significant role in the determination of different economically important traits (Momoh and Kershima, 2008). Knowing the body weight of ducks is important for a number of reasons such as breeding, correct feeding and health in the absence of weighing scales, especially in rural communities. Body weight of live animals is the most reliable measure of growth performance and the significance of linear body measurement of animals has been emphasized especially in its use for predicting live weight and relationship with other body morphometric traits (Adewumi *et al.*, 2006).

### 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 situated between Latitude 11° 51' North and Longitude 30°5' East and at an altitude of 354 m above sea level. The area falls within the semi-arid zone of West Africa which is characterized by short rainy season (3-4 months per annum) and a long dry season (8-9 months). The mean ambient temperature is low in December to January ranging from 15-19°C and high in March to June, ranging from 33-44°C with low relative humidity that range from 5-24.5% (Encarta, 2007). Therefore, three distinct seasons were identified: dry cold (October to January); dry hot (February to May) and wet (June to September).

#### Experimental Birds and Management

A total of one hundred (100) sexually matured ducks (12 – 36 months of age) Khaki Campbell ducks was used for the study. They were vaccinated against Newcastle disease and were fed breeder mash

containing 18% crude protein (CP) and 2500 kcal/kg metabolizable energy. Feed and water were given *ad-libitum* throughout the experimental period. The study was conducted in different seasons identified as: dry cold (October to January); dry hot (February to May) and wet (June to September). The body weight of each duck was measured using a sensitive top loading weighting balance while the length and circumference measurement were taken using a simple measuring tape calibrated in centimeters (cm). The linear body measurements and the anatomical reference points were measured and recorded as described by Teguai *et al.* (2008). All data for body weight and body measurements were analyzed by General linear model (GLM) procedure of SAS (2002). Duncan's multiple range tests was used to separate the significant means. The model used is as follows;

$$Y_{ij} = \mu + A_i + S_j + e_{ij}$$

Where:

$Y_{ij}$  = observation on the  $i^{\text{th}}$  age of the within  $j^{\text{th}}$  season respectively.

$\mu$  = overall population means

$A_i$  = effect of  $j^{\text{th}}$  age (12, 24 and 36 months)

$S_j$  = effect of  $k^{\text{th}}$  season (wet, dry hot and dry cold)

$e_{ij}$  = random error associated with each observation

## RESULTS AND DISCUSSION

The least square means of body weight (BW) and linear body measurements of Muscovy ducks as affected by sex, season and age are presented in Table 1. The overall means of body weight (BW), body length (BDL), breast circumference (BRC), drumstick circumference (DSC), neck length (NKL) and total leg length (TLL) were 1.78 kg, 40.67, 28.28, 8.91, 16.91 and 11.90 cm, respectively. Significant ( $P < 0.05$ ) difference between sex, age and seasons effect were observed in this study.

### Effect of Sex

The effect of sex on some linear body measurements was significant ( $P < 0.05$ ) while body weight, drumstick circumference and total leg length were not significantly ( $P > 0.05$ ) different. Sexual dimorphism existed in all linear body traits with males recording highest mean values than females. Significant differences in favour of males in this study were in line with the reports of previous studies on Khaki Campbell ducks reported by Yakubu *et al.* (2015).

**Table 1: Least Square Means and Standard Errors of Body Weight and Linear Body Measurements of Khaki Campbell Ducks**

Variables	BW	BDL	BRC	DSC	NKL	TLL
Overall Means	1.718±0.14	40.67±0.21	28.28±0.23	8.48±0.14	16.91±0.19	11.90±0.11
Sex	Ns	*	*	Ns	*	ns
Male	1.95±0.27	41.39±0.28 <sup>a</sup>	28.76±0.35 <sup>a</sup>	8.44±0.20	17.72±0.19 <sup>a</sup>	12.06±0.17
Female	1.49±0.03	39.94±0.28 <sup>b</sup>	27.80±0.30 <sup>b</sup>	8.52±0.20	16.09±0.29 <sup>b</sup>	11.74±0.13
Age (Months)	Ns	**	*	**	*	***
12	1.41±0.02	39.42±0.29 <sup>b</sup>	26.89±0.32 <sup>c</sup>	7.72±0.25 <sup>b</sup>	15.58±0.27 <sup>c</sup>	11.39±0.18 <sup>b</sup>
24	1.97±0.40	40.94±0.27 <sup>a</sup>	27.92±0.29 <sup>b</sup>	8.64±0.25 <sup>a</sup>	17.17±0.24 <sup>b</sup>	11.67±0.17 <sup>b</sup>
36	1.77±0.04	41.64±0.42 <sup>a</sup>	30.03±0.41 <sup>a</sup>	9.08±0.18 <sup>a</sup>	17.97±0.32 <sup>a</sup>	12.64±0.14 <sup>a</sup>
Seasons	Ns	*	Ns	*	***	*
Wet	1.65±0.04	40.67±0.34 <sup>b</sup>	28.22±0.36	7.72±0.19 <sup>c</sup>	16.97±0.23 <sup>ab</sup>	11.81±0.20 <sup>b</sup>
Dry Cold	1.48±0.03	41.67±0.37 <sup>a</sup>	28.47±0.44	9.31±0.20 <sup>a</sup>	16.42±0.38 <sup>b</sup>	12.58±0.12 <sup>a</sup>
Dry Hot	2.02±0.40	39.67±0.31 <sup>c</sup>	28.14±0.42	8.42±0.27 <sup>b</sup>	17.33±0.33 <sup>a</sup>	11.31±0.16 <sup>c</sup>

BW: Body Weight, BDL: Body Length, DSC: Drumstick Circumference, THL: thigh length, NKL: Neck Length and TLL: Total Leg Length. Means within the same column in a subset with different letters are significantly different at \* ( $P < 0.05$ ), \*\* ( $P < 0.01$ ), \*\*\* ( $P < 0.001$ ) and ns non-significant.

In most sexually dimorphic species, males appear to be larger in size and more conspicuous compared to their female counterparts (Ajayi *et al.*, 2012). The gender influenced differences reported for all the

morphological traits in favour of males could be adduced from the difference between sex differential hormonal effects on growth (Ajayi *et al.*, 2012).

Sexual dimorphism in ducks is manifested with respect to a larger number of body sizes. This may be attributed to sex hormones which may promote larger muscle development in males than in females (Guni *et al.*, 2013). According to Lorentz *et al.* (2011), sexual dimorphism is mostly influenced by genetic, environmental factors and shaped as well as natural and sexual selection. The degree and direction of sexual size dimorphism often is a consequence of different selective regimes acting separately on males and females (McCracken *et al.*, 2000).

#### **Effect of Age**

The effect of age was not significantly ( $P>0.05$ ) different on body weight; however, linear body measurements were significant ( $P<0.05$ ) different on breast circumference and neck length, ( $P<0.01$ ) on body length and drumstick circumference and ( $P<0.001$ ) on total leg length, respectively. The result of this study indicated a progressive increase in linear body measurements over age. Means of linear body measurements increased from 42.17 to 45.68, 29.46 to 33.33 and 8.63 to 10.03 cm for body length, breast circumference and drumstick circumference at one to three years of age, respectively. The body weights of these ducks were similar to the report of Khatun and Kumar (2019) who observed 1.41 to 1.24 kg values in Khaki Campbell ducks at different ages. Therefore, body conformation traits are also important parameters in assessing the potential genetic improvement and development of any livestock breed/strain (Olereforuh-Okloleh, 2017).

#### **Effect of Season**

The effect of season on body weights and linear body measurements was significant ( $P<0.05$ ). Body weights were higher in the dry hot (2.13 kg) followed by dry cold (2.01 kg) and wet (1.95 kg) seasons respectively. These differences may be due to exposure of the ducks to scavenging during dry hot which was common in Nigeria and the availability of kitchen wastes during the seasons. These values were higher than 1.72, 1.74, 1.69 and 1.73 kg in early and late rainy seasons as well as early and late dry seasons respectively reported by Okpe and Udoumoh (2016) in Nigerian ducks. The differences observed could be attributed to confounding effects of environmental factors. Wind speed has an impact on outbreak of diseases such as fowl pox, fowl cholera, coccidiosis etc during the dry cold season (Afrimash, 2019). Seasonal variation is one of the major non-genetic factors that affect poultry production. However, in some poultry birds heat stress exerts poor well-being effects (Ayo *et al.*, 2011). Similarly, De Rensis and Scrammuzzi (2003) stated that heat stress is a major factor that decreases productivity and reproductive efficiency of livestock due to lower feed intake and negative energy balance.

#### **CONCLUSION**

Based on the results obtained in this study, it was concluded that body weight and linear body measurements were affected by sex, age and season. Thus, these factors have to be taken into consideration when designing breeding programmes for the improvement of growth traits in ducks.

#### **REFERENCES**

- Adewumi, O.O., Chineke, C.A., Alokun, J.A. and Oladipupo, O. A. (2006). Effect of genotype and sex on linear body measurement in sheep. *Proceedings of 11<sup>th</sup> Ann. Conf. of Ani. Sci. Ass of Nig. (ASAN) 18<sup>th</sup> -21<sup>st</sup> Sept. Moor Plantation Ibadan, Nigeria.* 207-209.
- Adzitey, F. and Adzitey, S. P. (2011). Duck Production: Has a potential to reduce poverty among rural households in Asian community. *Journal of World's Poultry Research*, 1(1):7-10.
- Afrimash (2019). Common poultry diseases during the rainy season-signs, prevention and treatment. <http://www.afrimash.com>.
- Ajayi, O. O., Adeleke, M. A., Sanni, M.T., Yakubu, A and Peter, S.O. (2012). Application of principal component and discriminant analysis to morpho-structural indices of indigenous and exotic chickens raised under intensive management system. *Tropical Animal Health Production*, 44:1247-1254.
- Ayo, J.O., Obidi, J.A. and Rekwot, P.I. (2011): Effects of heat stress on the wellbeing, Fertility, and hatchability of chickens in the Northern Guinea Savannah Zone of Nigeria: A Review. *International Scholarly Research Network ISRN Veterinary Science Volume 2011, Article ID 838606*, 10 pages.

- Banga-Mboka, H., Maes, D., and Leroy, P.L. (2007). Indigenous Muscovy ducks in congo-Brazzaville: A survey of indigenous Muscovy ducks management in households in Dolise city. *Tropical Animal Health and Production*, 39: 115-192.
- De Rensis, F. and Scrammuzi, R. J. (2003). Heat stress and seasonal effects on reproduction in dairy cows. A Review. *Theriogenology*, 60:1139e51.
- Encarta (2007). Encarta Microsoft @ student 2007 (DVD). Redmond, WA, Microsoft cooperation.
- Guni, F.S., Katule, A.M. and Mwakilembe, P.A.A. (2013). Characterization of local chickens in selected districts of the Southern Highlands of Tanzania: II. Production and Morphometric traits. *Livestock Research for Rural Development*, 25.
- Khatu, P. and Kumar S. D. (2019). Gross anatomy of epididymis and ductus deferens of adult Khaki Campell ducks in Bangladesh. *Journal of Bioscience and Agriculture Research*, 22(1):1-5.
- Lorentz, L.H., De Genova, G.L., Lunedo, R., Ferraz, J.B.S., De Rezende, F.M. and Filho, T.M. (2011). Production and body composition traits of broilers in relation to breast weight evaluated by path analysis. *Science Agriculture (Piracicaba, Brazil)*, 68: 320-325.
- McCracken, K.V., Paton, D.C. and Afton, A.D. (2000). Sexual size dimorphism of the Musk duck. *Wilson Bull*, 112: 457-466.
- Okpe, G. C. and Udoumoh A. F. (2016). Effect of season on structural composition of drake testes and daily spermatozoa production as determined by quantitative testicular histology. *Medicine Weter*, 72 (10), 627-631.
- Oleferuh-Okoleh, V. U., Kurutsi, R. F. and Ideozu, H. M. (2017). Phenotypic evaluation of growth traits in two Nigerian local chicken genotypes. *Animal Research International*, 14(1):2611-2618.
- SAS. (2002). Statistical Analysis System, Computer Software Version 9.1: Statistical SAS Institute Inc. Cary, Northern Carolina 27513, USA.
- Teguia, A., Ngandjou, H.M., Defang, H. and Tchoumboue, J. (2008). Study of the live body weight and body characteristics of the African Muscovy Duck (*Cairina moschata*). *Tropical Animal Health Production*, 40: 5-10.
- Yakubu A., Kuje D., Okpeku M. (2009). Principal components as measures of size and shape in Nigerian indigenous chickens. *Thailan d Journal of Agricultural Science*, 42, 3, 167-176.
- Yakubu, A., Muhammed, M.M., Ari, M.M., Musa-Azara, I.S. and Omeje, J.N. (2015). Correlation and path coefficient analysis of body weight and morphometric traits of two exotic genetics group of ducks in Nigeria. *Bangladesh Journal Animal Science*. 44(1): 1-9.