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MORPHOMETRIC EVALUATION OF THE NIGERIAN HEAVY LOCAL CHICKEN ECOTYPE REARED AT NSUKKA

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Abstract

Morphometric measurements have been found useful in contrasting size and shape of animals and body weight can be determined without the use of weighing scales. The aim of the study was to predict body weight from linear body measurement and establish regression equation for the prediction of body weight. A total of 120-day old the Nigerian heavy local chicken ecotype (NHLCE) chicks were used for the study. The birds were generated from the existing NHLCE parent stocks in the Department of Animal Science farm. Cocks and hens were randomly selected from the existing flock. Artificial insemination was used as the mating method. Fertile eggs produced were marked accordingly and hatched with the aid of an electric automated incubator. The chicks were brooded for eight weeks. Body weight and linear body measurements were taken biweekly. The results showed that body weight, body length, chest girth and shank length increased with age. The average body weight ranged from 37.90g at day old to 567.60g at 8 weeks of age. Average body length ranged from 9.73cm at day old to 26.31cm at 8 weeks, chest girth ranged from 3.18cm at day old to 9.76cm at 8 weeks, average shank length ranged from 3.68cm at day old to 10.39cm at 8 weeks of age. The regression analysis showed an equation with a coefficient of determination (R^2) of 0.736. it was therefore concluded that linear body measurements can be used to predict body weight and that farmers who may not have means of weighing their birds could estimate body weight the morphological characteristics.

Keywords: Morphometry, local chicken, heavy ecotype, artificial insemination, evaluation

Introduction

The local chicken constitutes about 80% of chicken reared in the rural areas and they contribute substantially to annual meat and egg production. These local breeds of domestic chicken are kept mainly by smallholder farmers under traditional management practices and have adapted to a wide range of ecological settings (Dana *et al.*, 2011). Conceptually, according to Momoh *et al.* (2010), the indigenous Nigerian chicken have been grouped into two major ecotypes on the basis of body weight and body size; light and heavy ecotype with body weights ranging from 0.68-1.50kg and 0.9-2.5kg, respectively.

The Nigerian heavy local chicken ecotype is a breed of chicken that has been developed as dual purpose chickens for egg and meat production and has been grouped according to their feather colors (Udeh *et al.*, 2018). Some distinguishing characteristics of this indigenous breed of chicken include ability to adapt to harsh weather, disease resistance, hardy and self-reliant. They also fend for themselves by roaming about and can also hatch and brood their chicks (Assan, 2015).

Morphometric measurements have been found useful in contrasting size and shape of animals (Ajayi *et al.*, 2008). Morphometric measurements are very important in describing the uniqueness of animal genetic resources and providing data for conserving of poultry genetic resources and phenotypic characteristics. However, much is not known about the morphometric description of the Nigerian heavy local chicken ecotype. Hence, the aim of this study was to predict body weight using linear body measurements of the heavy ecotype Nigerian heavy local chicken ecotype.



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Materials and Methods

Experimental site

The study was carried out at the Local Chicken Breeding Section of the Poultry Unit, Department of Animal Science Teaching and Research Farm, University of Nigeria, Nsukka. Nsukka is located in Enugu State, Nigeria. The study lasted for 8 weeks.

Experimental Animals and Management

A total of 120 Nigerian heavy local chicken ecotype day-old chicks were used for the study. The birds were generated from the existing NHLCE parent stocks in the Department of Animal Science farm. Cocks and hens were randomly selected from the existing flock and mated to produce the chicks for the study. Artificial insemination was used as the mating method and was done on intervals of two days. Fertile eggs produced were marked accordingly and hatched with the aid of an electric automated incubator. The chicks were brooded for eight weeks. The birds were given feed and water *ad libitum* throughout the experimental period. Vaccination and medications were provided as at when due and other routine management practices provided accordingly. The following traits were measured biweekly:

Body Weight (BW): measured with a weighing scale in grams (g)

Body Length (BL): measured as the distance between the base of the neck and the cloaca using a measuring tape in centimeters (cm)

Chest Girth (CG): was taken when a measuring tape was looped around the region of the breast under the wing.

Shank Length (SL): recorded as the length of tarso-metatarsus from the hock joint to the metatarsal pad using a measuring tape.

Data analysis

Linear regression procedure of SPSS statistical package was used to find the best linear combination of linear traits measured that can best predict the body weight (SPSS, 2013) version 19.00. The linear regression model adopted was:

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3$$

Where:

Y= dependent or endogenous variable (BW)

a = intercept

b= regression coefficient

X= independent or exogenous variables (BL, CG, SL)

The strength of the prediction equation was evaluated based on the coefficient of determination (R^2)

Results and Discussion

Descriptive statistics

The results of the descriptive statistics of the body weight and linear body measurements of the Nigerian heavy local chicken ecotype are presented in Table 1.

Table 1: Descriptive statistics of the body weight and linear body measurements of the Nigerian Heavy local chicken ecotype

Age	Parameter	Mean	Std. Error of Mean	Std. Dev.	Variance	Minimum	Maximum	CV (%)
Day old	BW (g)	37.90	0.33	1.48	2.19	35.00	40.00	3.91
	BL (cm)	10.82	0.24	1.27	5.84	8.38	10.41	24.45



2 Weeks	CG (cm)	8.49	0.11	0.58	0.33	7.87	9.65	11.11
	SL (cm)	4.04	0.15	0.78	0.62	3.56	5.08	15.09
	BW (g)	113.65	2.26	10.09	101.81	98.00	132.00	8.88
	BL (cm)	15.62	0.25	1.29	1.66	13.72	17.02	24.80
	CG (cm)	12.69	0.23	1.21	1.47	11.18	14.99	23.32
4 Weeks	SL (cm)	6.45	0.28	1.46	2.13	5.59	7.62	28.08
	BW (g)	235.20	5.25	23.48	551.31	193.00	270.00	9.98
	BL (cm)	21.26	0.44	2.28	5.21	19.56	23.62	43.92
	CG (cm)	18.25	0.36	1.85	3.43	10.92	23.11	35.65
	SL (cm)	9.14	0.39	2.02	4.07	8.13	10.92	38.81
6 Weeks	BW (g)	430.40	8.80	8.79	77.26	331.00	490.00	2.04
	BL (cm)	24.87	0.49	2.54	6.45	21.84	28.70	48.89
	CG (cm)	21.93	0.45	2.32	5.36	19.05	24.89	44.55
	SL (cm)	10.67	0.47	2.44	5.94	9.4	12.45	46.91
	BW (g)	567.60	10.67	47.71	2276.24	492.00	640.00	8.41
8 Weeks	BL (cm)	27.19	0.48	2.50	6.27	23.62	30.73	48.19
	CG (cm)	24.58	0.50	2.59	6.73	21.84	28.19	49.91
	SL (cm)	11.81	0.50	2.61	6.79	10.16	13.46	50.16

BW: Body weight, SL: Shank length, BL: Body length, CG: Chest girth.

The body weights, body length, chest girth and shank length increased with age. Average body weight ranged from 37.90g at day old to 567.60g at 8 weeks. Body length ranged from 9.73cm at day old to 26.31cm at 8 weeks. Chest girth ranged from 8.54cm at day old to 23.46cm at 8 weeks. Shank length ranged from 3.68cm at day old to 10.39cm at 8 weeks of age. Ojo *et al.* (2014) agreed with this pattern of growth and reported that there was a gradual increase of body weight and linear body measurement with age. In another study, Semakula *et al.* (2011), reported that all linear body measurements increased with increasing age and stagnated above 8 months of age. They further noted that linear measurements reflect structural growth, and thus, are not expected to change much after maturity is attained; however, body weight and girth which depend on changes in muscles and fat deposition vary.

The coefficient of variation (CV) is a measure of dispersion of the variable or the degree of variation to the population mean. It is a ratio of the standard deviation to the mean. A lower CV implies low degree of variation while a higher CV connotes a higher variation (Udeh *et al.*, 2021). The CVs of the growth traits were lower at week 0 and 2, but gradually as from week 4 to week 8 of age. This is in agreement with the findings of Semakula *et al.* (2011) who reported that all linear body measurements increased with increasing age and stagnated above eight weeks of age. At week four, BL had the highest CV (18.89%) and this agreed with the result obtained by Momoh and Karishima (2008) who reported that body length and chest circumference had highest variation when he utilized standard error of the mean to estimate variation.

Linear regression

The result of the linear regression of body weight on linear body measurement of the Nigerian heavy local chicken ecotype is presented in Table 2.

Table 2: Linear regression for the combination of morphological traits for predicting body weight of heavy ecotype local chickens

Predictor	Prediction equation	R	R ²	Adjusted R ²
BL,CG,SL	BW = -4.9 + 1.7BL + CG + 4SL	0.86**	0.742**	0.736

BW: Body weight, SL: Shank length, BL: Body length, CG: Chest girth, ** Significant at P<0.01

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The R value represents the simple correlation between the morphological traits and body weight of the birds and was 0.86. This indicates a high degree of correlation. The result indicated that other linear body measurements were significantly associated with each other in a strong positive direction. The results of this study were similar to the earlier results reported in various studies on Nigerian indigenous chickens (Mancha *et al.*, 2008; Yakubu and Salako, 2009).

Conclusion and Recommendation

The findings suggest that variation existed in the studied population and that there is a relationship between body weight and linear body measurements. The correlation coefficients showed that body weight (BW) had a significant linear relationship with linear body measurement traits. Also, the regression results suggested that the predictive equations could be used to predict body weight accurately. It is therefore, recommended that the local chicken framers should use the predictive equation for body weights to estimate body weight of birds under circumstances of unavailability of weighing scales.

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