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PREDICTION OF MATURED LIVE BODY WEIGHT OF THREE PLUMAGE VARIETIES OF NOILER CHICKEN USING LINEAR BODY MEASUREMENTS AS REGRESSORS

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Abstract

The objective of the study was to predict live body weight from liner body measurements of Noiler chickens. Data on body weight (BW) and five body measurements [body length (BL), shank length (SL), breast girth (BG), and wing length (WL)] were individually collected from 240 mature Noiler chickens of three different varieties (Black, Brown and Barred) raised from hatch to maturity at 16 weeks. Data were collected on body weight, shank length, breast girth, body length and wing length at 16 week (maturity). Data collected were analyzed using the REG procedure of SAS. The results showed that body weight was significantly and strongly correlated with most linear body measurements. Further, SL (R^2= 0.7739) best predicted BW in black variety of Noiler chicken while BL best predicted BW in brown and barred variety (R^2= 0.8850; R^2= 0.6661, respectively). Therefore, it can be concluded that BW is associated with linear body measurements and that multiple regression equations that included a combination of the four linear body measurements are suitable for predicting BW of Noiler chicken populations.

Keywords: Noiler, prediction equations, regression, body weight, linear body measurements

Introduction

Noiler chicken was developed and introduced to the Nigerian Poultry industry by Amo Farm Sieberer Hatchery Limited. The name "Noiler" is believed to have been coined from the unification of two words; Nigeria and Broiler. Smallholder farmers are the major beneficiaries of the introduction of this breed of chicken as it helps to address the difficulties of food and financial insecurities rampant among the Nigerian rural population, especially women (Dudusola *et al.*, 2020). Noiler chicken can perform very well under free-range system of management and are highly resistant to common tropical poultry diseases. Body weight has been reported to be highly correlated with linear body measurements in many poultry species including chicken. This association could be especially useful for estimating body weight from these measurements when suitable weighing scales are not available. Therefore, the objective of the study was to predict the body weight of Noiler chicken from linear body measurements.

Materials and Methods

Experimental location

The experiment was conducted at the Poultry Unit of the Teaching and Research Farm, Obafemi Awolowo University, Ile-Ife, Osun State, Nigeria. The Farm lies on approximately Latitudes 7° 54′ 277″ N and 7° 56′ 074″ N and Longitudes 4° 54′ 155″ E and 4° 55′861″ E with an altitude of about 244 m above mean sea level.

Experimental birds and management

Two hundred and forty day-old chicks, comprising of eighty each from black, brown and barred strains were used. The birds were brooded and raised on deep litter in labelled pens in a semi-open house. Experimental birds were fed *ad-libitum* together during the first 12 weeks with their average daily feed intake measured. The birds were however sorted into sexes in 2s and 3s in standard galvanized battery cages and provided with similar management throughout the study period. The animals were raised under the intensive system. In the

morning, the animals were fed diets using standard commercial starter diet (19 % crude protein (CP)) and 2,750 kcal ME/kg) from hatch to 4 weeks of age, followed by a grower diet (15 % CP and 2,600 kcal ME/kg) *ad libitum*. Experimental birds were also given water *ad libitum*.

Data collection

Data were collected on body weight (BW), breast girth (BG), body length (BL), wing length (WL), and shank Length (SL) at 16 weeks of age. Body weight was measured early in the morning before feeding with a Kerro® electronic compact scale with a maximum capacity of 5000g with sensitivity of 0.1g. Linear body measurements were measured using a measuring tape.

Data analysis

The REG procedure of SAS (2003) was used to generate equations to predict live body weight from body linear measurements as follows:

$Y = a + b_1 X_1 + b_2 X_2$ -------- $b_n X_n + e$. Where: Y = Body weight; a = intercept; b_1, b_2 ……b_n =Regression coefficients; X_1, X_2, ……X_n = linear body measurements

Results and Discussion

Table 1 shows the prediction equations for body weight of black Noiler chicken using linear body measurements as regressors. Considering the regressors individually, SL best predicted the BW in the black variety of Noiler chicken (R^2=0.7739). This indicated that nearly 70 percent of the variance in BW was explained by SL thus this body measurement could be used as the single most important predictor of BW. Similar observations were reported in Nigerian indigenous chickens (Ukwu *et al*.,2014), and Japanese quail (Gambo *et al*., 2014). A combination of SL with one or more of other measurements (BG, BL, WL) generally improved the predictive power of the equations. For example, when SL was combined with BG, R^2 increased to 0.8179 for the black Noiler variety. The significant association among body weight and body linear parameters indicated by the prediction equations showed that the regression equation. Since BW is highly dependent on growth (Alabi *et al*., 2012), the predictive equations developed in the present study showed that BW could be estimated from most morphometric measurements. Further, SL best predicted BW in both sexes, with coefficients of determination (R^2) equals 0.3112 in males and 0.5118 in females. When SL was combined with BG, R^2 of male black Noiler chicken increased to 0.4251 and the R^2 of female Noiler chicken increased to 0.6332 when combined with BL.

Table 1: Prediction equation for the effect of morphometric variables on Body weight of three varieties Noiler Chicken

Number of parameters	Sex	Regression Equation	R^2
1	M	BW= -1591.98 + 453.20SL	0.3112
	F	BW= -2964.88 + 592.34SL	0.5118
	O	BW= -3308.99 + 636SL	0.7739
2	M	BW= -4843.07+ 134.45BG + 352.86SL	0.4251
	F	BW= -4486.64 + 48.63BL + 491.47SL	0.6332
	O	BW= -4681.46 + 91.18BG + 479.73SL	0.8179

3	M	BW= -6475.90 + 263.43BG -79.45WL + 341.81SL	0.5231
	F	BW= -5528.32 + 54.82BG + 43.21BL + 455.85SL	0.7113
	O	BW= -5238.75 + 75.49BG + 39.75BL + 369.64SL	0.8323
4	M	BW= -6880.62 + 247.55BG + 32.24BL – 82.30WL + 266.48SL	0.5242
	F	BW= -5645.67 + 76.14BG + 43.24BL – 22.67WL +467.01SL	0.7377
	O	BW= -5551.40 + 117.54BG + 41.98BL – 38.31WL + 368.29SL	0.8473

M= Male F= Female O=Overall BL=BL=Body length, SL= Shank length, BW=Body weight, BG= Breast girth, and WL=wing length

Prediction equations for body weight of brown Noiler chicken using linear body measurements as regressors are presented in Table 2. Unlike for black variety, BL best predicted BW with R^2 of 0.885. This indicated that nearly 90 percent of the variance in BW of brown varieties was explained by BL thus this body measurement could be used as a single most important predictor of BW of brown Noiler Chicken. Further, BL best predicted BW in both sexes, with coefficients of determination (R^2) equals 0.6712 in males and 0.4272 in females. When BL was combined with BG, R^2 of male brown Noiler chicken increased to 0.7822 and the R^2 of female brown Noiler chicken increased to 0.5401 when combined with SL.

Table 2: Prediction equation for the effect of morphometric variables on Body weight of Brown variety Noiler Chicken

Number of parameters	Sex	Regression Equation	R^2
1	M	BW= -2203.59 + 87.42BL	0.6712
	F	BW= -4197.50 + 125.95BL	0.4272
	O	BW= -3127.63 + 104.20BL	0.8850
2	M	BW= -5118.79 + 114.68BG + 76.22BL	0.7822
	F	BW= -5675.82 + 129.69BL + 155.35SL	0.5401
	O	BW= -4542.02 + 96.36BG + 75.71BL	0.9203
3	M	BW= -5735.84 + 118.82BG + 64.15BL + 117.17SL	0.8142
	F	BW= -5645 + 68.80BG + 91.29BL + 137.04SL	0.6119
	O	BW= -4365.92 + 89BG + 61.33BL + 87.40SL	0.9286
4	M	BW= -5754.74 + 118.13BG + 63.72BL + 1.71WL + 118.74SL	0.8143
	F	BW= -5742.69 + 70.20BG + 94.74BL – 10.52WL + 156.70SL	0.6203
	O	BW= -4353.72 + 90.16BG + 61.77BL – 2.88WL + 88.33SL	0.9287

M= Male F= Female O=Overall BL=BL=Body length, SL= Shank length, BW=Body weight, BG= Breast girth, and WL=wing length

In Table 5, BL also best predicted BW with coefficients of determination (R^2) equals 0.6661 in barred varieties of Noiler chicken. This indicates that nearly 70 percent of the variance in BW of barred varieties was explained by BL thus this body measurement could be used as a single most important predictor of BW of barred Noiler Chicken. BL and SL best predicted BW in male and female sexes respectively, with coefficients of determination (R^2) equals 0.5827 in males and 0.4220 in females. When BL was combined with BG, R^2 of

male barred Noiler chicken increased to 0.6566 and the R^2 of female barred Noiler chicken increased to 0.6805 when SL combined with BG.

If all the measurements of BL, BG, SL, and WL were included, R^2 of the black variety increased to 0.8473, that of brown variety increased to 0.9287, and that of barred increased to 0.8206. Thus, a model that combines all four measurements could be best in accurately predicting BW in the studied chicken populations. This present study agrees with the conclusion of Latshaw and Bishop (2001), who implied that the predictive power of the equations was improved when more measurements are included.

Table 3: Prediction equation for the effect of morphometric variables on Body weight of Barred variety Noiler Chicken

Number of parameters	Sex	Regression Equation	R^2
1	M	BW= -3917.07 + 124.39BL	0.5827
	F	BW= -3841.23 + 687.78SL	0.4220
	O	BW= -4622.65 + 137.08BL	0.6661
2	M	BW= -3616.60 + 31.50BG + 99.36BL	0.6566
	F	BW= -5875.92 + 101.82BG + 581.04SL	0.6805
	O	BW= -3152.59 + 58.93BG + 405.51SL	0.7549
3	M	BW= -3487.11 + 105.72BG + 106.12BL – 95.44WL	0.7403
	F	BW= -6153.45 + 91.89BG + 30.43BL + 472.79SL	0.6997
	O	BW= -4344.50 + 44.51BG + 58.82BL +257.27SL	0.8001
4	M	BW= -5105.23 + 96.03BG + 84.45BL – 82.57WL + 281.73SL	0.7855
	F	BW= -6295.15 + 93.70BG + 24.90BL + 16.78WL + 462.94SL	0.7028
	O	BW= -4649.91 + 69.58BG + 66.31BL – 43.76WL + 301.17SL	0.8206

M= Male F= Female O=Overall BL=BL=Body length, SL= Shank length, BW=Body weight, BG= Breast girth, and WL=wing length

Conclusion

High coefficient of determination (R^2) values obtained for the prediction equations indicated that bodyweight of Black, Brown and Barred Noiler chickens can be predicted from linear body measurements. Further, shank length is the most important predictor of body weight in Black Noiler chickens while body length is the most important predictor of body weight in Brown and Barred Noiler chickens. Therefore, the prediction equations are variety-specific and the choice of the optimal equation may depend on the body measurements that are easy to take and practical under the on-farm condition. Under smallholder management conditions, where the weighing balance may not be readily available, a simple measuring tape can be used to estimate the body weight of Noiler chickens using the developed prediction equations.

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