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Bio estimation of Body Weight on the Basis of Body Measurement of Crossbred Yoruba Ecotype Indigenous Chickens

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ABSTRACT

The study was conducted to assess the possibility of predicting body weight on the basis of body measurement in crossbred Yoruba Ecotype. This is in order to provide further information leading to their improvement. The genotype was made up of Yoruba Ecotype Chicken (FEC) and Dominant Black (DB). Mating types resulted from the crossing were (DB x DB), (DB x YE) and (YE x YE). Data were collected on Body Weight (BG), Breast Girth (BG), Body Length (BDL), Kneel Length (KL), Neck Length (NL), Shank Length (SL), Wing Length (WL) and Beak Length (BKL). These were measured individually on adult progenies resulted from the crosses. The measurements were taken with aid of weighing scale and simple measuring tape. The General Linear Model (GLM) of the Statistical Analysis System (SAS) was used for the analysis of the data generated. Coefficient of determination (R^2) for all the traits were generally positive and significant ($P < 0.05$), highest value was obtained for DB x DB followed by DB x YE and least value was obtained for YE x YE. The value range from 0.88 – 0.98 in DB x DB, 0.36 – 0.97 in DB x YE and 0.86 – 0.95 in YE x YE. BG gave highest coefficient of determination across the genotypes; BG (0.98, 0.97, 0.95), followed by SL (0.94, 0.97, 0.95) and least value were observed in BKL (0.56, 0.365 and 0.46) for (DB x DB), (DB x YE) and (YE x YE) respectively. Conclusively, the result indicated that significant amount of improvement can be achieved through continuous selection and breeding of the genotypes involved in this study

Introduction

Prediction of body weight on the basis of body measurement is essential because it assists both the sellers and buyers to have accurate, easy, cheap and rapid means of obtaining the body weight of mature poultry without recourse to a scale or weighing balance. In addition, it also aids breeding and selection. The demand for poultry meat has been on the high side in recent times, this is mainly due to the palatability and nutritional importance of poultry meat that has been discovered. The market evaluation of poultry meat in rural communities is usually by visual evaluation rather than the use of scale that characterise the urban poultry meat shops. There is an increasing interest in recent times among scientists and other stake holders in rural poultry development, particularly the local chickens. In terms of numbers, the local chickens constitute about 92% of the total poultry population in Nigeria (Akinwumi *et al.*, 1979).

Indigenous chickens in Africa are generally hardy, adaptive to rural environment, survive on little or no inputs and adjust to fluctuation in feed availability (Kitalyi, 1996). The Nigerian indigenous chickens are suitable for the development of layer strain for the tropical environment (Ayorinde, 1986). This is because they possess some inherent advantages which include good fertility and hatchability, better flavour of meat and egg, high degree of adaptability to prevailing condition, high genetic variance in their performance, disease tolerance, ease of rearing and ability to breed naturally (Adedeji *et al*,2008).

Unselected and unimproved populations of Nigerian indigenous chickens are characterized by considerable genetic variation in productive trait owing to genetic and ecological diversity (Mathur and Horst, 1990; Ajayi and Agaviezo, 2009; Adebambo, 2005) as well as the extensive husbandry and interregional marketing systems which bring ecotypes together (Ogbu,2010). For the unimproved Nigerian indigenous chickens, birds of the same age vary in growth potentials. This, in addition to the expression of social dominance lead to intense cannibalism through various forms of pecking. This often discourages the keeping of groups of indigenous chickens in confinement (Ogbu and Omeje, 2011). The Yoruba ecotype chicken has been reported to survive by fending for themselves under extensive system of production (Ibe, 1998). Their output (meat and egg) are readily available to villages and people in semi-urban areas. Thus, serves as a good source of protein in their diet as well as good source of income.

Prediction of body weight on the basis of body measurement is very important since there are generally no weighing scales in poultry markets in villages and the price of chicken largely depends on body size which implies that the profit of the farmers will be affected if the weight is not correctly predicted.

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The objective of this study is therefore to investigate the possibilities of using body measurement to predict the body weight of crossbred Yoruba ecotype indigenous chickens for further breeding and selection of the new genotype.

MATERIALS AND METHODS

A total of 30 birds were used for this experiment. This consisted of 20 Yoruba ecotype birds (15 females and 5 males) and 10 Harco Black (5 Male and 5 Female). The birds were fed on commercial breeder's diet and this was provided *ad-libitum*. The method that was used for collection of sperm through artificial insemination is the double handed massage method. Eggs from the inseminated birds were collected and kept in a room at a temperature between 10-14^0 and 75% relative humidity prior to incubation. The eggs were set in a kerosene fuelled table type incubator at a temperature between 38-39^{0}C and relative humidity between 55-60% for the first 18 days. The temperature was increased to 39-40^{0}C and relative humidity of 70-75% from 19th day to hatching time. Candling of the eggs was carried out at a day 4 and day 18 of the incubation in order to sort out unfertilised eggs and dead ones. Hatched chicks were raised to maturity and data on body measurements were evaluated with the aid of weighing scale and measuring tape rule.

Reference point for body measurement is as stated below:

Body Weight (kg): Measured as total weight of individual chicken.

Breast Girth (BG): Measured as the circumference of the chest taken at the top of the pectus (hind breast)

Body Length (BL): Measured as distance from the tip of the beak over the head through body trunk to the tail.

Kneel Length:

Neck Length: This is the length of the *axial skeleton* from the first to the last *cervical vertebrae*.

Shank Length: **):** Measured as the distance between the mid region of the Genus and that of the Regiotarsalis.

Wing Length: Measured as the distance between the tip of one wing and the tip of the other wing when spread out.

Beak Length: Measured as the distance between the base of the beak to the tip of the beak.

Statistical Analysis

Data obtained was subjected to one way analysis of variance using the general linear model (GLM) procedure of the statistical analysis system (SAS, 2003).

The regression model:

$Y = a+b_{xi}+e_i$

Where:

Y=dependentvariable

a=intercept on y-axis

b= regression coefficient i.e. change in the dependent variable resulting from a unit change in the independent variable

x_1 =independent variable (age)

e_1 = residual error

Results and Discussion

Table 1 shows the coefficient of determination (r^2). Breast Girth (BG) was the highest (0.982), closely followed by the breast girth (NL) with R^2 of 0.0.978 then the keel length (KL), shank length (SL), wing length (WL), Body length (WL) and lastly the beak length (BL) with R^2 of 0.951, 0.949, 0.918, 0.882 and 0.562 respectively in pure Dominant Black chicken. The adjusted coefficients of determination was almost in the same order.

Table 2 shows the coefficient of determination of the crossbreed of Harco Black with Yoruba Ecotype. The Breast Girth (BG) was also the highest (R^2 = 0.97) followed closely by the shank length (SL) with R^2 of 0.880, then the body length (BL), then the wing length (WL), Neck Length (NL) closely followed by the keel length (KL) with R^2 of 0.845, 0.820, 0.864, 0.791 respectively and lastly the beak length which is not significant with R^2 of 0.0365. The adjusted coefficient of determination was also in the same order.

Table 1. Equations predicting body weight on the basis of body measurements in Pure Dominant Black with Yoruba Ecotype (DB × DB).

Regression Equation	Adjusted R2	R2	Sign
Y = -450.64 + 530.84BG	0.970	0.982	***
Y = - 95.43 + 56.88NL	0.969	0.978	***
Y = -206.31 + 93.44KL	0.949	0.951	***
Y = -382.38 + 411.79BKL	0.554	0.562	***
Y = -457.80 + 70.92BL	0.878	0.882	***
Y = -285.28 + 48.59WL	0.916	0.918	***
Y = -243.31 + 94.23SL	0.948	0.949	***

*** Significant (P<0.05)

NS Not Significant

BG- breast girth, NL- neck length, KL- keel length, BKL- beak length, BL- body length, WL- wing length, SL- shank length.

Table 3 shows the coefficient of determination of the progenies of the pure breed of Yoruba Ecotype with Yoruba Ecotype. The body length (BL) was the highest (0.931).This was closely followed by the shank length (0.927). Then, the neck length (NL), with r^2 of 0.876, closely followed by the wing length (WL). The beak length (BKL) of 0.870, then the keel length (KL) of 0.868 and lastly the breast girth (BG) with a value of 0.666

Table 2. Equations predicting body weight on the basis of body measurements in crossbred Harco Black with Yoruba Ecotype (DB × YE).

Regression Equation	Adjusted R2	R2	Sign
Y = -515.03 + 612.43BG	0.941	0.970	***
Y = -573.56 + 151.19NL	0.860	0.864	***
Y = -701.98 + 210.83KL	0.785	0.791	***
Y = -512.13 + 2.85BKL	0.0081	0.365	***
Y = -734.39 + 103.01BL	0.840	0.845	***
Y = -617.93 + 91.02WL	0.815	0.820	***
Y = -648.82 + 198.09SL	0.848	0.880	***

*** Significant (P<0.05)

NS Not Significant

BG- breast girth, NL- neck length, KL- keel length, BKL- beak length, BL- body length, WL- wing length, SL- shank length

Table 3. Equations predicting body weight on the basis of body measurements in pure Yoruba Ecotype (YE × YE).

Regression Equation	Adjusted R2	R2	Sign
Y = -132.97 + 281.97BG	0.652	0.951	***
Y = -573.56 + 151.19NL	0.872	0.876	***
Y = -325.05 + 123.89KL	0.864	0.868	***
Y = -501.03 + 477.45BKL	0.456	0.461	***
Y = -295.26 + 50.34BL	0.929	0.931	***
Y = -289.39 + 49.44WL	0.868	0.872	***
Y = -258.96 + 99.37SL	0.925	0.927	***

*** Significant (P<0.05)

NS Not Significant

BG- breast girth, NL- neck length, KL- keel length, BKL- beak length, BL- body length, WL- wing length, SL- shank length.

The pure breed of the Dominant Black and Yoruba Ecotype had the highest coefficient of determination in the breast girth, neck length, keel length, back length and the wing length but the highest body length and shank length was recorded by the pure breed Yoruba Ecotype while the lowest coefficient of determinant was recorded for the breast girth by the pre breed Yoruba Ecotype. The coefficient of determination was not significant for the beak length of the crossbreed of Harco Black and Yoruba Ecotype with a value of 3.65 since it is less than 5% that means the beak as a body parameter cannot be used to predict the body weight of the crossbred Harco Black and Yoruba Ecotype. Other parameters were significant for all the breeds. The crossbreed of Harco Black and Yoruba Ecotype was the second largest with respect to the breast girth, while the pure breed recorded the second largest wing length, beak length, keel length and neck length. The neck length was the highest for both the crossbred Dominant Black with Yoruba Ecotype and that of Harco black with Yoruba Ecotype but the body length had the highest coefficient of determination for the pure breed Yoruba Ecotype. This suggests that breast girth is more accurate in predicting the body weight in the crossbreeds while the body length is more efficient for the pure breed.

Several studies, conducted to predict body weight for different animal species, indicated that the heart girth was one of the greatest body weight predictors (Heinrichs *et al*., 1992).

In this study, the breast girth is the best parameter in predicting the body weight of crossbred chickens but the body length is the best measurement for predicting body weight in pure Yoruba Ecotype breed. This study is in agreement with Momoh *et al*., (2008) that concluded that body length and chest circumference are the most suitable body measurements for this purpose. Udeh and Ogbu, (2011) recorded a positive relationship between bodyweight and most of the body measurements showed that bodyweight can be predicted from body measurements. A similar observation was reported by Ajayi *et al.,* (2008). Oyetade (2011) concluded that breast girth was found to be the best and most reliable parameter estimates at different ages. In terms of hierarchy, breast girth was significantly followed by body length and lastly keels length.

CONCLUSION

The result obtained from this research shows that prediction of body weight on the basis of measurement of body parameter is possible. Generally, the progenies of the crossbreed of Dominant Black with Yoruba Ecotype had the highest coefficient of determination of all the body parameters.

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