CONFORMATION TRAITS AS PREDICTORS OF BODY WEIGHT OF BROILER CHICKENS IN THE SEMI-ARID ZONE OF NIGERIA

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ABSTRACT

The objective of the experiment was to assess the impact of conformation traits on the body weight among Napri-X, Marshall and Ross broiler chickens. The study used 315 strains. The birds were brooded with the aid of a kerosene stove and charcoal as heat source and reared on deep litter from day-old to 8 weeks of age. All the chicks were fed ad libitum with a broiler starter feed containing 23.75% Crude Protein (CP) and 3,038.64 MEKcal/kg up to 4 weeks of age. Thereafter, the birds were given broiler finisher diet containing 19.95% CP and 3,102.00 MEKcal/kg up to 8 weeks based on the standard of National Research Council (NRC, 2004). The experiment was conducted in a Complete Randomized Design (CRD). Treatments were replicated seven times with fifteen birds per pen. Conformation traits otherwise called linear body measurements were taken on weekly basis. The data collected on each strain were subjected to Linear Multiple Regression Model procedure of SPSS (2011) version 20. The results show that the regression analysis was highly significant ($p<0.001$) in all the groups and R^2 values more than 50% in all the groups. This suggests that conformation traits are very good predictors for body weight in broilers. Therefore, it is concluded that in rural areas where scale is not available, any of these conformation traits (NEL, BKL, THL, SHL, BRW, BDL and WNL) could be used to predict body weight of broiler chicken.

It is therefore recommended that, poultry breeders and farmers can use any of these conformation traits to obtain satisfactory body weight of chicken.

Key words: Conformation traits, Napri-X, Marshall, Ross, Strains.

INRODUCTION

Broilers are fast growing birds reared to provide tender meat for human consumption as they appear more frequent than any other animal protein source of meat (Ruttanavut and Yamauchi, 2010). Most of the linear body measurements reflect primarily the length of long bones of the animals. In addition, Ibe (1989) reported that a number of conformation traits are known to be good indicators of growth and market value in broilers. Such conformation traits include shank length, breast width, keel length, wing span, chicken height, body length, thigh length and head circumference. The relationship between body weights and conformation traits has been found to have important implications in the production of broilers with desirable body conformation (Ibe and Nwakalor, 1987). However, Okon *et al.* (1996) indicated that, the relationships between body weight and conformation traits are direct and positive. As such knowledge of this relationship would help breeders organize their programme in order to achieve optimum combination of body weight and good conformation for maximum economic returns (Adeniji and Ayorinde, 1990). Body growth in livestock may be evaluated with body components such as live weight and linear body measurements (Wolanski *et al.*, 2006 and Tilki, 2007). Poultry breeders need some techniques to select animals for breeding purposes. Linear body measurements otherwise called conformation traits are important parameters in predicting body weight and this has been observed by commercial breeders and producers. In places where scales are not available as is the case in most rural African communities (Nesamvuni*et al.*, 2000), linear body measurements such as shank length, drum stick length, and wing length can be used in a predictive

equation to predict body weight in broilers (Akanno *et al.,* 2007). The objective of this study is to assess the extent to which conformation traits influence body weight in three broiler chickens.

MATERIALS AND METHODS

The experiment was conducted at the poultry unit of teaching and research farm, Department of Animal Health and Husbandry, AuduBako College of Agriculture, Dambatta (ABCOAD). ABCOAD is located between latitude 12^0 20.260´ North and longitude 8^0 31.567´ East. The College possesses a tropical climate with annual rainfall of 600mm that lasts for four months (between June and October) and the mean annual temperature is 38^0C with highest temperature occurring in April to May (41^0C) and lowest in January to February (30^0C) (Abdulrashid*et al.,* 2011). The relative humidity ranges from 22 to 52% as recorded by (KNARDA, 2011). The experiment lasted for 8 weeks. A total of 315 day old broiler strains comprising 105 each of NAPRI-X, Marshall and Ross were used. NAPRI-X strain was purchased from National Animal Production Research Institute (NAPRI) while Marshall and Ross strains were procured from Obasanjo farms in Abeokuta, Ogun State and transported to Kano. Each strain was identified by wing tag, randomized and allotted to pens in a brooder house with floor covered using wood shavings which was kept dry throughout the experimental period by replacing the litter regularlyconforming to standard management procedures as described by (Oluyemi and Roberts, 1979). The birds were brooded with the aid of kerosene stoves and charcoal as heat source and reared on deep litter from day-old to 8 weeks of age. All the chicks were fed *ad libitum* with a broiler starter feed containing 23.75% Crude Protein (CP) and 3,038.64 MEKcal/kg up to 4 weeks of age. Thereafter, the birds were given broiler finisher diet containing 19.95% CP and 3,102.00 MEKcal/kg up to 8 weeks in accordance with NRC (1994) nutrient standard for broiler birds. Fresh, cool drinking water was also given *ad libitum.* Vaccinationand other routine medication were carried out as at and when due. The experiment was conducted in a Completely Randomized Design (CRD). However, treatments were replicated seven times with fifteen birds per pen. The body weight of the birds was measured weekly. The conformation traits (neck length, back length, thigh length, shank length, breast width, body length and wing length) were measured on weekly basis using a tape rule calibrated in centimeters. The data collected on each strain were subjected to Multiple Regression Analysis (MRA) procedure using Statistical package for social science SPSS (2011) version 20. The following statistical model was used in the analysis:

$$Y_{ij} = \mu + C_i + e_{ij}$$

Where, Y_{ij}= Observation (Lack Length, Back Length, Thigh Length, Shank Length, Breast Width, Body Length and Wing Length) made on the j^{th}individual belonging to the i^{th} strain of broilers

μ = Overall estimate of the population mean

C_i = the effect of i^{th} strain of broiler (*i*=1,2 and 3)

e_{ij}= Random error associated with each measurement

Multiple regression models were used to determine prediction equations for the three strains of broilers at 8 weeks of age respectively.

RESULTS

Table 1 indicates regression equations relating body weight to body conformation traits with their accuracy of prediction (R^2) values for the three strains of broilers. It will be observed that the regression analysis were highly significant ($p<0.001$) in all the groups and the coefficient of determination (R^2) values more than 50% in all the strains. This suggests that the body conformation traits are very good predictors of body weight in broilers.

The results in addition showed that in NAPRI-X, NEL, SHL, BRW, BDL and WNL have significantly predicted the BW with NEL and SHL having the highest magnitude of B-values indicating that the traits have substantially contributed to the BW. These traits accounted for 98% variance in the dependent variable (BW). Similarly, in Marshall, BDL, NEL, THL and SHL were the most significant predictors accounting for 97.6% variance in dependent variable (BW) indicating that, these four traits accounted for major contribution to the BW. In addition, the predictor traits in Ross strain were BKL, BDL, SHL, THL and NEL accounting for 93% variance in the dependent variable, meaning that these traits were the major contributing traits to the BW in Ross Strain.

Table 1: Regression equation relating body weight and linear body measurements at 8 weeks of age for three strains of broiler chicken

Strain type	Prediction equations	R^2	S.E.	Sig.
NAPRI-X	BW = - 676.68 + 82.96NEL – 27.71BKL -12.30THL + 33.49SHL + 15.77BRW + 18.46BDL + 28. 00WNL	98.0	91.28	***
Marshall	BW= -980.00+ 69.62NEL – 47.00BKL + 39.13THL + 24.42SHL – 43.67BRW + 125.23BDL -19.06WNL	97.6	81.53	***
Ross	BW= -1089.94+ 16.67NEL + 56.44BKL + 26.76THL + 47.54SHL – 6.23BRW + 50.92BDL – 42.45WNL	93.4	117.98	***

NAPRI-X = A synthetic broiler breed of National Animal Production Research Institute, BW = Body weight, NEL = Neck length, BKL = Back length, THL = Thigh length, SHL = Shank length, BRW = Breast width, BDL =Body length, WNL =Wing length, R^2 = Coefficient of determination, S.E. = Standard error and *** = very highly significant ($p<0.001$)

DISCUSSIONS

The findings of the study depict the predictive power (R^2) of the conformation traits in body weight. The results showed satisfactory explanatory power of conformation traits in body weight of the broiler strains. The finding is consistent with the report of Udeh *et al* (2011) who equally discovered that conformation traits contribute substantially to the body weight of Anak, Arbor Acre, Marshall and Ross strains. However, the findings shed more light on the relevance of conformation traits in determining body weight of the broiler chickens and this could be more relevant especially in areas where weighing scale may not be readily available.

The findings of the study indicated that, the most common predictor traits in all the three strains was NEL, SHL, and BDL which account for 82.96, 69.62 and 16.67, 33.49, 24.42 and 47.54, 18.46, 125.23 and 50.92 respectively, depicting that the predictive power of the BDL in Ross is higher (125.23) than in other strains. However, BRW and WNL were found to have predictive capacity in NAPRI-X only while BDL, NEL, THL and SHL have common predictive power in Marshall and Ross strains respectively.

CONCLUSION

The results of Multiple Regression Analysis showed conformation traits are good predictors of body weight of broilers. Therefore, it is concluded that conformation traits constitute important components that make body weight in all the three strains. In addition, within the traits, the most common predictor traits in all the three strains was NEL, SHL, and BDL whereas, BRW and WNL were found to have predictive power in NAPRI-X while BDL, NEL, THL and SHL have common predictive power in Marshall and Ross strains respectively. Therefore, breeders and poultry farmers should consider morphological traits in determining body weight especially in rural areas where measuring scale is not available. Moreover, preference should be given to the traits which have high prediction power during breeding

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ESTIMATION OF FIVE SELECTED SERUM BIOCHEMICAL VARIABLES IN FOUR-CHICKEN STRAINS USING SIMPLE LINEAR FUNCTION

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ABSTRACT
The study was conducted at the Federal University of Technology, Akure Teaching and Research Farm to establish the relationship existing between serum biochemical variables by predicting the total protein (TP) of chickens from the other serum biochemical variables. One hundred and twenty day old chicks of four strains were purchased from reputable farm comprising 30 chicks per strain and were used for the study that lasted for eight (8) weeks. The experiment was arranged in a completely randomized design and the birds were distributed into four treatments. Each group was replicated three times at 10 birds per replicate. The birds were fed experimental diet *ad-libitum* while adequate health preventive measures were ensured during the period of the study. At the end of the experiment, serum samples obtained from 48 birds were taken to the laboratory for analyses to generate data for statistical analysis. Analytical results showed that serum biochemical variables were highly significant ($p<0.01$) among the four chicken strains with the exception of some parameters. Coefficient of determination (R^2) was highest with albumin (64.33%) for Marshall exotic chicken strain. Hence, accuracy of prediction was highest in albumin. This function was best with Marshall Broilers compared to the other chicken strains used in the study. Albumin had the highest contribution to total protein (TP) while alkaline phosphatase generally contributed lowest. Albumin, globulin and cholesterol had positive and direct relationship with TP. It was concluded that albumin was the best predictor of TP from other serum variables among the chicken strains. Serum biochemical variables could be used to predict TP in chickens and assess the level of immunity, well being and meat quality of poultry birds.
Keywords: Indigenous, Relationship, Albumin, Immunity and Serum Protein

INTRODUCTION
Indigenous chickens in Africa are increasingly being preferred for consumption by consumers due to their unique organoleptic properties such as taste, flavour, and low chemical contamination when compared to commercial chickens (Chumngoen and Tan, 2015). However, diseases and poor productivity are the major limiting factorsto indigenous chicken development (Desta and Wakeyo, 2013). The blood serum parameters are reliable indicators of health status and reflect any physiological, nutritional or even pathological changes that occur in the organism (Koronowicz *et al*., 2016). These biochemical indicators simultaneously characterize the homeostasis of the internal environment of the animals which has an effect not only on their health but also on the production parameters (Pavlík *et al*., 2007). Total cholesterol is a precursor of steroid hormones (Pavlík *et al*., 2007) and simultaneously the building component of cell membranes (Zhang *et al*., 2019). Adequate function of the liver can be detected from the activity of the aspartate aminotransferase enzyme (Mollahosseini *et al*., 2017). Total protein and albumin values reflect both protein utilization from the feed (Pavlík *et al*., 2007) and the level of haemo-concentration (Greene *et al*., 2013). Assessment of variations in the health status of the Nigerian indigenous chickens via their serum profile would further help our understanding of diversity of these birds which are either low in number or threatened by extinction (Atansuyi *et al*., 2019). An efficient way of assessing and characterizing different animal species is to evaluate their blood for environment dependent factors.
The information about the blood serum indicators of Nigerian indigenous chickens is insufficient or even non-existent. Thus, this study seek to provide some unavailable pieces of informationon the serum profile of the Nigeria Indigenous chickens which could help in generating the required baseline information necessary for characterization, conservation, breeding and improvement strategies.

Materials and methods