MORPHOLOGICAL TRAITS AS PREDICTORS OF BODYWEIGHT OF BROILER CHICKENS IN THE SEMI-ARID ZONE OF NIGERIA

[*€]AHMED, I.A., [ɤ]ADEYINKA, I.A.,[ↀ]AKPA, G.N., [ↀ]KABIR, M., [€]GALADIMA, N.M., [€]ABUBAKAR, M., [¥]Idris, D.Y. [ↀ]Umar, U.A.

[*€]Department of Animal Health and Husbandry, AuduBako College of Agriculture, Dambatta, P.M.B. 3159, Kano State-Nigeria

[ɤ]National Animal Production Research Institute(NAPRI), Ahmadu Bello University, Zaria, Kaduna State-Nigeria

[ↀ]Department of Animal Science, Ahmadu Bello University, Zaria, Kaduna State-Nigeria

[¥]Department of Animal Health and Production Technology, Federal College of Agricultural Produce Technology, Kano State-Nigeria

Corresponding Author:*iliyasunadada@gmail.com +234 (0) 8065532319*

ABSTRACT

The objective of the research was to examine the influence of morphological traits as predictors on body weight among three strains comprising of Napri-X, Marshall and Ross. 315 strains were used in the study. 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 MEKcal/kg up to 8 weeks based on the standard of National Research Council. The experiment was conducted in a Complete Randomized Design (CRD). Treatments were replicated seven times with fifteen birds per pen. Morphological traits 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 regression analysis were highly significant ($p<0.001$) in all the groups and R^2 values more than 50% in all the groups, indicating that the morphological traits are very good predictors of body weight in the three broiler strains. It is therefore concluded that morphological traits (CBL, CBH, OCL, OCW, BEL, ELL, ELW, WTL and WTH) constitute substantial portion in the body weight of the three strains. However, it is recommended that breeders and poultry farmers should consider these parameters in determining weight of chicken.

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

INTRODUCTION

There has been a rapid increase in the number of farmers owning broiler parent and grandparent stocks leading to an increase in the population of meat type chicken in Nigeria (Adebambo *et al.*, 2005). These farms hatch and sell strains of broilers using different brand names. The broiler parents are usually imported from the temperate regions of the world (Udeh *et al.,* 2011). The performance of these birds is influenced by genotype and environment. The uses of unsuitable genotypes in hot regions result in decreased growth rate, reduced protein gain and high mortality (Yalco *et al.,* 1997). The implication is that broiler farmers should select the strains that are adaptable to the Nigerian environment with good performance. It is also important that the broiler farmer monitor the growth performance of their birds on regular basis to know when they have attained the desired market weight. Many livestock specialists apply methodology for morphological characterization with the aim of comparing their various breeds (Francesch *et al.,* 2011). In fowls, not many measures have been taken from live birds; a few studies have been on wild fowls. Some measurements reported include length measurement, wingspan, beak length, comb length (Scott, 1982; Ceballos *et al.,* 1989), apparent size (Scott, 1982), folded wing length (Scott, 1982; Ceballos *et al.,* 1989; Ralph *et al.,* 1993; SEO, 2000), tarsus length (Scott, 1982; Ceballos *et al.,* 1989; SEO, 2000) and third primary length (SEO, 2000). In practices 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). However, other traits that are less significant nutritionally than conformation traits; are called morphological traits otherwise called head measurements. They include comb length and height, ocular length and width, beak length, wattle length and width, ear lobes length and width

can also be used in a predictive equation to predict body weight in broilers. The objectives of this experiment are: to compare the performance characteristics of three strains of broilers 2. To predict body weight using morphological traits in broilers.

MATERIALS AND METHODS

The experiment was carried out at the poultry unit of Teaching and Research Farm, Department of Animal Health and Husbandry, Audu Bako College of Agriculture, Dambatta (ABCOAD), Kano. 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 which 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), Shika, Zaria 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 regularly conforming 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.* Vaccination and other routine medication have been provided as at and when due. The experiment was conducted in a Complete Randomized Design (CRD). However, treatments were replicated seven times with fifteen birds per pen. The morphological traits (Comb length, Comb width, Ocular length, Ocular width, Beak length, Ear lobes length, Ear lobes width, Wattle length and Wattle height,) were measured on weekly basis using 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 (Comb length, Comb height, Ocular length, Ocular width, Beak length, Ear lobes length, Ear lobes width, Wattle length, Wattle height) 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 reveals regression equation relating body weight to morphological 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 R^2 values more than 50% in all the groups, indicating that the morphological traits constitute the significant predictors of body weight in broiler chickens.

The results further revealed that in NAPRI-X, CBL, CBH, OCL, OCW, BEL, ELL, ELW, WTL and WTH have significantly predicted the BW with WTL, CBL, ELW, ELL having the highest magnitude of B-values indicating that the traits have substantially contributed to the BW. These traits accounted for 99% variance in the dependent variable (BW). Similarly, in Marshall, WTL, CBL and ELW were the most significant predictors accounting for 99.9% variance in dependent variable indicating that, these three traits accounted for major contribution to the BW. Meanwhile, the predictor traits in Ross strain were WTH, OCW, BEL, WTL and ELW accounting for over 99% variance in the depending variable, indicating that these traits were the major contributing traits to the BW in Ross Strain.

Table 1: Regression equation relating body weight and morphological traits in NAPRI-X, Marshall and Ross strains

Strain Type	Prediction equation	R^2	S.E	Sig
NAPRI-X	BW = -161.89 + 312.03CBL - 132.65CBH - 41. 02OCL - 233.68OCW + 56.98BEL + 127.61ELL + 165.79ELW + 1003.09WTL – 1019.77WTH.	99.3	573.361	***
Marshall	BW = -967.53 + 1270.28CBL -1132.89CBH -85. 15OCL -254.82OCW -4.18BEL –330.15ELL + 376.77ELW + 1483.69WTL – 2058.91WTH	99.9	509.224	***
Ross	BW = 805.65 – 277. 60CBL -363.64CBH -390.60OCL +837.61OCW +10.28BEL +336.78ELL – 267.66ELW + 340.57WTL +911.04WTH	99.8	403.874	***

NAPRI-X = A synthetic broiler breed of National Animal Production Research Institute, BW = Body Weight, CBL = Comb length, CBH = Comb Height, OCL = Ocular length, OCW = Ocular Width, BEL = Beak Length, ELL =Ear Lobes Length, ELW =Ear Lobes Width, WTL = Wattle Length, WTH = Wattle Height, R^2 = Coefficient of determination, S.E. = Standard error and *** = very highly significant ($p<0.001$)

DISCUSSION

The results of Multiple Regression Analysis showed that morphological traits appeared to be important components that determine the weight of Napri-X, Marshall and Ross strains. The study is consistent with the report of Francesch, *et al.* (2011) who equally reported that morphological traits are important components in determining weight of birds. The study revealed the predictive capacity of morphological traits demonstrating that these traits are substantially adequate in influencing the body weight in all the three broilers strains.

The findings of the study revealed that the most common predictor trait in all the three strains was ELW which account for 165.79, 376.77 and 267.66 in NAPRI-X, Marshall and Ross strains respectively, depicting that the predictive capacity of the trait is higher in Marshall in all other strains. However,

ELW, WTL and CBL were found to have predictive capacity in NAPRI-X and Marshall while WTH, OCW, BEL, WTL, ELW have common predictive power in NAPRI-X and Ross respectively.

CONCLUSIONS

The findings of the study demonstrate the contributions of morphological traits to the body weight in the three strains of broiler chickens. Therefore, it is concluded that morphological traits should be given attention when measuring weight in broiler chickens. However, within the traits ELW has the most predictive power in all the strains whereas ELW, WTL and CBL were found to have predictive capacity in NAPRI-X and Marshall while WTH, OCW, BEL, WTL, ELW have common predictive power in NAPRI-X and Ross. 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

REFERENCES

Abdulrashid, M., Abubakar, M. and Adamu, H.Y. (2011). Prevalence of Newcastle Disease on Rural Poultry in Dambatta Metropolis of Kano State. In: Proceedings of the 17th Annual Conference of the Animal Science Association of Nigeria (ASAN), 17: 137 – 140.

Adebambo, A.O., Faybenvo, O.I., Fragite, S.O., Ikeobi, C.O.N. and Adebambo, O.A. (2005). Preliminary assessment of growth and reproductive data of three strains of chickens for broiler development in Nigeria. Proceedings 1st Nigeria international poultry summit. Ota Ogun State. PP: 8-11.

Akanno, E.C., Ole, P.K., Okoli, I.C. and Ogundu, U.E. (2007). Performance characteristics and prediction of body weight of broiler strains using linear body measurements. In: *Proceedings of the 22nd Annual Conference of the Nigerian Society for Animal Production, Calabar.* 22: 162-164.

Ceballos, P., Molina, J., Franco, A. and Palacios, B. (1989). Manual del Anillador, 94-113 (ICONA-MAPA), (Madrid).

Francesch, A., Villalba, I. and Cartana, M. (2011). Methodology for morphological characterization of chicken and its application to compare partridge Penedesenca and blond Empordanesa breeds. In: *Animal Genetic Resources.48: 79-84*.

KNARDA, Weather Station. (2011). Kano State Agricultural and Rural Development Authority, weather station.

Nesamvuni, A.E., Malandzii, J., Zamanyimi, N.D. and Taylor, G.J. (2000). Estimates of body weight in Nguru type cattle under commercial management conditions. *South Afr. J. Anim. Scie., Vol. 30*.

NRC (National Research Council), (1994). *Nutrient Requirement of poultry. 9th Rev. Edn., National Academy Press, Washington, DC., USA., ISBN-13:9780309048927, 1-15*.

Oluyemi, J.A. and Roberts, F.A. (2000). *Poultry production in warm wet climate.* Mcmillan Press Ltd., London.

Ralph, C., Geupel, J., Geoffrey, R., Pyle, G., Meter, M., Thomas, E. and Desate, D. (1993). *Handbook of field methods for monitoring land birds.* USDA, Forest Service, Pacific Southwest Research Station, Albany, Califonia.

Scott, B. (1982). Clave del observador de aves. In S.A. Omega, ed., Barcelona. PP 13.

SEO/Birdlife, (2000). *Centro de migration de aves.*Programa de Biometria. Manual de metodos de campo.

SPSS (2011): Statistical Package for Social Sciences. SPSS Version 20 IBM Inc. 444 Michigan Avenue, Chicago, IL60611, USA.

Udeh, I., Isikwenu, J.O. and Ukughere, G. (2011). Performance Characteristics and Prediction of Bodyweight using Linear Body Measurements in four Strains of Broiler Chicken. *International Journal of Animal and Veterinary Advances 3(1): 44-46.*

Yalco, S., Settar, P., Ozkan, S. and Cahaner, A. (1997). Comparative evaluation of three commercial broiler stocks in hot versus temperate climates. *Poultry Sc., 76: 921-929.*