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Short Communication

Growth and morphometric traits of local ecotypes of domesticated fowls reared under traditional semi-intensive system in Nigeria

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Abstract

The body weight gain and linear increase of some morphometric traits in domestic ecotype chickens reared under traditional semi-intensive system for eight weeks were examined. A total of 146 chickens were selected from 10 farms across Ogbomoso and its environs. The birds were randomly assigned into two groups after taking their initial weights. Group A were maintained on full scavenging for food and water while group B were partly offered 50g maize pomace per bird daily in the morning before scavenging. Body weight increased exponentially in both groups, with more consistency in group B. Group B had higher AWG at third week of study. Correlation between body weight and the morphometric traits were higher in group B, ranging between 0.825 and 0.990. Supplementing feed of local ecotype birds reared under semi-intensive system with maize pomace improved weight and linear measurements, with shank length being more predictive of total body weight.

INTRODUCTION

Nigerian's dependence on indigenous poultry species, which the domestic fowl (*Gallus gallus domesticus*) is in numerical preponderance, can be traced back to centuries, especially in the sub-urban and rural areas. The local poultry strains are found largely in the rural areas where they are managed extensively in small numbers in almost every household because of their adaptive ability to harsh environmental conditions (Manyelo *et al*., 2020). Local strains (ecotype) of poultry constitute about 80% of the total poultry production in sub-Sahara countries (Desha *et al*., 2016).

These local strains are genetically adapted to the local environment, requiring little or no medical intervention for sustenance and growth because of their hardiness and disease resistance (Manyelo *et al*., 2020). Despite their inferiority in terms of meat and egg production compared to the exotic breeds, they remain an important source of animal protein especially to small holder farmers and rural household as reported by Manyelo *et al*. (2020). These local ecotypes are raised on free range system and play a major role in improving the socio-economic status of many rural communities (Manyelo *et al*., 2020). They are also used as an alternative protein source to the game and other livestock so as to arrest problems of inadequate protein intake especially in developing countries. The indigenous chickens are predominantly the most consumed chickens among the rural dwellers, because they are readily available, easy to manage with least cost of production, and are well adapted to the tropical environmental conditions.

Indigenous chickens are a pool of heterogeneous individuals (Fayeye *et al*., 2005) which differ in adult body size, weight and plumage, and they are known for their adaptation superiority in terms of their resistance to endemic disease and harsh environmental condition (Nwakpu *et al*., 1999). Their production system is mostly based on scavenging feed resources. They are genetically unimproved and remain predominant in African villages despite the introduction of exotic and cross bred types (Mtileni *et al*., 2012). Indigenous chickens are economically important to Nigerian populace because their rearing demands use of very little resources and brings financial reward in a short while (Olawumi *et al*., 2008). FAO (2008) recognized these facts and view rural poultry as an important tool for poverty alleviation in Africa.

Studies on indigenous chicken is vital in order to

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boost their production under the prevailing conditions and rural semi-intensive rearing system through the use of unconventional feedstuff like maize pomace. Unconventional feed supplementation for the indigenous chickens on free range system could be the impetus needed for improved growth performance. Maize pomace is the by-product retained from the production of "ogi". Maize pomace could be a major breakthrough for improving rural economic growth via optimization of their livelihood through better performance of their livestock. However, not much work has been done on maize pomace with respect to indigenous chickens. This study was aimed at evaluating the growth performance, both in weight and linear traits, of the indigenous ecotype chickens fed maize pomace.

MATERIALS AND METHODS

Study Area

The study was carried out in 10 various small holder poultry farms spread across Ogbomoso and its environs. Ogbomoso is about 105km North-west ward from Ibadan, the Oyo State capital and 53km South-west of Ilorin, the capital of Kwara State. Ogbomoso is located on latitude of 8°15`N of the equator and longitude 4°15`E of the Greenwich meridian.

Study Population

A total of 146 local ecotype birds were used for the study. The 10 small holder poultry farms were selected on the availability of the breed and willingness of the farm owner to allow the birds for the phenotypic measurements. Furthermore, the mode of rearing for the study, which is semi intensive system, are already being practised on those farms.

Management of the Bird

The birds were managed on semi-intensive rearing system. Night shelters, which were provided by the farmers, were made as similar as possible in all the rearing locations. The birds were randomly assigned into two groups and wing tagged for easy identification. Group A were maintained on full scavenging for food and water while group B were partly offered 50g of maize pomace per bird in the morning for the purpose of the study before they were let out to roam freely and scavenge for food and water throughout the day. All the birds were restrained together in the shelter for the night. The study lasted for eight weeks.

Data Collection

Data were collected on weekly basis for a period of eight weeks. Weekly body weight (BW) were taken with the aid of a sensitive scale of 0.5g accuracy by placing the bird on a top loading measuring scale while measuring tape was used to measure the morphometric traits which included shank length (SL), thigh length (TL), keel length (KL), chest length (CL) and back length (BL) according to Vincent *et al* (2015).

Statistical Analysis

Data collected were analysed using one-way classification procedure of SAS (2003) to determine the fixed effect of age on body weight and morphometric traits. The model used was of the form:

$Y_i = \mu + a_i + e_i$

Where Y_i = parameter if interest
μ = Overall mean of the observation
a_i = fixed effect of age (1,2, ….. 8)
e_i = residual effect

Using the procedure of CORR available in the SAS (2003) package, the Pearson product-moment correlation coefficient (*r*), simply called the correlation coefficient, was used to examine the linear relationship between the body weight and the morphometric traits.

$$r = \frac{\Sigma(X_i Y_i)}{\sqrt{\Sigma X_i \Sigma Y_i}}$$

Where
r = pearson correlation
X_i = first variable of the i^{th} parameter
Y_i = second variable of the i^{th} parameter

The Pearson correlation is defined between -1 and +1 ($-1 \leq r \leq 1$) where -1 indicates a perfect decreasing (negative) linear relationship, +1 indicates a perfect positive (increasing) linear relationship and some values between -1 and +1 in all other cases indicate the degree of linear relationship between the parameters.

RESULTS AND DISCUSSION

Table 1 showed the body weight and morphometric traits as affected by age of the bird. The results of the study, as presented in the Table, showed that body weight and the measured morphometric traits increased as the age of the bird increased. This confirms the positive response of feed consumption on growth. As reported by Oluyemi and Robert (2000), the small average body weight gain reported in this study, agrees with the already known features of indigenous chicken which is relatively small despite maize pomace supplementation. The

Table 1. Body weight and morphometric traits as affected by age of the bird

Week	N	BW		SL		TL		KL		CL		BL	
		A	B	A	B	A	B	A	B	A	B	A	B
1	146	224	222	4.42	4.41	6.29	6.27	8.90	8.90	10.2	10.4	20.0	21.1
2	146	278	293	4.79	4.79	7.28	7.26	10.0	10.1	10.5	10.6	23.2	23.5
3	146	303	318	5.35	5.36	7.98	8.01	10.9	10.7	10.9	11.1	24.5	25.1
4	146	370	393	5.66	5.70	8.50	8.50	11.5	11.4	11.2	11.3	26.0	26.8
5	146	426	450	6.09	6.15	8.90	9.11	12.1	12.4	12.0	11.9	27.3	28.1
6	146	478	502	6.58	6.66	9.80	10.0	12.7	12.9	12.5	12.7	29.6	30.1
7	146	517	553	7.08	7.19	10.3	10.4	13.3	13.4	13.2	13.6	31.6	32.9
8	146	578	699	7.66	7.80	11.0	11.3	14.4	14.4	14.3	14.8	33.2	34.0

Group A = Free scavenge, Group B = 50g maize pomace + free scavenge, BW = Body weight, SL = Shank length, TL = Thigh length, KL = Keel length, BRL = Breast length, BL = Back length.

group A birds were able to achieve 61.0% increase in weight at the end of the study which is lower compared to 68.2% achieved by group B birds. This showed that inclusion of maize pomace to the daily feed consumption of scavenging birds improved their growth by over 7%. This increased growth rate is assumed to positively impact on the protein consumption of the rural community and the overall livelihood of the local farmers.

and 42.87%, respectively) at the end of the study though not as long as those recorded in group B. In the study of Fayeye *et al*. (2005), the local ecotypes doubled their previous weight between two and three weeks, while growth at a later age was increasing at a decreasing rate.

Table 2 showed the average weekly and daily body weight gain of the birds as affected by age. The average weight gain per day (ADG) in the present study ranged from 3.56 to 9.58g for group

Table 2. Average weekly and daily weight gain as affected by age

Week	N	BW		AWG		ADG	
		A	B	A	B	A	B
1	146	224	222	---	---	---	---
2	146	278	289	54.5	66.5	7.78	9.48
3	146	303	358	25.0	69.0	3.56	9.86
4	146	370	429	67.1	71.8	9.58	10.2
5	146	426	502	55.8	72.9	7.96	10.4
6	146	478	575	41.8	73.5	5.97	10.5
7	146	517	649	49.09	74.0	7.01	10.6
8	146	578	724	56.12	74.6	8.02	10.7

Group A = Free scavenge, Group B = 50g maize pomace + free scavenge, BW = Body weight, AWG = average weekly gain, %WG = Percentage weekly gain, ADG = Average daily gain.

For the morphometric traits, the group B had relatively longer linear traits length than the group A. Shank length and TL in group A experienced relatively increased length (42.30%

A and 9.48 to 10.7g for the birds in group B. Unlike the birds in group A where daily weight gain was not regular, the ADG estimated for group B followed an increasing pattern, though

Table 3. Interrelationship between body weight, and morphometric traits

Parameters	BW	SL	TL	KL	CL	BL
BW	------	0.982	0.891	0.906	0.923	0.905
SL	0.728	------	0.990	0.888	0.899	0.900
TL	0.733	0.827	------	0.859	0.911	0.881
KL	0.627	0.850	0.736	------	0.825	0.862
CL	0.795	0.783	0.663	0.828	------	0.952
BL	0.728	0.775	0.786	0.708	0.647	------

Group A = diagonal to the right; Group B = diagonal to the left
BW = Body weight, SL = Shank length, TL = Thigh length, KL = Keel length, CL = Chest length, BL = Back length.

very minimal. It could be deduced from the result that feed availability during scavenging were inadequate at some point, thus making supplemented feed received by group B to cover up for the shortage. The highest ADG was recorded during the fourth week (9.58g) while the lowest was recorded in the second week (3.56g) for group A. The ADG in this study for both groups were quite lower than 10.0 – 35.9g reported by Oluyemi and Robert (2000) during the first eight weeks of growth in broiler chickens.

Table 3 presented the correlation between body weight and the measured morphometric traits. The results showed a significant and positive correlation between the body weight and the morphometric traits. This was similar to the findings of Ige (2013) who reported high, positive and significant correlation coefficient between body weight and linear body measurements. All the correlations for the two groups were high ranging between 0.627 and 0.850 for group A and between 0.825 and 0.990 for group B. The high correlation value obtained in this study is an indicative of the fact that linear measurements can be used as criteria for selection of body weight in local chickens (Ige *et al*., 2007). The result obtained by Yahaya *et al*. (2012) with a correlation of between 0.86 and 0.97 for BW and morphometric traits in Hubbard chickens supported the findings of the present study. The highest correlation between BW and the morphometric traits was 0.850 in SL for group A and 0.982 in SL for group B. This indicated that SL plays a major role in the final body weight attained by the birds.

CONCLUSION

The rate of body weight gain per bird per day, the morphometric traits and the correlation between them increased more when maize pomace was supplemented to the diet of scavenging birds reared under semi-intensive system. This revealed that local farmers could improve weight gain in their flock under semi intensive system with supplement of maize pomace for improved profitability, more poultry meat and ultimately better livelihood.

Conflict of interest: All authors indicate that there is no any actual or potential conflict of interest that could inappropriately or possibly influence this work after publication.

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