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COMPARATIVE STUDY OF INDIGENOUS CHICKENS IN SOUTH EAST AND NORTH CENTRAL NIGERIA: BODY WEIGHT AND LINEAR BODY MEASUREMENTS

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ABSTRACT

This study was designed to undertake a comparative evaluation of Nigerian local chickens in Imo state (South east) and Benue state (North central) of Nigeria with particular reference to their body weight and linear body measurements. Two hundred and twenty-four (224) mature indigenous chickens from Imo state (Southeast) and Benue state (North central) of Nigeria were used for this study. The local chickens were kept by rural farmers on free range, and geographical cluster sampling was used for data collection. Sampling was done in early morning hours before the local chickens were released by their keepers. Data were collected on body weight and linear body measurements (body girth, wing length, thigh length, toe length and shank length). Data were subjected to statistical analysis using t-test, and correlation procedure of Statistical Package for the Social Sciences (SPSS) version 20.0. The results of this study suggest that body weight of local chicken cocks from South east and North central were significantly ($P<0.05$) heavier than their female counterparts. Local chickens in North central Nigeria, irrespective of sex, were significantly ($P<0.05$) better than local chickens in South eastern Nigeria in terms of body weight, shank length, wing length and toe length. However, body girth of local chickens in Southeast and North central Nigeria were not significantly different ($P>0.05$). Therefore, indigenous chickens in North central Nigeria were heavier than indigenous chickens in South eastern Nigeria. Nigerian indigenous chickens in Southeast and North central Nigeria need to be further studied comparatively under intensive system.

Keywords: Body measurements, chickens, indigenous, heterogeneous, Nigeria

INTRODUCTION

Nigerian local chickens are kept and managed by the native people mainly as a valuable source of protein as well as income. These chickens play major roles not only in rural economics but also contribute substantially to the gross national product (Momoh *et al*., 2007). Their ease of rearing under extensive system of management, adaptability to harsh environmental conditions, resistance to diseases, better flavour of meat and eggs make them a good preference by the rural farmers.

Nigerian local chickens abound in different geographical/ecological zones as classified by vegetation types such as rainforest zones of the South, and Savannah zones of Northern Nigeria. The Nigerian local chickens found in each of the geographical zones are believed to constitute

different genetic population with limited inter-population gene flow, which could be attributed to long distances separating them. These local chickens have lived, reproduced, and may have evolved pronounced adaptabilities in response to combined influence of locally prevailing environmental conditions, uncontrolled breeding as well as forces of natural selection, mutation and random genetic drift. It is based on this background that some researchers have come up with phenotypic classification of Nigerian local chickens ecologically into different ecotypes, for example Fulani ecotype, Yoruba ecotype, heavy and light ecotypes, Tiv ecotypes etc. The variation in the phenotype of local chickens, according to Oluyemi and Roberts (2000), demonstrates the effect of natural selection and indicates the potential for improvement through artificial selection and or crossbreeding.

Although some researchers have attempted conceptual classification of Nigerian local chickens into different ecotypes, there is dearth of knowledge on comparative investigation of local chicken populations found in different agro-ecological zones in Nigeria. Categorically, Sonaiya and Olori (1990) characterized Nigerian indigenous chickens based on ecotypes. Olori (1992) reported two local chicken ecotypes characterized as forest and savannah or Yoruba and Fulani ecotypes, respectively. Momoh *et al*. (2010) grouped Nigerian local chickens based on body size and body weight into heavy ecotype (HE) and light ecotype (LE). The heavy ecotype represents local chickens from dry savannah (Guinea and Sahel savannah), Montane region and cattle kraals of the North whose mature body weights range from 0.9 – 2.5kg, while the light ecotype represents local chickens from the swamp, rainforest and derived savannah zones with mature body weights of between 0.68 – 1.50kg (Momoh *et al.*, 2010). Oluyemi *et al*. (1982) reported that various local chicken ecotypes are found in different agro-ecological zones in Nigeria, and each local chicken ecotype vary in shape, size and plumage colour.

Since variations in phenotypic traits in Nigerian local chickens have been reported in available literature (Egahi *et al.*, 2010), there is need to compare the performance of Nigerian indigenous chicken populations that abound in different geographical locations in Nigeria. The aim of this study, therefore, was to undertake a comparative evaluation of local chickens in Southeast and North central Nigeria, with particular focus on body weight and linear body measurements.

MATERIALS AND METHODS

Location of Study

The study was conducted in Imo State (rainforest region) and Benue State (derived Savannah region) of Nigeria. The two states vary in their ecological conditions, and the local chickens within each ecosystem may have adapted to the prevailing local climatic conditions. Imo State is located in Southeastern part of Nigeria. Imo state lies between latitude 4°45′N and 7°15′N, and longitude 6°50′E and 7°25′E. It has an annual rainfall varying from 1500mm to 2200mm and an average annual temperature above 20°C. It is located at an elevation of 152m above sea level. Benue State is located in the North central derived Savannah region of Nigeria. Benue state lies between latitude 6°25′N and 8°8N, and longitude 7°47′E and 10°E. It has an annual rainfall varying from 1200mm to 1500mm, and an average annual temperature of 28°C. It is located at an elevation of 180m above sea level.

Experimental Population and Management

A total of two hundred and twenty-four (224) mature (above 20 weeks of age) indigenous chickens of Nigeria were used for the study. The chickens were managed on free range by local farmers.

Data Collection

Data were collected on body weight of individual birds using a weighing balance with accuracy of 0.1kg. The following linear body measurements were taken using a tailor's tape: shank length, thigh length, wing length, toe length and body girth. Linear body measurements were taken as described by Fayeye *et al*. (2006) and are described below:

Shank length: length of tarso-metatarsus from the hock joint to the metatarsal pad,

Body girth: the circumference of the breast region,

Wing length: length of the wing from the scapula joint to the last digit of the wing,

Toe length: length of the third toe measured

Thigh length: length between the hocks joint and the pelvic joint (Molenaar *et al*., 2008).

Statistical Analyses

Data collected from the experiment were statistically analyzed using t-test, and correlation procedure of Statistical Package for the Social Sciences (SPSS) version 20.0.

RESULTS AND DISCUSSIONS

Effect of Sex on Body Weight and Linear Body Measurements

The results of the effect of sex on body weight and linear body measurements of indigenous chickens in Southeast and North central Nigeria are shown in Table 1. Mean body weight of local chicken cocks in South east (1.26 kg) and North central Nigeria (1.76 kg) were significantly ($P< 0.05$) heavier than mean body weight of local chicken hens in South east (1.01 kg) and North central Nigeria (1.31 kg). Sexual dimorphism accounted for 19.27% and 25.13% of the differences in body weight of indigenous chickens in Southeast and North central parts of Nigeria, respectively. Linear body measurements (shank length, thigh length, wing length, and toe length and body girth) of indigenous chicken cocks in South east and North central were significantly ($P< 0.05$) longer than those of their respective female counterparts. The observed differences in linear body measurements of indigenous chicken cocks and hens may be due to sexual dimorphism. This has also been reported in Nigerian local chickens (Fayeye *et al*., 2006; Ijaiya *et al*., 2010) in Muscovy duck (Raji *et al*., 2009; Ogah, 2011a; Yakubu, 2011) in turkey (Ogah, 2011b) and indigenous chickens of South Africa (Alabi *et al.* 2012).

Table 1. Effect of sex on body weight and linear body measurements of local chickens in Southeast and North central Nigeria

	Sex		
	Male		Female
Measurements	Mean±SEM		Differences %
Southeast			
Body weight (kg)	1.26±0.02[a]	1.01±0.02[b]	19.27
Shank length (cm)	7.26±0.08[a]	6.42±0.08[b]	11.56
Thigh length (cm)	13.73±0.20[a]	12.23±0.20[b]	10.89
Wing length (cm)	14.78±0.21[a]	12.77±0.16[b]	13.58
Toe length (cm)	4.81±0.08[a]	4.43±0.06[b]	7.83
Body girth (cm)	34.63±0.24[a]	32.41±0.38[b]	6.39
North central			
Body weight (kg)	1.76±0.04[a]	1.31±0.02[b]	25.13
Shank length (cm)	10.31±0.16[a]	8.58±0.12[b]	16.80
Thigh length (cm)	14.29±0.18[a]	12.20±0.20[b]	14.67
Wing length (cm)	16.36±0.25[a]	14.20±0.21[b]	13.20
Toe length (cm)	6.60±0.10[a]	5.91±0.08[b]	10.46
Body girth (cm)	35.21±0.34[a]	31.91±0.41[b]	9.38

ab= means in the same row with different superscripts are significantly different (P< 0.05)
SEM= standard error of mean

Effect of Location on Body Weight and Linear Body Measurements

The effect of location on body weight and linear body measurements of Nigerian indigenous chicken cocks and hens are shown in Tables 2 and 3, respectively. Mean body weight of local chicken cocks in North central (1.76 kg) was significantly (P<0.05) heavier than mean body weight of cocks in Southeastern Nigerian (1.26). Linear body measurements (shank length, thigh length, wing length, toe length) of local chicken cocks in North central were significantly (P< 0.05) longer than those of cocks in Southeastern Nigeria.

Table 2. Effect of location on body weight and linear body measurements of male local chickens

	Location	
	South east males	North central males
Measurements	Mean±SEM	
Body weight (kg)	1.26±0.02[a]	1.76±0.04[b]
Shank length (cm)	7.26±0.08[a]	10.31±0.16[b]
Thigh length (cm)	13.73±0.20[a]	14.29±0.18[b]
Wing length (cm)	14.78±0.21[a]	16.36±0.25[b]
Toe length (cm)	4.81±0.08[a]	6.60±0.10[b]
Body girth (cm)	34.63±0.24[a]	35.21±0.34[a]

ab= means in the same row with different superscripts are significantly different (P< 0.05)
SEM= standard error of mean

Table 3. Effect of location on body weight and linear body measurements of female local chickens

	----------	Location	----------
	South east females		North central females
Measurements	----------	Mean±SEM	----------
Body weight (kg)	1.01±0.02[a]		1.31±0.02[b]
Shank length (cm)	6.42±0.08[a]		8.58±0.12[b]
Thigh length (cm)	12.23±0.20[a]		12.20±0.20[a]
Wing length (cm)	12.77±0.16[a]		14.20±0.21[b]
Toe length (cm)	4.43±0.06[a]		5.91±0.08[b]
Body girth (cm)	32.41±0.38[a]		31.91±0.41[a]

SEM= standard error of mean; ab= means in the same row with different superscript are significantly different (P< 0.05).

There was no significant difference (P> 0.05) in body girth of cocks from the two geographical locations, although cocks in North central showed longer body girth than cocks in Southeast. Again, mean body weight of local chicken hens in North central (1.31 kg) was significantly (P<0.05) heavier than mean body weight of hens in Southeastern Nigeria (1.01 kg). Linear body measurements (shank length, wing length, and toe length) of local chicken hens in North central were significantly (P<0.05) longer than those of hens in Southeastern Nigeria. However, there were no significant differences (P>0.05) in thigh length and body girth of local chicken hens from the two geographical locations.

This study revealed that indigenous chickens in North central are heavier than indigenous chickens in Southeastern Nigeria. There may be genetic basis for the observed significant differences in body weight and linear body parameters of local chickens in the two geographical locations. This, therefore, suggests the existence of genetic diversity among Nigerian indigenous chicken populations. Again, since vast cereal grains available in Nigeria are majorly produced in Northern Nigeria, it could be that local chickens in North central Nigeria have more access to feed in form of vast cereal grains and pods found in the derived Savannah region of North central Nigeria than indigenous chicken population in the rain forest region of South eastern Nigeria. Thus, local chickens in North central are believed to feed better than local chickens in the Southeast. Mean body weights of Nigerian indigenous chickens observed in this study were in agreement with earlier reports (Ibe, 1990; Oluyemi, 1990; Ebang and Ibe, 1994; Oluyemi and Roberts, 2000) that Nigerian local chickens were relatively small in body size. Although indigenous chickens found in the North central are heavier than their counterparts in Southeastern Nigeria, their small body sizes makes them indistinguishable as different breeds. Thus, Nigerian local chickens in the North central and Southeastern Nigeria may not qualify or be classified as different breeds of chicken.

Correlations between body weight and linear body measurements

Correlations between body weight and linear body measurements of Nigerian indigenous chickens in North central and South east are shown in Tables 4 and 5, respectively. All correlations were positive and significant (P< 0.01). The implication is that increase in body

weight will result to increase in linear body measurements of local chickens. Thus, any selection programme geared towards improving body weight will lead to corresponding improvement in linear body measurement of birds. This finding is similar to the reports of Yahaya *et al*. (2012) for broiler strains; Alabi *et al*. (2012) for three indigenous chicken breeds of South Africa, and Ukwu *et al*. (2014) for mature female local chickens in Benue state of Nigeria.

Table 4. Correlations between body weight and linear body measurements of Nigerian local chickens in North central

Parameters	BW	SL	TL	WL	TOEL	BG
BW	1					
SL	0.668**	1				
TL	0.722**	0.706**	1			
WL	0.660**	0.594**	0.503**	1		
TOEL	0.674**	0.699**	0.672**	0.656**	1	
BG	0.801**	0.633**	0.588**	0.673**	0.602**	1

**Correlation is significant at the 0.01 level; BW= body weight; SL= shank length; TL= thigh length; BG= body girth; TOEL= toe length; WL= wing length

Table 5. Correlations between body weight and linear body measurements of Nigerian local chickens in South east

Parameters	BW	SL	TL	WL	TOEL	BG
BW	1					
SL	0.694**	1				
TL	0.785**	0.521**	1			
WL	0.572**	0.504**	0.487**	1		
TOEL	0.545**	0.454**	0.499**	0.355**	1	
BG	0.751**	0.411**	0.734**	0.439**	0.330**	1

**Correlation is significant at the 0.01 level; BW= body weight; SL= shank length; TL= thigh length; BG= body girth; TOEL= toe length; WL= wing length

CONCLUSION

The findings of this study suggest that indigenous chickens in Southeast and North central Nigeria were heterogeneous in body weight and linear body measurements. Local chickens in North central Nigeria were heavier than local chickens found in South eastern Nigeria. It is therefore recommended that further comparative research should be carried out in the two geographical locations using Nigerian indigenous chickens managed under intensive system.

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