

Body Weight, Biometric and Serum Indices of Indigenous Normal Feathered Chickens

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Body growth in livestock may be evaluated with live weight and body measurements. A total of sixty (60) adult birds of both sexes (30 males and 30 females) of indigenous normal feathered chickens reared by smallholder farmers with similar management system in the two areas in Lafia (Azuba and Akurba), Nasarawa State were randomly sampled. The result of the total leg length (TLL) and wing length (WL) of the female chickens were superior to those of their male counterparts. Thigh circumference (TC) of indigenous locally adapted normal feathered chickens of Azuba were higher ($P<0.05$) than those of Akurba. Total leg length (TLL) and Wing length (WL) of indigenous chickens of Akurba were superior ($P<0.05$) to those of Azuba respectively. There was location and sex interaction ($L^* S$) effect ($P<0.05$) of

Breast circumference (BC), Thigh circumference (TC), Foot length (FL), Total leg length (TLL) and Wing length (WL) while no interactions were observed between Body weight (BW) and Body length (BL). The results of total protein, urea, creatinine and cholesterol of the serum of the chickens of both sexes of the two study areas were not significant ($P<0.05$) however, the result of the albumin concentration of the serum was significant ($P<0.05$). The albumin level of the chickens of Azuba from this study appears to be better than that of Akurba. The findings of the present study might provide better understanding of the sexual differences in the improvement of the chickens.

Keywords: Body weight, biometric traits, serum, normal feathered, chickens

INTRODUCTION

Rural poultry offers a wide range of genetic potential in Nigeria, as the local chickens are genetically heterogeneous with diverse phenotypes and genotypes to select from. Chickens are important animal genetic resource in Sub-Saharan Africa (Nigeria inclusive), and their genetic improvement therefore, has been identified as one of the available sustainable ways of improving productivity with concomitant effect on the income and livelihoods of rural farmers. Most economic traits in farm animals show continuous variation and the fundamental genetic nature is very complex (Li *et al.*, 2010). Indigenous chicken is one of the most important livestock

worldwide because it provides a large proportion of protein in human diet in terms of eggs and meat. Genetic differences exist in all farm animals which lead to variability in their productive and performance abilities both within and between breeds. Differentiating this variability could be a basis for selection and subsequent genetic improvement of farm animals.

Growth is related to an increase in cell number and volume. It is a complex and highly dynamic physiological process that exists from conception until maturity. Growth in any traits is a result of the genetic potential of the individual and genetic X environment interaction (Kor *et*

al., 2006). Body growth in livestock may be evaluated with body components (biometrics) such as live weight and body measurements (Wolanski *et al.*, 2006; Saatci and Tilki, 2007). Poultry breeders need some techniques to select animals for breeding purposes. Further selection towards meatiness and egg production improvement requires reliable and easy-to-apply methods for estimating the performance and breeding value of chickens. Examining relationships between live weight and linear body measurements of chickens especially in rural communities where weighing scales may not be readily available can assist in the selection. However, using simple correlation coefficients between body weight and linear type traits may not explain the complex relationships in all aspects and may be inadequate in investigating the causal effects among the biologically related variables (Keskin *et al.*, 2007). The objective of the study was to determine the biometric characteristics and serum indices of indigenous normal feathered chicken reared by rural farmers in some selected areas of Lafia, Nasarawa State.

MATERIALS AND METHODS

Experimental location

The study were carried out in two areas in Lafia (Azuba and Akurba), Nasarawa State. The state is located at guinea savannah zone of North Central Nigeria. It lies between latitude 08°35 N and longitude 08°33 E. The mean monthly maximum and minimum temperature is 35.06°C respectively while the mean monthly relative humidity is 74% and the rainfall is about 168.9mm (NIMET, 2008).

Experimental birds and management

A total of sixty (60) adult birds of both sexes (30 males and 30 females) of indigenous normal feathered chickens reared by smallholder farmers with similar management system in the two area in Lafia, Nasarawa State, Nigeria was randomly sampled. Each bird was tagged with an identification number for record purposes. The birds were managed semi-intensively and fed with corn and maize grains respectively.

Blood sample collection and laboratory analysis

2 mls of blood samples were obtained from each bird in Azuba and Akurba with a 21-G needle connected to a 5 ml syringe. Samples were collected into anti-coagulant free tubes and allowed to clot. Serum were obtained after the blood samples had been allowed to stand for two

hours at room temperature and centrifuged for ten minutes at 2000 rpm to separate the cell from the serum. Serum total protein, albumin, and urea were analyzed using sigma assay kits, while creatinine and cholesterol were determined according to the procedure of Slot, (1965).

Body size and biometric traits measurements

Body weight (BW), six primary biometric traits body length (BL), breast circumference (BC), thigh circumference (TC), foot length (FL), total leg length (TLL) and wing length (WL)] were measured on each bird

Body weight (BW): 10-kg digital measuring scale was used for the individual weight measurement.

Body length (BL): Body length was taken between the tip of the Rostrum maxillare (bill) and that of the Cauda (tail, without feathers).

Breast circumference (BC): Was taken under the wings at the edge of the sternum.

Thigh circumference (TC): Was measured as the circumference of the drumstick at the coxa region.

Foot length (FL): Was taken as the distance from the shank joint to the extremity of the *Digitus pedis*.

Total leg length (TLL): Was taken as the length of the femur, shank and metatarsal.

Wing length (WL): WAS taken from the shoulder joint to the extremity of the terminal phalanx, digit 111.

Statistical analysis

The general linear model (GLM) of SPSS (version 22) and T-test were used to compare the body weight, biometrics and serum biochemical characteristics (albumin, serum total protein, creatinine, serum cholesterol and urea) of the indigenous normal feathered chickens of the two locations.

The following linear model was used:

$$Y_{ijk} = \mu + S_i + L_j + (SL)_{ij} + e_{ijk}$$

Where;

Y_{ijk} = Individual mean population

μ = General mean of the population

S_i = Sex effect

L_j = Effect of location

SL_{ij}= Interaction between sex and location
 e_{ijk}= Error effect or term.

RESULTS

The result of (Table 1) above indicates significance difference ($P < 0.05$) for total leg length (TLL) and wing length (WL) whereas no significance differences ($P < 0.05$) was observed for body weight (BW), body length (BL), breast circumference (BC), thigh circumference (TC) and foot length (FL) for both sexes (males and females) indigenous locally adapted chicken of Azuba and Akurba respectively.

The total leg length (TLL) and wing length (WL) of the female indigenous locally adapted normal feathered chickens were superior or better than those of the male counterparts ($P < 0.05$). The result of Body weight (BW), Body length (BL), Breast circumference (BC) and Total leg length (FL) were not significant ($P < 0.05$) for the both locations, however, Thigh circumference (TC) of indigenous locally adapted normal feathered chicken of Azuba was higher ($P < 0.05$) than those of Akurba. Total leg length (TLL) and Wing length (WL) of indigenous locally adapted normal feathered chicken of Akurba were superior ($P < 0.05$) to those of Azuba respectively (Table 2).

The results of Body weight (BW), Body length (BL) and Foot length (FL) of the indigenous normal feathered chicken of Azuba and Akurba were not significantly different ($P < 0.05$). The results of the Thigh circumference (TC) and Total leg length (TLL) was statistical different ($P < 0.05$). Thigh circumference (TC) of the indigenous normal feathered chicken of Azuba (8.69) was higher than that of Akurba (7.79). The result of Total leg length (TLL) of the indigenous chicken of Akurba (17.71) was higher than those of Azuba (16.03) respectively. Female birds were also superior ($P < 0.05$) to their male counterparts in terms of Total leg length (TLL) and Wing length (WL). The results of Body weight (BW), Body length (BL), Breast circumference (BC), Thigh circumference (TC) and Foot length (FL) were not significantly different ($P < 0.05$) in the both sexes (males and females).

There was also location and sex interaction effect ($P < 0.05$) on Breast circumference (BC), Thigh circumference (TC), Foot length (FL), Total leg length (TLL) and Wing length (WL) while no interaction was observed between Body weight (BW) and Body length (BL) of the indigenous normal feathered chicken studied (Table 3). The result of total protein, urea, creatinine and cholesterol of the serum of the indigenous normal feathered chickens of both sexes of the two study areas were not significant ($P < 0.05$), however, the result of the albumin concentration of the serum was significant ($P < 0.05$). The albumin level of Azuba from this table appears to be better than that of Akurba (Table 4).

DISCUSSION

Sex effect on body weight and biometric traits of the indigenous normal feathered chicken

The total leg length (TLL) and wing length (WL) of the female indigenous locally adapted normal feathered chickens were superior or better than those of the male counterparts ($P < 0.05$) and is an indication that females have relatively longer legs and wing length than their male counterparts in this study. The result of this study corroborates with the work of Yakubu, (2011) who reported similar result for leg length of Muscovy duck indicating superiority for females over the males. Generally, a higher phenotypic variation of traits indicates a higher genetic variation, which guarantees a sufficient selection response. This is important because directional selection on morphological traits, which commonly occurs in natural populations (Kingsolver *et al.*, 2001),

Location effect on body weight and biometric traits of the indigenous normal feathered chicken

Thigh circumference (TC) of indigenous locally adapted normal feathered chicken of Azuba was higher ($P < 0.05$) than those of Akurba. Total leg length (TLL) and Wing length (WL) of indigenous locally adapted normal feathered chicken of Akurba were superior ($P < 0.05$) to those of Azuba respectively and this could be attributed to the slight environmental variation and probably the general management care offered to the chicken at the two locations. In a related study, Yakubu *et al.* (2011) compared the morphometric traits of Muscovy ducks from two agroecological zones of Nigeria. Maintaining this variation is important if the goal is to continue to improve the performance of the birds and respond to change in climate, disease or consumers' preference while improving the livelihood of livestock keepers and food security of the populace.

Location and sex interaction effect on body weight and biometric traits of the indigenous normal feathered chicken

There was location and sex interaction ($L * S$) effect ($P < 0.05$) on Breast circumference (BC), Thigh circumference (TC), Foot length (FL), Total leg length (TLL) and Wing length (WL) while no interaction was observed between Body weight (BW) and Body length (BL) of the indigenous normal feathered chicken studied. The superiority of females for some traits in times of sex and location interaction of this study is inconsistent with the report of Bochno *et al.* (1994) who advanced that superiority of males over females could be as a result of their ability to feed at greater depth and better feed

Table 1. Sex effect on body weight and biometric traits of the indigenous normal feathered chicken reared in Azuba and Akurba areas of Lafia.

Traits	SEX		P-value
	Males (n=15)	Females (n=15)	
Body weight (BW) kg	0.62 ± 0.11	0.61 ± 0.11	0.45 ^{ns}
Body length (BL) cm	20.11± 2.39	22.92± 2.39	0.41 ^{ns}
Breast circumference (BC) cm	17.10± 0.24	17.02± 0.24	0.82 ^{ns}
Thigh circumference (TC) cm	8.25 ± 0.15	8.23 ± 0.15	0.95 ^{ns}
Foot length (FL) cm	6.29 ± 0.10	6.16 ± 0.10	0.38 ^{ns}
Total leg length (TLL) cm	16.22± 0.20 ^b	17.52± 0.20 ^a	0.00 ^{**}
Wing length (WL) cm	16.29± 0.16 ^b	17.45± 0.16 ^a	0.00 ^{**}

ab- means within the same rows carrying different superscripts are statistically different (P< 0.05). Mean ±SE

**significant at (P<0.05); ns-not significant.

SE- Standard error.

Table 2. Location effect on body weight and biometric traits of the indigenous normal feathered chicken reared in Azuba and Akurba areas of Lafia.

Traits	Location		P-value
	Azuba (n=15)	Akurba (n=15)	
Body weight (BW) kg	0.62 ± 0.02	0.61 ± 0.02	0.77 ^{ns}
Body length (BL) cm	19.62± 2.39	23.41± 2.39	0.27 ^{ns}
Breast circumference (BC) cm	17.29± 0.24	16.83± 0.24	0.18 ^{ns}
Thigh circumference (TC) cm	8.69 ± 0.16 ^a	7.79 ± 0.16 ^b	0.00 ^{**}
Foot length (FL) cm	6.15 ± 0.11	6.31 ± 0.11	0.29 ^{ns}
Total leg length (TLL) cm	16.03± 0.26 ^b	17.71± 0.26 ^a	0.00 ^{**}
Wing length (WL) cm	16.21± 0.21 ^b	17.53± 0.21 ^a	0.00 ^{**}

ab- means within the same rows carrying different superscripts are statistically different (P< 0.05). Mean ±SE

**significant at (P<0.05); ns-not significant.

SE- Standard error.

Table 3. Location and sex interaction effect on body weight and biometric traits of the indigenous normal feathered chicken reared in Azuba and Akurba areas of Lafia metropolis.

Traits	Location		Sex		L*S
	Azuba	Akurba	Male	Female	
BW (kg)	0.62 ± 0.02 ^a	0.61±0.02 ^a	0.62±0.02 ^a	0.60±0.02 ^a	ns
BL (cm)	19.62±3.38 ^a	23.41±3.38 ^a	20.11±3.38 ^a	22.92±3.38 ^a	ns
BC (cm)	17.29±0.34 ^a	16.83±0.34 ^a	17.10±0.34 ^a	17.02±0.34 ^a	**
TC (cm)	8.69±0.21 ^a	7.79±0.21 ^b	8.25±0.21 ^a	8.23±0.21 ^a	**
FL (cm)	6.15±0.14 ^a	6.31±0.14 ^a	6.29±0.14 ^a	6.16±0.14 ^a	**
TLL (cm)	16.03±0.28 ^b	17.71±0.28 ^a	16.22±0.28 ^b	17.52±0.28 ^a	**
WL (cm)	16.21±0.23 ^b	17.53±0.23 ^a	16.29±0.23 ^b	17.45±0.23 ^a	**

ab- means within the same row carrying different superscripts are statistically different (P< 0.05) separately for location and Sex effects.

Mean ±SE

**significant at (P<0.05); ns-not significant.

SE- Standard error.

conversion efficiency. The result of this findings disagreed with the report that Sex-related differences in the biometrics of Muscovy ducks is the strong female

selection for high quality males or competition among males for limited access to females which led to fixation of larger body size and other secondary sexual

Table 4. Serum biochemical indices of forty (40) indigenous normal feathered chickens of both sexes investigated.

Parameters	Azuba N=20	Akurba N=20	Significant
Total protein (ml)	6.00 ± 0.20	7.950 ± 0.35	ns
Albumin (ml)	1.95 ± 0.06 ^a	1.85 ± 0.05 ^b	**
Urea (ml)	5.93 ± 0.07	5.95 ± 0.25	ns
Creatinine (ml)	0.54 ± 0.06	0.50 ± 0.09	ns
Cholesterol (mg/dl)	84.79± 5.00	84.15 ± 4.15	ns

ab- means within the same columns carrying different superscripts are statistically different (P<0.05).

ns –not significant at (P<0.05).

Mean ± SE

characters in males (McCracken *et al.*, 2000).

Serum biochemical indices of indigenous normal feathered chickens

Serum parameters are important in the proper maintenance of the osmotic pressure between the circulating fluid and the fluid in the tissue space so that the exchange of materials between the blood and cells could be facilitated. They also contributed to the viscosity and maintenance of the normal blood pressure and PH. The result of total protein, urea, creatinine and cholesterol of the serum of the indigenous normal feathered chickens of both sexes of the two study areas were not significant (P<0.05) and it is consistent with the report of Ladokun *et al.* (2008) who observed no significant (P<0.05) genetic effect in their study. However, the result of the albumin concentration of the serum was significant (P<0.05) and this is not in agreement with the report of Ladokun *et al.* (2008) who reported no significant difference in the albumin level of chicken. The significant serum biochemical values are suggestive of the existence of genetic variation.

Conclusion

The total leg length (TLL) and wing length (WL) of the female indigenous locally adapted normal feathered chickens were superior to those of the male counterparts. Thigh circumference (TC) of indigenous locally adapted normal feathered chicken of Azuba was higher than those of Akurba. Total leg length (TLL) and Wing length (WL) of indigenous chicken of Akurba were superior to those of Azuba respectively and this could be attributed to the slight environmental variation and probably the general management care offered to the chicken at the two locations. There was location and sex interaction (L* S) effect on Breast circumference (BC), Thigh circumference

(TC), Foot length (FL), Total leg length (TLL) and Wing length (WL) while no interaction was observed between Body weight (BW) and Body length (BL) of the indigenous normal feathered chicken studied. The result of total protein, urea, creatinine and cholesterol of the serum of the indigenous normal feathered chickens of both sexes of the two study areas were not significant (P<0.05). The significant serum biochemical values are suggestive of the existence of genetic variation.

Recommendation

The findings of the present study might provide better understanding of the sexual differences in the improvement of the indigenous normal feathered chickens.

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