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Body Weight and Morphometric Differentiation of 3 Local Chicken Varieties in South-South Nigeria

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Abstract: The body weight and morphometric characteristics of the three varieties of local chickens in South-South Nigeria were evaluated. Data collected on body weight and linear dimensions (body girth, thigh, wing, shank and neck lengths) were analyzed using the Multivariate General Linear Model of SPSS Version 7.0 for Analysis of Variance (ANOVA). Significantly different ($p<0.05$) means were separated using the Duncan Multiple Range Test. Among the cockerels, naked neck performed best in body weight and all the linear dimensions. Normal feathered cockerels ranked second in body girth but performed worst in body weight; thigh, wing, neck and shank lengths. Frizzled feather cockerels had least body girth but ranked second in body weight; thigh, wing, neck and shank lengths. Among the pullets, naked neck had the best body weight and neck length but ranked second in body girth; thigh, wing and shank lengths. Normal feathered pullets had the best body girth; thigh, wing and shank lengths but ranked second in body weight and neck length. Frizzled feather pullets performed worst in body weight and all the linear dimensions. The three varieties differed significantly ($p<0.05$) only in body weight and wing length. Best results were obtained by the naked neck cockerels. Due to the superiority of the naked neck variety, particularly the cockerels they should be further characterized, conserved and crossed with the normal feathered variety to enhance body weight and morphometric characteristics.

Key words: Local chickens, varieties, morphology, body weight, characterization

INTRODUCTION

Poultry production refers to the greatest potential for increasing the per-capita protein intake in Nigeria (Aphunu and Akpobosa, 2009). Local chickens constitute about 80% of 120 million poultry birds in Nigeria and are mostly kept by the rural families as a means of ensuring the much needed income and protein for the family. The local chickens are categorized into varieties such as the normal feathered, frizzled feather and naked neck. Studies have shown that the normal feathered local chickens are the most prominent whereas the naked neck and frizzled feather are rare and almost becoming endangered and the gene pool they represent may be lost if not characterized and conserved (Ajayi, 2010). A qualitative measure of body conformation of these varieties is desirable as it will enable reliable genetic parameters to be estimated and permit its inclusion in breeding programmes.

Linear body measurements have been used severally to characterize breeds, evaluate breed's performances as a criterion for selecting replacement animals and evaluating breed controlled environments (Shrestha *et al*., 1984). Relationships existing between body weight and body conformations reflect on feed efficiency and performance of the chicken (Adeniji and Ayorinde, 1990). Studies involving body measurements in poultry have made significant contributions in poultry production.

The objective of this study therefore is to investigate the body weight and morphometric characteristics of the three varieties (naked neck, frizzled feather and normal feathered) of the local chicken in South-South Nigeria.

MATERIALS AND METHODS

The study site: This research was conducted in the Poultry unit, Department of Animal Science Teaching and Research Farm, University of Uyo, Uyo Akwa Ibom State South-South Nigeria. Uyo is located between latitude 05°02' North and longitude 07°56' East with a natural day-length of 12-13 h. Monthly mean minimum temperature ranged from 21.3-24.9°C and mean maximum temperature ranged from 28.4-34.5°C. Annual rainfall ranged between 2000 mm and 3000mm. Relative humidity ranged from 78-93%.

Procurement of experimental birds: The local chickens used were purchased from four different localities (Uyo, Esit Eket, Nsit Ibom and Ikono Local Government

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Areas) in Akw a Ibom State, Nigeria. The localities chosen were based on their distances from Uyo, the site of research. The distances of these localities in km from Uyo are Uyo-0, Nsit Ibom-23, Ikono-46 and Esit Eket-69. The local chickens assembled this way gave a representative sample of local chickens in Akwa Ibom State.

A total of 312 local chickens (240 pullets and 72 cocks) were purchased from the four localities. Twenty pullets and 6 cockerels of each variety were purchased from each of the localities.

Management of experimental birds: At inception, local chickens from different localities were quarantined separately for 7 days and fed growers mash (15% crude protein) to stabilize them. Thereafter, 15 pullets and 3 cockerels of each variety were selected from each locality based on their health conditions and having body weights ranging between 0.9-1.8 kg. The 216 healthy chickens from all varieties (180 pullets and 36 cockerels) were assembled from all localities for the research.

Local chickens of each variety from all locations were assembled and raised separately on deep litter to generate a broad based population for random mating. Mating ratio of cocks to hens was maintained at 1:5. Feed was changed to layers mash (16.5% CP) when 5% of hens laid eggs. Feed and water were provided *ad libitum*.

Eggs laid were brooded and hatched naturally by the hens. After 2 days hatch, each hen with her chicks were housed separately and monitored. Vaccinations and prophylactics were given at appropriate ages. Chicks (0-6 weeks) were fed chicks mash (18% CP), growing birds were fed growers mash (15% CP).

Data collection and statistical analysis: Data were collected when chickens were mature (7 months old). Measurements were on individual body weights (kg) and morphometric parameters (cm) such as shank length, body girth, thigh length, wing length and neck length. Each chicken was restrained and allowed to be calm before readings were made. Means of all data for the 3 varieties were computed. Data were analyzed with the Multivariate General Linear Model of SPSS Version 7.0. Significant ($p<0.05$) means were separated using Duncan (1955) Multiple Range Test.

RESULTS AND DISCUSSION

Body weight and morphometric characteristics of cockerels: Mean body weight and linear dimensions of cockerels in the 3 varieties are presented in Table 1. Cockerels of the 3 varieties performed differently with respect to mean body weight. This confirmed an earlier observation by Aphunu and Akpobasa (2009) that these varieties perform differently in a tropical environment. Mean body weight ranging between 0.93±0.34 and 1.31±0.36 kg for the 3 varieties was similar to the findings by Gunn (2008) that body weight of local chickens was between 0.95 and 1.80 kg. Mean body weight differed significantly ($p<0.05$) among the 3 varieties of local chicken cockerels with the frizzled feather cockerels having the highest mean body weight (1.31±0.36 kg) followed by the naked neck cockerels with 1.18±0.42 kg. The normal feathered cockerels had the least mean body weight (0.93±0.34 kg). Horst (1991) and Magothe *et al.* (2010) noted that the frizzled feather and the naked neck genes conferred better feed conversion on these genotypes when compared to their normal feathered counterparts. This could probably be the reason for the highest mean body weight of frizzled feather and naked neck varieties in this study.

Table 1: Body weight and morphometric characteristics of three varieties cockerels

Parameters	Normal feathered	Naked neck	Frizzled feather
Body weight (kg)	0.93 ±0.34^{c}	1.18±0.42^{b}	1.31±0.36^{a}
Body girth (cm)	15.20±1.75^{a}	16.03±1.49^{a}	14.44±1.49^{b}
Thigh length (cm)	14.83±1.12^{a}	15.70±1.23^{a}	15.43±1.45^{a}
Wing length (cm)	14.80±1.71^{c}	16.23±1.17^{a}	15.53±3.84^{b}
Neck length (cm)	10.20±1.09^{b}	11.43±1.63^{a}	10.24±0.94^{b}
Shank length (cm)	13.20±1.68^{b}	14.01±0.92^{a}	13.41±1.56^{b}

$^{a-c}$Means in the same row with different superscripts are significantly different ($p<0.05$)

Mean body girth ranged between 14.44±1.49 and 16.03±1.49 cm for the 3 varieties. Naked neck variety had the longest body girth (16.03±1.49 cm) followed by normal feathered variety (15.20±1.75 cm) while the shortest body girth (14.44±1.49 cm) was recorded by the frizzled feather variety. Ejekwu *et al.* (2006) observed that naked neck carrying genotypes perform better than their counterparts in body girth. This advantage of the naked neck is explained by its decreased feather cover which allows for sensible heat loss (Bordas and Merat, 1984). In the present study, mean body girth of normal feathered and naked neck cockerels were significantly different ($p<0.05$) from those of frizzled feather cockerels.

Mean thigh lengths compared favorably with the range of between 13.70 and 15.00 cm observed by Badubi *et al.* (2006). Naked neck variety had the longest thigh (15.70±1.23 cm) followed by frizzled feather (15.43±1.45 cm) while normal feathered had the least (14.83±1.12 cm). However, there was no significant difference ($p>0.05$) between the 3 varieties for thigh lengths, suggesting that genotype had no significant effect on thigh length of cockerels.

Mean wing length of between 14.80±1.71 and 16.23±1.17 cm in this study was within the range of between 17.05 and 17.17 cm observed by Ejekwu *et al.*

(2006). Present results indicate that naked neck and frizzled feather have longer wings (16.23±1.17 and 15.53±1.84 cm, respectively) than the normal feathered (14.80±1.71 cm). Mean wing length of the 3 varieties were significantly different ($p<0.05$) suggesting significant ($p<0.05$) genotype effects on wing length.

The naked neck varieties had the longest neck (11.43±1.63 cm) followed by frizzled feather (10.24±0.94 cm) while the normal feathered variety had the shortest neck (10.20±1.09 cm). Neck length of naked neck was significantly different ($p<0.05$) from those of frizzled and normal feathered varieties. Mean shank length of naked neck (14.01±0.92 cm) was significantly different ($p<0.05$) from those of frizzled (13.41±1.56 cm) and normal feathered (13.20±1.68 cm) varieties.

Body weight and morphometric characteristics of pullets: Mean body weight and linear dimensions of pullets in the 3 varieties are presented in Table 2. Mean body weight for naked neck (2.64±0.47 kg) was highest followed by normal feathered (1.01±0.33 kg) and frizzled feather (0.98±0.03 kg). According to Deeb *et al*. (1994), there is an advantage of naked neck and frizzled feather genes over their normally feathered counterpart in a humid tropical environment in terms of feed intake, growth rate and weight gain. This could be the reason for the better mean body weight of the naked neck and frizzled feather varieties of pullets in this study. However, mean body weight of naked neck was significantly different ($p<0.0.5$) from those of frizzled and normal feathered varieties.

The highest mean body girth of 15.60±1.49 cm was obtained by normal feathered pullets. Naked neck and frizzled feather pullets recorded 15.00±2.12 and 13.76±1.60 cm, respectively. Broady *et al*. (1984) reported that the difference in body girth depends on changes in muscular and fat deposition. Mean body girth of normal feathered and naked neck were significantly different ($p<0.05$) from that of frizzled feather.

The mean thigh length of normal feathered (15.68±1.58 cm) was significantly different ($p<0.05$) from naked neck (14.61±1.72 cm) and frizzled feather (14.10±1.51 cm). The normal feathered variety had the longest wing (15.50±1.26 cm) than the naked neck (15.11±1.92 cm) while the shortest wing (13.86±1.60 cm) was recorded by frizzled feather. However, there was no significant difference ($p>0.05$) between normal feathered and naked neck but frizzled feather was significantly different ($p<0.05$) from other varieties. The longest neck of the naked neck pullets (11.73±2.72 cm) was significantly different ($p<0.05$) from those of normal feathered (10.70±1.47 cm) and frizzled feather (9.83±1.05 cm) varieties. Shank length of the 3 varieties ranged between 11.71±1.43 and 13.81±1.07 cm. There was no significant difference ($p>0.05$) between the 3 varieties of pullets for shank length. Results therefore suggest that genotype had no significant effect ($p>0.05$) on shank length of pullets.

Table 2: Body weight and morphometric characteristics of three varieties of pullets

Parameters	Normal feathered	Naked neck	Frizzled feather
Body weight (kg)	1.01±0.33^{b}	2.64±0.47^{a}	0.98±0.03^{b}
Body girth (cm)	15.60±1.49^{a}	15.00±2.12^{a}	13.76±1.60^{b}
Thigh length (cm)	15.68±1.58^{a}	14.61±1.72^{b}	14.10±1.51^{b}
Wing length (cm)	15.50±1.26^{a}	15.11±1.92^{a}	13.86±1.60^{b}
Neck length (cm)	10.70±1.47^{b}	11.73±2.72^{a}	9.83±1.05^{b}
Shank length (cm)	13.81±1.07^{b}	13.38±1.95^{a}	11.71±1.43^{c}

$^{a-c}$Means in the same row with different superscripts are significantly different ($p<0.05$)

Body weight and morphometric characteristics of 3 varieties of local chickens: Mean values of body weight and morphometric characteristics obtained for both cockerels and pullets in each variety are presented in Table 3.

Naked neck varieties performed best in body weight and girth, wing, neck and shank lengths and ranked second for thigh length. Normal feathered variety had the best thigh length, ranked second in body girth, wing, neck and shank lengths but had the least body weight. The frizzled feather varieties ranked second in body weight and had the least values for all the morphometric characteristics measured. An evaluation of the contributions or ranking of the pullets and cockerels to the total score of each variety is presented in Table 4.

Table 3: Body weight and morphometric characteristics of three varieties of local chickens

Parameters	Normal feathered	Naked neck	Frizzled feather
Thigh length (cm)	15.26±0.33^{a}	15.16±0.34^{a}	14.88±0.33^{b}
Wing length (cm)	15.13±0.47^{b}	15.63±0.49^{a}	14.69±0.47^{c}
Neck length (cm)	10.43±0.37^{b}	11.58±0.36^{a}	10.04±0.35^{b}
Shank length (cm)	13.48±0.33^{a}	13.64±0.35^{a}	12.43±0.33^{b}

$^{a-c}$Means in the same row with different superscripts are significantly different ($p<0.05$)

Table 4: Ranking of cockerels and pullets of three varieties of local chickens for body weights and morphometric characteristics

		Position		
Parameters	Sex	1	2	3
Body weight (kg)	M	nn	ff	no
	F	nn	no	ff
Body girth (cm)	M	nn	no	ff
	F	no	nn	ff
Thigh length (cm)	M	nn	ff	no
	F	no	nn	ff
Wing length (cm)	M	nn	ff	no
	F	no	nn	ff
Neck length (cm)	M	nn	ff	no
	F	nn	no	ff
Shank length (cm)	M	nn	ff	no
	F	no	nn	ff

nn: naked neck; no: normal feathered; ff: frizzled feather

Naked neck cockerels when compared with cockerels of other varieties performed best in body weight and all the morphometric characteristics. Normal feathered cockerels ranked second in body girth and performed worst in body weight, thigh, wing, neck and shank lengths. Frizzled feather cockerels ranked second in body weight, thigh, wing, neck and shank lengths but had the least body girth.

Comparison of pullets in the 3 varieties revealed that naked neck pullets had the best body weight and neck length; ranked second for body girth, thigh, wing and shank lengths. Normal feathered pullets had best body girth, thigh wing and shank length and ranked second for body weight and neck length. Frizzled feather pullets had the least body weight and performed worst in all the morphometric characteristics.

CONCLUSION

The results obtained revealed that the 3 varieties of local chickens perform differently with respect to body weight and morphometric characteristics in a humid tropical environment. Naked neck varieties performed best followed by normal feathered and lastly the frizzled feather. Naked neck cockerels performed better than the pullets; normal feathered pullets better than the cockerels and frizzled feather cockerels were better than the pullets. On the whole best results were obtained from naked neck cockerels.

RECOMMENDATIONS

Due to the superiorly of the naked neck varieties, particularly the cockerels they should be further characterized, conserved and crossed with normal feathered variety to enhance body weight and morphometric characteristics of Nigerian local chickens.

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