MORPHOLOGICAL EVALUATION OF SEXUAL DIMORPHISM OF INDIGENOUS BREED OF CHICKEN IN SOUTHWEST

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Abstract
A study was conducted to assess the morphological evaluation of sexual dimorphism of indigenous chicken. A total of 156 adult local indigenous chickens comprising of 78 cocks and 78 hens reared under extensive management system belong to two breeds (frizzle feather and normal feather) were randomly sampled. The body weight and linear body measurement parameters considered were; shank length (SL), thigh length (THL), wing length (WL), chest girth (CG), neck length (NL) and thigh circumference (THC). Data collected were analyzed using SAS software. Breed had non-significant effect ($p>0.05$) on body weight and linear body measurement except thigh length, body length and neck length, which were significantly ($p<0.05$) higher in male. Sexual dimorphism was observed for SL, BL, CG and NL with higher values observed in males. In conclusion, variation in some of the linear body measurement within the genotype and sex could be used as selection criteria for improvement of indigenous breeds of chicken in this region, hence Frizzle feathered chickens observed superior traits compared to normal feathered counterpart in terms of shank length, thigh length, body length chest girth in male.

Keyword: Morphological, Sexual Dimorphism, Growth Traits, Breeds, Chicken

Indigenous chickens (*Gallus domesticus*) adapted to harsh environmental conditions which include extensive small-scale village, free-range and organic production systems. Sometimes, such chickens are referred to as traditional, scavenging, backyard, village, local or family chickens, (Mahendra, 2016). The local chicken production system, which is mostly free-range (extensive), can best be described as a low input-low output system. The variations in local chickens mostly comprise plumage color, body size, feather patterns, comb types and shank color. Throughout the world, numerous indigenous or local chickens have been reported. Naked neck chickens, normal feathered chickens and the frizzle feathers are reported to be found in Nigeria. Local or indigenous chickens are more abundant mostly in developing and underdeveloped countries than those that are already developed. Numerous studies have shown that local chickens play a key role in improving the socio-economic status of many rural communities.

Sexual dimorphism represents phenotypic differences between male and female of the same species in size, form and structure. Dimorphism may also influence differences in parental investment during times of food scarcity (Velando, 2002). Sexual dimorphism in form and behavior can lead to sex differences in space and resource use. Sexual dimorphism in avian species has been reported to affect several secondary phenotypic traits range from egg size, feather color, morphology and distribution, appendicular skeleton dimension, head length and size, tail inclination or lateralization, or even behavioral patterns or cognitive process.

MATERIALS AND METHODS

Study location

The study was conducted in Akure North Local Government Area latitude $5^0$45’ and $7^0$52’N and longitude $4^0$20’ and $6^0$05’E) and Akure South Local Government Area (Latitude $7^0$21’N and $7^0$50’N and

Longitude $5^0$50' and $7^0$25'N (Ovimaps, 2020). The Akure North Area are; Ayede Ogbese, Igoba, Oba-Ile, Iju, Itaogbolu, while Akure South comprises of Oda town, Arakale, Ibule, Awule, Ijoka.

Experimental animals

A total of one hundred and fifty-six (156) adult indigenous chickens comprising of 78 cocks and 78 hens of Frizzle and Normal feathered breed of chicken reared under extensive management system were randomly sampled within Akure North and South of Ondo State, Nigeria.

Data collection

The parameters examined on each adult indigenous chicken were body weight, shark length, thigh length, wing length, body length, chest girth, and neck length and thigh circumference.

Body Weight: Measurement of body weight was taken using a weighing scale (kg) individually. *Body Length*: Body length measured from the tip of the beak to the end of the tail when the bird was laid down on its back. *Neck length:* Measured when the neck is carefully stretched and the tape rule is positioned along the midline of the birds back (cm). *Shank Length*: Shank length was measured as the distance from the foot pad to the hock joint (cm). *Thigh Length*: Was measured from the tip of the tarsus to the ball joint. *Wing Length*: Was measured by stretching the wing and the measurement taken from humorous-coracoids junctions to the tip of the digit (cm).

Statistical analysis

Data generated were subjected to analysis of variance (ANOVA), using General Linear model (GLM) procedure of SAS (2002). Significantly different means between the breeds and sex in terms of body weight and linear body measurement were separated using Duncan Multiple Range Test (DMRT) of SAS procedure, (Duncan, 1955). The fixed effect model used shown below:

$$Y_{ijk} = \mu_{í} + G_{í+} S_{í} + (G_{í+} S)_k E_{ijkl}$$

Where: Y_{ijk} = Observation on the measurable characteristics**,** μ = Overall mean**,** $G_{í}$ = Effect of $í^{th}$ breeds (frizzle and normal feather)**,** $S_{í}$ = Effect of j^{th} sex (male and female)**,** $(G_{í+} S)$ = interaction effect of k^{th} (breed and sex), E_{ijk} = Random error.

RESULTS AND DISCUSSION

Least Square Means (±SE) of Body Weight and Linear Body Measurement

Least squares means of body weight and linear body measurement in frizzle feathered and normal feathered breed of chickens are presented in (Table 1). Breed had non-significant ($p<0.05$) effect on body weight and linear body measurement except thigh length, body length and neck length which were significantly ($p>0.05$) higher in frizzle feathered chickens. This disagrees with the findings of Adekoya *et al*. (2013) who observed significant effect between normal and naked neck for body weight. The value on body weight recorded for frizzle (1.28±0.09) and normal (1.26±0.03), is similar to the reports of Abdulraheem *et al*. (2020) who also observed (1.25) in frizzle feathered chicken, but high estimate (1.48) on normal feathered chicken. The thigh and body length were significantly higher in frizzle; this is contrary with the findings of Adekoya *et al*. (2013) who reported higher estimate on normal feathered chicken when comparing two breeds of indigenous chicken. This difference may be attributed to genetic makeup of the individual.

Table 1: Least square means (SE) of body weight and linear body measurement in breeds of chicken

	Breed	
Traits	Frizzle Feather	Normal Feather
Body weight	1.28±0.09	1.26±0.03
Shank length	13.41±0.62	12.70±0.19
Thigh length	$12.45±0.45^a$	$11.58±0.14^b$
Wing length	15.48±0.97	16.96±0.30
Body length	$38.68±1.49^a$	$34.59±0.45^b$

Chest girth	23.45±0.78	22.84±0.24
Neck length	7.44±0.64[b]	10.17±0.20[a]
Thigh circumference	10.08±0.37	10.60±0.11

ab means with different superscript on the same row are significantly different (p>0.05).

Sexual Dimorphism of Body Weight and Linear Body Measurement in Chicken

Table 2 shows sexual dimorphism of body weight and linear body measurement in chicken. The result shown that, the body weight, thigh length, wing length and thigh circumference were not significantly different (p<0.05) within the sex, while shank length, body length, chest girth and neck length were significantly (p>0.05) higher in males. The following parameters, shank length, body length, chest girth and neck length were significantly (p<0.05) effected by sex. This agrees with the findings of Deeb and Cahaner, (2001) and Zaky and Amin (2007) who reported sex effect on some growth traits in chicken. Also Abdulraheem *et al*. (2020) recorded sexual dimorphism in favor of the cocks as they were superior to the hens. Faith *et al*. (2018) who observed no significant effect on shank length and chest girth in both sexes. The body weight had non-significant effect on sex; this disagrees with the report of Faith *et al*. (2018) who observed significant effect on body weight. These apparent sex associated differences might be attributed to the usual between sex differential hormonal effects on growth.

Table 2: Sexual Dimorphism of body weight and linear body measurement in Chicken

	Sex	
Traits	Male	Female
Body weight	1.31±0.06	1.22±0.07
Shank length	13.65±0.42[a]	12.46±0.49[b]
Thigh length	12.36±0.30	11.66±0.36
Wing length	16.44±0.65	16.01±0.78
Body length	37.66±0.99[a]	35.61±1.19[b]
Chest girth	23.88±0.52[a]	22.41±0.63[b]
Neck length	9.28±0.43[a]	8.33±0.52[b]
Thigh circumference	10.47±0.25	10.21±0.30

ab means with different superscript on the same row are significantly different (p>0.05).

Effect of interaction on Linear Body Measurement in Chicken

The traits, shank length (SL), thigh length (TL) and body length (BL) and measured were significantly in favor of males (frizzle feathered) except the NL which was significantly higher in male of normal feather (Table 3). Similarly, the BL and chest girth (CG) however were in favor of frizzle female. But in the same vain the wing length (WL) and neck length (NL) were higher estimated in normal feather females. Sexual dimorphism favored male of both breeds with respect to body weight and conformational traits. This sexual dimorphic condition had been reported in poultry species Ilori *et al*. (2010) to be partly due to the presence of testosterone in male chickens which affects growth process and developments of body parts and feathers not directly related to reproduction (Warmick and Legates, 1979). This occurrence has been attributed to differences in hormonal profile, aggressiveness and dominance when both sex are raised together (Fayeye *et al*., 2006).

Table 3: Interaction effect between breed and sex on linear body measurement in chicken

	Breed			
Traits	Frizzle Male	Normal Male	Frizzle Female	Normal Female
Body weight	1.32±0.11	1.30±0.04	1.23±0.14	1.21±0.04
Shank length	14.07±0.78[a]	13.23±0.27[b]	12.75±0.96	12.17±0.27

Thigh length	13.00±0.57[a]	11.72±0.20[b]	11.90±0.70	11.43±0.19
Wing length	15.97±1.23	16.90±0.43	15.00±1.50[b]	17.02±0.42[a]
Body length	39.50±1.88[a]	35.82±0.65[b]	37.85±2.30[a]	33.37±0.64[b]
Chest girth	24.10±0.99	23.66±0.34	22.80±1.21[a]	22.02±0.34[b]
Neck length	7.63±0.81[b]	10.93±0.28[a]	7.25±0.99[b]	9.42±0.28[a]
Thigh circumference	10.10±0.47	10.83±0.16	10.05±0.57	10.37±0.16

ab means with different superscript on the same row across the breed are significantly different ($p>0.05$).

Conclusion

The variation in some of the linear body measurement traits between the genotype and sex could be used as selection criteria for improvement of indigenous breeds of chicken in this region, hence Frizzle feathered chickens observed superior traits compared to normal feathered counterpart in terms of shank length, thigh length, body length and chest girth in male.

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