ABG -11

Effects of Sex and Genotype on the Biometry of the Tongues of Nigerian Indigenous Chickens

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Abstract
Eighteen apparently healthy adult normal feathered, naked neck and frizzle feather genotypes of Nigeria indigenous chickens (three male and three female of each genotypes all above one year of age) were purchased, quarantined for two weeks and stabilized for another two weeks with the aim of studying effects of sex and genotype on the biometry of the tongues of these indigenous chickens. At the end of the stabilization, they were slaughtered and the tongues were harvested. The size, width, length and thickness of the tongues were measured using weighing balance and thread, meter rule, compass (divider) and digital Vernier calliper. There was no significant interaction effect ($p<0.05$) between sex and genotype on the combined dependent variables. There was significant difference ($p<0.05$) between the mean total lengths of the tongue of male and female Nigerian chickens, and in mean width of the tongue at the lingual apex among the three Nigerian genotypes of chicken. There was no significant difference ($p\geq0.05$) in all other parameters measured between the male and female Nigerian chickens and among the three Nigerian indigenous genotypes of chicken. This study contributes to the knowledge of Avian Anatomy up to the level of genotypes. It has also established a base line data for further research on the tongue in these three genotypes of Nigerian indigenous chicken.

Key words: Sex, Genotype, Biometry, tongue, Chicken

Introduction

The indigenous poultry species represent valuable resources for livestock development because their extensive genetic diversity allows for rearing of poultry under varied environmental conditions, providing a range of product and functions. Thus, great genetic resources embedded in the indigenous poultry await full exploitation that will provide basis for genetic improvement and diversification to provide breeds that are adapted to local condition for the benefit of farmers in developing countries (Sonaiya *et al.,* 1999). In term of their anatomy, avian tongues show fundamental similarities to the division of the mammalian tongues (apex, body, and root). Large species specific difference in shape and size are thought to be modification allowing the tongue to function as a specialized tool for obtaining and processing food (Komarck *et al.,* 1986; Vollmerchaus *et al.,* 1992).

Bird tongues are characterised by the occurrence of a single or double crest, which separates the body and root of the tongue by a wide variety of mechanical papillae useful for manipulation of food, filtration of liquid and transport of food particles on the lingual surface (Komarck *et al.,* 1986; Vollmerchaus *et al.,* 1992). Some recent studies on the morphology of the avian tongue have been restricted in general to gross inspection of the region and to the chickens in general (Igwebuike and Eze, 2010; Igwebuike and Anagor, 2013). Very little information exists in the literature regarding the genetic variations on the tongues of the Nigerian indigenous chicken genotypes. Thus understanding genetic biometric variation in the tongues of the indigenous chicken genotypes will be of help for Comparative Anatomists as well as for Veterinary Pathologists.

Therefore, the study was carried out with the aim of studying effects of sex and genotype on the biometry of the tongues of Nigerian indigenous chickens.

Materials and Methods

The present study was conducted in the Anatomy Laboratory, Department of Animal Health and Production Technology, Niger State College of Agriculture, Mokwa, North central, Nigeria. Mokwa is located at Latitude 9^{0}19 '38' North and Longitude 5^{0}3 '16' East (Google map, 2014). Eighteen apparently healthy adult Normal feather, naked neck and frizzle feather genotypes of Nigeria indigenous chickens (three male and three female of each genotypes all above one year of age) were purchased from local market in Mokwa. They were quarantined for two weeks and stabilized for another two weeks in a pen at Poultry unit, Livestock farm of the College. They were fed with commercial grower diet; within these periods and drinking water was given *ad libitum* under a good management. At the end of these periods, all the chickens were slaughtered using *Halal* method (Wilson, 2005) of slaughtering and the tongues were harvested. The size, width, length and thickness of the tongues were considered for studies. The weight (g), length (cm), width (cm) and thickness (cm) were measured using weighing balance and thread, meter rule, compass (divider) and digital Vernier calliper respectively. The tongue data obtained were expressed as mean ± SEM (Standard Error of Mean) and subjected to statistical analysis using Statistical Package for the Social Science (SPSS) version 17.0.

Multivariate Analysis of Variance (MANOVA) at 95% Confidence Interval (CI) was used to determine the level of significant difference in mean values among the three genotypes as well as their sexual dimorphism. Values of [$P \leq 0.5$] were considered significant. Where there were differences in means, they were separated with Tukey's HSD.

Results and Discussion

The mean tongue biometric parameters of the Nigerian indigenous genotypes of chicken are presented in tables 1.There was no significant interaction effect between sex and genotype on the combined dependent variables, F (14, 24) = 1.034, p = 0.455; Wilks' Λ = 0.389. The relation of genotype and sex to biometry of the tongue in the Nigerian indigenous chicken is presented in tables 2 and 3.

Table 1: Mean ± SEM biometry of tongues for male and female Nigerian indigenous genotypes of chicken

Parameters	Male normal feather	Female normal feather	Male naked neck	Female naked neck	Male frizzle feather	Female frizzle feather
Total length	2.28 ± 0.05	2.23 ± 0.13	2.58 ± 0.22	2.08 ± 0.17	2.78 ± 0.40	2.40 ± 0.32
Width at lingual apex	0.35 ± 0.06	0.35 ± 0.13	0.43 ± 0.10	0.33 ± 0.10	0.35 ± 0.06	0.48 ± 0.10
Width at lingual body	0.63 ± 0.17	0.73 ± 0.21	0.75 ± 0.13	0.55 ± 0.06	0.73 ± 0.15	0.83 ± 0.17
Width at lingual body	0.63 ± 0.17	0.73 ± 0.21	0.75 ± 0.13	0.55 ± 0.06	0.73 ± 0.15	0.83 ± 0.17
Thickness at lingual apex	1.87 ± 0.01	1.72 ± 0.16	1.88 ± 0.34	1.88 ± 0.44	1.51 ± 1.04	1.95 ± 0.42
Thickness at lingual body	3.14 ± 0.60	3.34 ± 0.45	3.34 ± 0.83	2.88 ± 0.70	2.71 ± 1.34	3.19 ± 0.44
Thickness at lingual root	4.14 ± 0.49	4.18 ± 0.80	4.66 ± 1.23	4.56 ± 1.23	3.72 ± 2.41	4.05 ± 0.72

Table 2: Effect of sex on the tongues of Nigerian indigenous chickens

Parameters	Male	Female	P-value
Total length (cm)	2.54 ± 0.07	2.23 ± 0.07	0.032*
Width at the lingual apex (cm)	0.38 ± 0.03	0.38 ± 0.03	0.411 ns
Width at the lingual body (cm)	0.70 ± 0.05	0.70 ± 0.05	0.257 ns
Width of at the lingual root (cm)	0.96 ± 0.03	0.97 ± 0.03	0.630 ns
Thickness at lingual apex (mm)	1.75 ± 0.15	1.85 ± 0.15	0.849 ns
Thickness at lingual body (mm)	3.06 ± 0.23	3.14 ± 0.23	0.759 ns
Thickness at lingual root (mm)	4.17 ± 0.39	4.26 ± 0.39	0.559 ns

ns Not significant at α= 0.05, * Significant at α = 0.05

Table 3: Effect of Genotype on the Tongues of Nigerian Indigenous Chickens

Parameters	NC	NN	FF
Total length (cm)	2.25 ± 0.09	2.33 ± 0.09	2.59 ± 0.09
Width at the lingual apex (cm)	0.35 ± 0.03[a]	0.38 ± 0.03[a]	0.41 ± 0.03[b]
Width at the lingual body (cm)	0.68 ± 0.06	0.65 ± 0.06	0.78 ± 0.06
Width at the lingual root (cm)	0.98 ± 0.03	0.94 ± 0.03	0.98 ± 0.03
Thickness at lingual apex (mm)	1.79 ± 0.18	1.88 ± 0.18	1.73 ± 0.18
Thickness at lingual body (mm)	3.24 ± 0.28	3.11 ± 0.28	2.95 ± 0.28
Thickness at lingual root (mm)	4.16 ± 0.47	4.61 ± 0.47	3.88 ± 0.47

a, b, c Means within the same row with different superscripts, are significantly different at (P<0.05). NC= Normal Chicken, NN=Necked Neck Chicken and FF = Frizzle Feather Chicken

There was significant difference ($p \leq 0.05$) between the mean total lengths of the tongue of male and female Nigerian chickens, and in mean width of the tongue at the lingual apex among the three Nigerian genotypes of chicken. On further separation, the mean value of 0.41 ± 0.03 cm, in FF was statistically different from mean values of 0.35 ± 0.03 cm, 0.38 ± 0.03 cm in NC and NN respectively. There was no significant difference ($p \geq 0.05$) in all other parameters measured between the male and female Nigerian chickens and among the three Nigerian indigenous genotypes of chicken.

The present results on the mean lengths of the tongue in NC, NN and FF found to be 2.25 ± 0.09cm, 2.33 ± 0.09cm and 0.35 ± 0.33 respectively are numerically higher than what was earlier reported in fowl by Gupta *et al*. (2015). The difference could be attributed to genetic influence. The present results on the mean width of the tongue at the lingual apex (0.35 ± 0.05cm, 0.38 ± 0.03cm and 0.41 ± 0.03cm), body (0.68 ± 0.06cm, 0.65 ± 0.06cm and 0.78 ± 0.06cm) and root (0.98 ± 0.03cm, 0.94 ± 0.03cm, 0.98 ± 0.03cm) in NC, NN, FF respectively are lower than the mean width value of 1.17 ± 0.03cm reported by Gupta *et al*. (2015) in fowl. In ostrich, the tongue was semicircular, short and broad with 1.92±0.15 cm length and 2.92±0.29 cm width. Its

base was attached to the rostral floor of pharynx by a short stalk like mucosal fold but the papillae were not visualized (Tadjalli *et al*., 2008). Jackowiak and Godynicki (2005) reported that the tongue of the white tailed eagle was 6 cm long. It was elongated with a sharp-ended apex. There was a deep median sulcus on the surface of the body of tongue, giving the tongue the shape of a drain pipe. The tongue of the cormorant was a small (1.4 cm long) fixed structure situated in the middle part of the elongated lower lip (Jackowiak and Godynicki, 2006). The tongue in partridge was characterized by its triangular shape with sharp extremity and its mean length was of 1 cm (Rossi *et al*., 2005). The present results on the mean thicknesses of the tongue at the lingual apex (1.79 ± 0.18mm, 1.88 ± 0.18mm and 1.73 ± 0.18mm respectively), body (.24 ± 0.28mm, 3.11 ± 0.28mm and 2.95 ± 0.28mm) and root (4.16 ± 0.47mm, 4.61 ± 0.47mm and 3.88 ± 0.47mm) in NC, NN and FF, are similar to previous work of King and Mclland (1984) in the hood pied-crow.

Conclusion

There was significant difference between the mean total lengths of the tongue of male and female Nigerian chickens, and in mean width of the tongue at the lingual apex among the three Nigerian genotypes of chicken. This study contributes to the knowledge of Avian Anatomy up to the level of genotypes. It has also established a base line data for further research on the tongue in these three genotypes of Nigerian indigenous chicken.

References

Gupta, S.K., Pathak, A. and Farooqi, M.M. (2015). Anatomy of oropharyngeal cavity of fowl. *Indian J. Vet. Anat.,* 27(1): 12-14.

Igwebuike, U.M. and Eze, U.U. (2010). Anatomy of the oropharynx and tongue of the African pied crow (Corvusalbus). *Veterinarski Archiv*, 80: 523 – 531.

Igwebuike, U.M. and Anagor, T.A. (2013). Gross and histomorphological assessment of the oropharynx and tongue of the guinea fowl (Numidameleagris). *Anim. Res. Intern*., 10: 1739 – 1746.

Jackowiak, H. and Godynicki, S. (2005). Light and scanning electron microscopic study of the tongue in the white tailed eagle (*Haliaeefusalbicilla, Accipitidae*, Aves). *Ann. Anat*., 187: 257-259.

Jackowiak, H. and Godynicki, S. (2006). Light and scanning microscopic study of the tongue in the *cormorant phalacrocoraxcarbo* (*Phalacrocoracidae*, Aves). *Zoo. Sci.,* 23: 16-167.

King, A.S. and Mclelland, J. (1984). Digestive system, in birds – their structure and function (2nd Edition). Bailliere Tindall, London.

Komarck, V., Mahriovesthy, L., Lemez, L. (1986). Anatomia Avium domesticarrumet embryologiagal liprivodave davatelstillkrrih a casoposov, Bratyalava.

Mclelland, J. (1979). Systema digestorium, In: Baumel, J.J., King, A.S., Lucas, A.M. and Breazile, J.E., Evans,. H.E. (Eds.), *Nomina anatomica avium*. Academic press, New York. Pp: 307-309

Rossi, J.R., Baraldi-Artoni, S.M., Olivera, O., Cruzm C., Franzo, V.S. and Sagula, A. (2005). Morphology of beak and tongues of Patridge *Rynchotusinfesceris. Ciene Rural,* 35:1098 – 1102.

Sonaiya, E.B., Branckaert, R.D.S. and Gueye, E.F. (1999). Research and development options for family poultry. First INFPD/FAO Electronic Conference on Family Poultry. *www.fao.org/docrep/008/y5169e/y5169e0b.htm*

Tadjalli, M., Mansouri, S.H. and Poost, A.P. (2008). Gross anatomy of oropharyngeal cavity in the ostrich (*Ostruthio camelus*). *Iranian J. Vet. Res. Shiraz university* MN., 25: 9.

Vollmerchaus, B. and Sinowatz., F. (1992). Verdalungsapparat. In: Wickel, R., Schummer, E., Seiferle. E. (Eds). Anatomie der vogel Bd. S, Lehrbuch der Anatomic der Haustiere. Parey, Berlin.

Wilson, G.W. (2005). Wilson's Practical meat inspection (7th edition). Blackwell Publishing, USA.