

COMPARATIVE BIOMETRY OF THE TONGUE IN THREE SPECIES OF RUMINANT

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ABSTRACT

Seventeen heads of apparently healthy adult ruminants {Six Red Sokoto bucks (RSB), Six adult Uda rams (UR) and five White Fulani bulls (WFB)} were purchased from slaughter house in Mokwa town immediately after the animals were slaughtered using *Halal* method of slaughtering with aim of comparing biometric parameters of their tongues. The weights of the tongues were measured by using a sensitive electronic balance in gram (g). The length and width were measured using thread and metre rule in centimeter (cm) while thickness was measured with the help of a digital vernier caliper in millimeter (mm). The results showed that all means of the biometric parameters of the tongue measured were all significantly ($P \leq 0.05$) different among the three species studied. On separation, the mean biometric parameters were significantly ($P \leq 0.05$) different from one another in the three species for some parameters and for some the mean biometric parameters of the tongue of WFB was significantly ($P \leq 0.05$) different from UR and RSB. The width of the lingual fossa was not significantly ($P > 0.05$). Different in the three species. The three ruminants studied have different morphometric patterns. This study in addition to its usefulness in clinical comparative anatomy and pathology, it has also established a comparative baseline data for further lingual studies in these species of the ruminant animals.

Key words: Biometry, comparative, tongue, ruminants

INTRODUCTION

Ruminant animals are disseminated all over the world, because of their adaptability to varying environmental conditions and the different nutritional regimens under which they were evolved (Aziz, 2010). Ruminant animals are kept mainly to produce meat or fibers (Aziz, 2010). Ruminants animals are able to survive and reproduce under a wide variety of environmental conditions, however, some breeds are better suited in certain climatic conditions than others (Mckenzie, 2009). The tongue is a movable musculomembraneous organ that occupies the greater part of the oral cavity. It has an attached root, body and free apex, capable of both vigorous and precise movements as in prehension, lapping, grooming and manipulation of food within the mouth on the one hand and speech articulation on the other, while in some animals the tongue participates in the heat loss by panting as in the dog (Dyce *et al.*, 2010). The middle portion of tongue is joined to the oral cavity by mucosal fold or frenulum, mucosa replications (palatoglossal arches) also pass each side of the root to join the soft palate (Nickel *et al.*, 1979). Ventrally the frenulum linguae fixed its caudal three-fourth leaving the rostral one – fourth free. The frenulum linguae extend from the root of the tongue caudally to the level of caruncula sublingualis rostral to the level of the first cheek tooth in ruminant (Martinez *et al.*, 1998). Any alteration and impairment of the tongue in farm animals, both in structure and function has a profound effect on the performance of the animals (Dyce *et al.*, 2010). Since the tongue plays an important role in talking, food, mastication, swallowing and rumination (Parvez and Rahaman, 2005). There are scanty reports on species similarities and differences of the tongue in these three species of ruminant animals. Thus, this study is undertaken with the aim of comparing the biometric parameters of the tongue in White Fulani Bull, Adult Uda ram and Red Sokoto Buck. The results from this study will be useful for clinical comparative anatomists and pathologists.

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°19'38" North and longitude 5°3'16" East (Google maps, 2020). Seventeen heads of apparently healthy adult ruminants {Six Red Sokoto bucks (RSB), Six adult Uda rams (UR) and five White Fulani bulls (WFB)} were purchased from slaughter house in Mokwa town immediately after the animals were slaughtered using *Halal* method (Wilson, 2005) of slaughtering. The tongue samples were collected after the separation of head from the carcass and stored in containers containing 10% neutral formalin before being taken to Anatomy Laboratory, Niger State College of Agriculture, Mokwa. The tongues were dissected and the extrinsic muscles (styloglossa, hypoglossal and genioglossa) from the tongues were removed. The tongues were then used for biometrical studies. The weights of the tongues were measured after the removal of the surrounding connective tissue and fat by using a sensitive electronic balance in gram (g). The lengths were measured using thread and metre rule in centimeter (cm) while width and thickness were measured with the help of a digital vernier caliper in millimeter (mm). The data of the tongue obtained were expressed as mean \pm SEM (Standard Error of Mean) and subjected to Statistical Analysis using Statistical Package for the Social Sciences (SPSS) version 26.0. One-way Analysis of Variance (ANOVA) at 95% Confidence Interval (CI) was used to determine the level of significant differences in mean values of the tongue parameters measured among the three species of ruminant. Values of ($P \leq 0.05$) were considered significant. Where there were differences in means, they were separated by Tukey's Honestly Significant Difference (HSD).

RESULTS AND DISCUSSION

The findings of the present study are summarized in Table 1.

Table 1: Mean \pm SEM of Biometric Parameters of the Tongue in Three Species of Ruminant

Parameters	White Bull	Fulani Uda Ram	Red Sokoto Buck
Total length of the tongue (cm)	36.12 \pm 0.88 ^c	16.40 \pm 1.02 ^b	13.20 \pm 0.61 ^a
Length of the apex of the tongue (cm)	19.80 \pm 0.62 ^c	7.97 \pm 0.64 ^b	6.17 \pm 0.35 ^a
Length of the body of the tongue (cm)	12.24 \pm 0.72 ^b	6.20 \pm 0.23 ^a	5.02 \pm 0.25 ^a
Length of the root of the tongue (cm)	6.36 \pm 0.84 ^b	3.23 \pm 0.28 ^a	3.07 \pm 0.22 ^a
Width of the tongue at the level of the root (mm)	5.90 \pm 0.24 ^b	3.67 \pm 0.30 ^a	3.63 \pm 0.35 ^a
Width of the tongue at the level of the middle torus (mm)	7.22 \pm 0.59 ^b	3.98 \pm 0.17 ^a	3.68 \pm 0.28 ^a
Width of the tongue at the level of the fossa linguae (mm)	5.76 \pm 0.47 ^b	2.87 \pm 0.16 ^a	2.71 \pm 0.17 ^a
Width of the tongue at the level of the apex (mm)	6.88 \pm 0.38 ^c	3.35 \pm 0.20 ^b	2.62 \pm 0.08 ^a
Width of the tongue at the level tip of the apex (mm)	4.24 \pm 0.24 ^c	2.68 \pm 0.22 ^b	1.93 \pm 0.19 ^a
Thickness of the body of the tongue (mm)	49.89 \pm 11.01 ^b	16.49 \pm 2.62 ^a	14.01 \pm 1.92 ^a
Thickness of the middle of apex of the tongue (mm)	31.14 \pm 6.88 ^b	9.70 \pm 1.79 ^a	9.29 \pm 1.39 ^a
Thickness at level of the tip of the tongue apex (mm)	17.19 \pm 5.12 ^b	5.14 \pm 0.76 ^a	7.18 \pm 1.87 ^a
Thickness of the root of the tongue (mm)	38.37 \pm 13.00 ^b	11.68 \pm 0.79 ^a	9.10 \pm 0.76 ^a
Lingual fossa length (cm)	3.84 \pm 0.19 ^c	2.75 \pm 0.41 ^b	2.62 \pm 0.17 ^a
Lingual fossa depth (cm)	3.96 \pm 1.35 ^b	2.20 \pm 0.21 ^{ab}	1.30 \pm 0.30 ^a
Total weight of the tongue (g)	579.00 \pm 36.24 ^b	72.83 \pm 8.15 ^a	53.83 \pm 4.43 ^a
Weight of the apex of the tongue (g)	227.20 \pm 15.3 ^b	23.00 \pm 3.66 ^a	17.16 \pm 1.90 ^a
Weight of the body of the tongue (g)	258.80 \pm 21.24 ^b	34.17 \pm 4.56 ^a	25.67 \pm 2.23 ^a
Weight of the root of the tongue (g)	81.60 \pm 7.62 ^b	12.17 \pm 0.95 ^a	10.83 \pm 0.91 ^a

^{a, b, c} The means within the same row with different superscripts, are significantly different at ($P \leq 0.05$) All means of the biometric parameters of the tongue measured were all significantly ($P \leq 0.05$) different among the three species studied. On separation, all the mean biometric parameters were significantly ($P \leq 0.05$) different from one another in the three species for Total Length of the tongue, Length of the Apex of the Tongue, Width of the Tongue at the Level of the Apex, Width of the Tongue at the Level of the Tip of the Apex, and Length of Lingual Fossa. The mean biometric parameters of the tongue of WFB was however significantly ($P \leq 0.05$) different from UR and RSB for Length of the Body of the Tongue, Length of the Root of the Tongue, Length of the Root of the Tongue, Width of the Tongue at the Level of the Root, Width of the Tongue at the Level of the Middle of Torus, Width of the Tongue at the Level of the Fossa Linguae, Thickness of the Body of the Tongue, Thickness at the level of Tip of the Tongue Apex, Thickness of the Root of the Tongue, Total Weight of the Tongue, Weight of the Apex of the Tongue, Weight of the Body of the Tongue and Weight of the Root of the Tongue. The present result on the mean lengths of the tongue of WFB, UR and RSB to be 36.12 ± 0.88 cm, 16.40 ± 1.02 cm and 13.20 ± 0.61 cm respectively are in close range with the reports of Shao *et al.* (2010), who found the length of the tongue to be 32.0 ± 1.40 cm in Yak cattle, Qayyum and Beg (1975), who found the length of the tongue to be 14.15 ± 0.08 cm in sheep and Murad *et al.* (2010), who found the length of the tongue to be 14.48 ± 0.24 cm in goat. The present result on the mean width of the apex of the tongues in UR to be 2.68 ± 0.22 cm, while the thickness at the level of the tip of the tongue apex 5.14 ± 0.76 mm, are in close range to the result of May (1970), who found the width of the tongue of sheep at the level of the tip of the apex to be 3.33 ± 0.08 mm and disagreed with his result on thickness of the tongue at the level of the tip of the apex 1.32 ± 0.09 mm. This difference may be due breed variation. The present result on the mean of thickness of the root of the tongue of UR to be 11.68 ± 0.79 mm and respectively, are not in agreement with earlier results of Kumar and Bate (2004) in adult ram, who found the thickness of the root of the tongues to be 9.33 ± 0.53 mm. The present results also are different from the reports of Murad *et al.* (2010), who found the thickness of the root of the tongues to be 20.7 ± 0.55 mm in the tongues of goat. This difference may be attributed to the breed variations of the animal under study.

CONCLUSION

The mean weights, lengths, thickness width of apex, body and root of the tongue of three species of ruminants studied were significantly different ($P < 0.05$) from one another, except the width of the lingual fossa of WFB, UR and RSB ($P \geq 0.05$). The three ruminants studied have different morphometric patterns. This study in addition to its usefulness in clinical comparative anatomy and pathology, it has also established a comparative baseline data for further lingual studies in these species of the ruminant.

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