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Research Article

Morphology of tongue in a local Iraqi breed cattle, *Bos taurus*

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Abstract: This study was conducted on 16 healthy local breed cattle tongue collected. Description of shape, location and measurements were provided. Based on the results, the tongue was divided into root, body and apex with mean total length of 28.4±1.5cm. Its dorsal surface has torus linguae which limited cranially by transvers fossa and has two gustatory papillae. The vallate papillae which percent intwo rows on either side of tongue and fungiform papillae thatembedded in dorsal surface of apex among the filiform papillae. Three mechanical papillae were filiform, long thread-like projection and conical papillae which is pointed tip projection and the specific lenticular papillae on the torus linguae.

Keywords: Morphology, Tongue, Papillae, Local breed cow.

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Introduction

The tongue is a highly mobile musclomembanous organ playing an important role in food intake and helping to break down and swallowing of food (Samuelson 2007). Tongue morphology was studied in different animal species e.g. birds (AL-Taai & Khalaf 2020) and porcupines (Abdularazzaq 2018). It is covered with a special mucous membrane that is on thedorsal surface of the tongue and is characterized by different sizes and shapes of projection-like papillae named lingual papillae. It is highly differentiated from gustatory and mechanical papillae. Small and large ruminants are characterized by the presence of specialized papillae which is lenticular papillae (Parvez & Rahaman 2005; Muliabady et al. 2010; Murad & Hassan 2010). Little data are available regarding the local breed cow in Iraq; however, few studies were done on the mammals in Iraq (Al-Sadi 1980; Al Zubadi & Yousif 2012; Badday 2021). Hence, this study aimed to investigate the gross anatomical features and the biometrical values of the tongue in a local Iraqi breed cattle, *Bos taurus*

Material and Methods

Our study was done on sixteen fresh and 10% formalin-fixed tongues obtained from Al-Shaaala slaughter. Heads were taken immediately from apparently healthy adult local breed cattle of 3-4 years. The tongues were removed carefully with the hyoid bone, then they were washed with water and then normal physiological saline to remove the food and other particles. For anatomical observations, including shape, distribution, and counting of papillae, photographs were taken (Cupta & Sharma 1991).

Dissecting microscope and magnified lens were used for biometrical measurement (Cupta & Sharma 1991) and for this purpose fresh tongues were used. All the extrinsic muscles and surrounding tissue and fat were removed carefully. Sensitive digital balance and digital vernier and centimeter tape were used for measurements of the length, width, thickness, and weight of the tongue. All measurement data were analyzed by using SPSS and the results were expressed as means ± SEM as significant at P˂0.05.

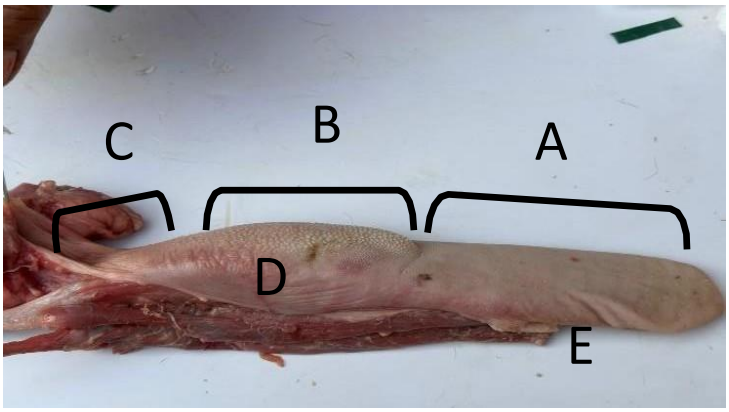

Fig.1. Anatomical specimen shows tongue of local breed cow: A- Apex, B- Bo.

Table 1. Macroscopic measurements (cm) of tongue of local breed cow (mean ±se. N=8).

	length	Width	thickness
Length of apex	10.5±0.4	6.1±0.4	2.1±0.3
Length of body	9.6±0.7	6.4±47	6.42±07
Length of root	8.3±0.4	6.2±0.7	4.6±0.2
Total length of the tongue	28.4±5	-	-

Fig.2. Anatomical specimen shows two folds of frenulum linguae in local breed cow.

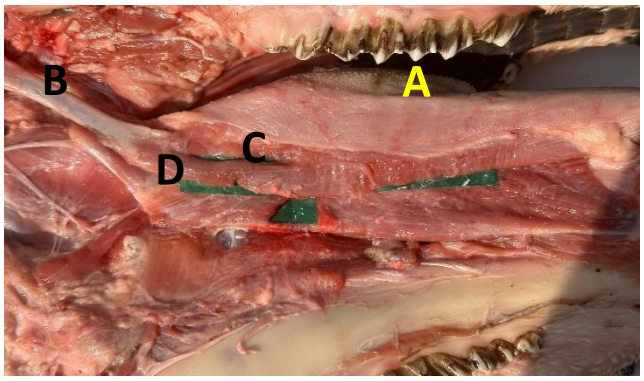

Fig.3. Anatomical specimen: A - tongue of cattle body, B- styloid process of hyoid bone, C - styloglossal muscle, and D- hypoglossal muscle.

Results and Discussion

The tongue of the local breed cattle consists of a root, body, and apex (Fig. 1) with a total mean length of 28.4 cm (Table 1). The tongue was located on the floor of the mouth cavity extended between the two mandibular bones; it was limited cranially by the caudal aspect of the incisive teeth and caudally by the glossoepiglotic fold (Fig. 1). This observation was in agreement with Parvez & Rahaman (2005) in the indigenous Bangladesh cow. The caudal two-thirds of the tongue is fixed by the lingual process of the hyoid bone and glossopalatine arch at the root and by the frenulum linguae from the ventral surface of the apex about 4.1 cm caudal to the sublingual caruncle (Figs. 2, 3) as reported by Parvez & Rahaman (2005) in the Bangladesh cow, and Cupta & Sharma (1991) in Indian buffalo. In addition, the ratio between the apex (free portion) and the fixed portion of the tongue was 1:2.7.

The apex of the tongue or free part formed from the meeting of the ventral and dorsal surface, and

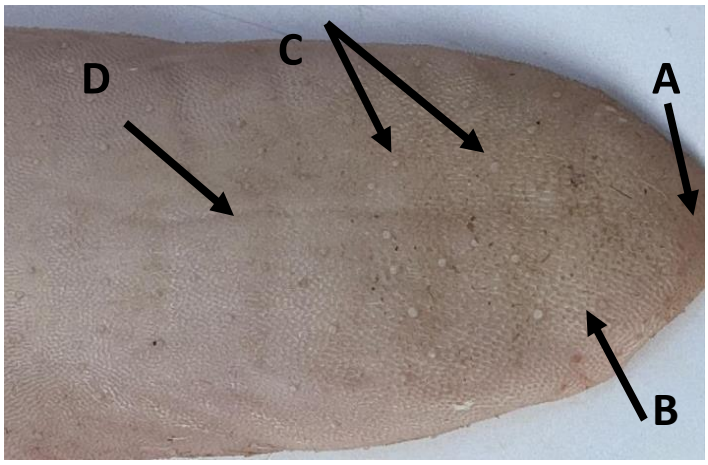

Fig.4. Anatomical specimen shows apex of tongue: A - lip of tongue, B - filiform papillae groove, C - Fungiform papilla, and D - shallow median.

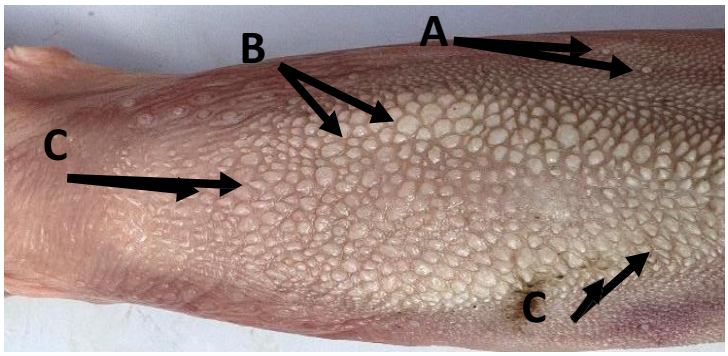

Fig.5. Anatomical specimen shows torus linguae (body of tongue): A - fungiform papillae, B - lenticular papillae, and C-conical papillae.

become narrow(pointed) (Fig. 4). Their mean length, width, and thickness were 10.5±0.5, 6.1±0.5 and 2.1±0.3, respectively (Table 1). The dorsum of the apex has dense long cornified third filiform and fungiform papilla spread among it (Fig. 4) similar to the report of Sari et al. (2010) in Zavot Cattal. The ratio of the free part to the fixed part of the tongue was 1/2.7 which was close to the ratio in Bangladesh cows (Parvez & Rahaman 2005). The body in the middle is greater than the thick part of the tongue forming the bulk of the tongue. It extended from the first cheek teeth cranially to the last cheek teeth caudally (Figs. 1, 3). It is quadrilateral in shape in dorsal, and two lateral surfaces are free and attached to the ventral surface.

The body's length, width, and thickness were 9.6±0.7, 6.41±47, and 5.42±0.7, respectively (Table 1). The dorsum of the body is characterized by percent clear round prominence torus linguae which are limited cranially by transvers shallow lingual fossa (Fig. 1). Our result is similar to the finding of Murad et al. (2010) in Ram, and Mahabady et al. (2010) and Ammar (2014) in goats. The torus linguae have an important role in the mastication of food by pressing food against the hard palate. The root is the fixed caudal part of the tongue, and their length, width and thickness were 8.3±0.4, 6.24±0.7, and 4.6±0.2, respectively (Table 1). The caudal part of the dorsal surface of the root was sloped caudally toward the base of the epiglottis (Figs. 1, 3). This result agrees with the findings of Parvez & Rahaman (2005) in cows and Mahabady et al. (2010) in buffalo. The mucous membrane along the dorsal surface of local breed cattle revealed two types of lingual papillae of the gustatory fungiform and circumvallate papilla and the mechanical filiform,

Table 2. Macroscopic measurement of lingual papillae (mm) of local breed cow mean ISE-N=8.

Vallate Pap.		Filiform Pap.		Conical Pap	
Total number		Length (mm)	3.1±0.3	Length mm	
Left side	26±0.2	Number of Pap./Cm^2	33.0±0.2	Large	4.1±0.3
Right side	24.1±0.3			Medium	3.3±0.2
Diameter				Small	3.0±0.5
Large	4.5±0.1				
Medium	3.2±0.3				
Small	2.9±0.3				
Lenticular Pap.		Fungiform Pap.			
Diameter		Diameter			
Large	2.4±0.5	Large	2.2±0.4		
Small	2.0±0.4	Small	1.9±0.3		

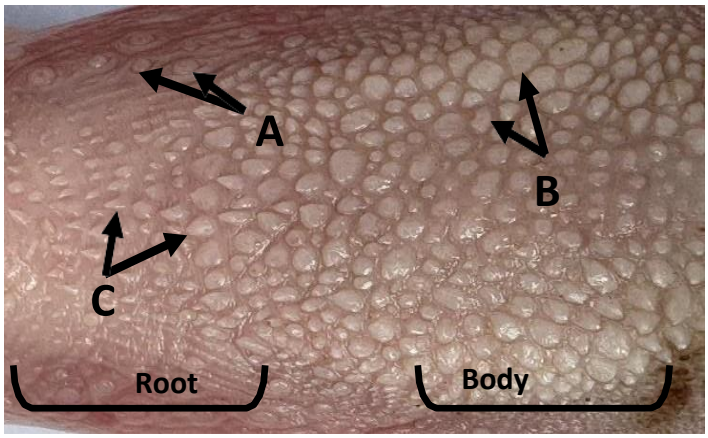

Fig.6. Anatomical specimen shows torus linguae (body of tongue): A - vallate, B - lenticular papillae, and C - conical papillae.

conical, and lenticular papilla (Figs. 4, 6).

The fungiform papilla is a gustatory small round dome-shaped with a convex dorsal surface and haa s mushroom-like appearance usually found embedded on the dorsal surface among the filiform papillae. It mostly concentrated on the dorsal surface and lateral border of the apex (Figs. 4, 5, 6) and extended caudally to the transverse fossa with a diameter of 2.2±0.4mm (Table 2). This result agreed with the finding of Agungpriyono et al (1995) in lesser mouse deer, Parvez & Rahaman (2005) in cow, and Sreerangini et al. (2010) in Sambar deer and disagree with the findings of Murad et al. (2010) in ram that few fungiform papillae extended on the ventral of the apex.

The circumvallate papillae are found on the dorsum ofthe root caudal to the torus lingual they are arranged in two rowson both sides of the tongue. It was round to oval slightly elevated from the dorsal surface, and large, middle, and small in size (Figs. 6, 7). Their diameter were 4.5±0.4, 2.2±0.3 and 1.9±0.5mm, respectively, and their total number on the right side was 24.1±0.3 in two rows and 26±0.2 on the left side (Table 2). Their number was more in the outer row and less in the inner row of both sides. Each papilla was surrounded by circumference narrow deepgroove, similar to the findings of Parvez & Rahaman (2005) in cows.

The filiform papillae are the more numerous mechanical papillae. It is a hard long thread-like projection highly confide and directed caudally posteriorly (Figs 4, 7). Their length was 3.2mm and the number per cm2 was 320.0±0.2 (Table 2). It is concentrated on the dorsum of the apex and lateral

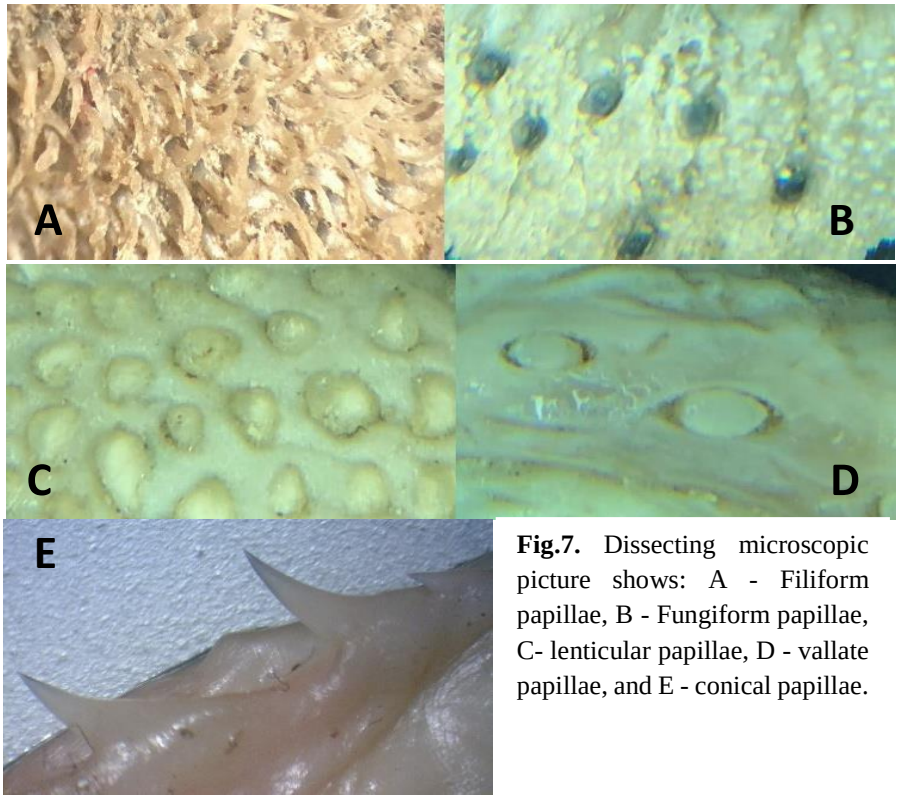

Fig.7. Dissecting microscopic picture shows: A - Filiform papillae, B - Fungiform papillae, C- lenticular papillae, D - vallate papillae, and E - conical papillae.

border and decrease in number and length caudally toward the torus linguae, similar to that finding of Cupta & Sharma (1991) in Indian yak cows. The conical papillae are elongated pointed conical in shape directed caudally. It presents in different sizes and lengths (large, medium and small) (Figs. 5, 6, 7). Their lengths were 4.1±0.3, 3.7±0.2, and 3.4±0.5mm, respectively (Table 2). The high concentration of conical papilla is found on the torus linguae and decreases their number and length toward the rood and this result was similar to the other herbivores Kumar & Bate (2004). Our result in disagreement with Sari et al. (2010) in Zavot Cattle who found the conical papillae extended caudally to the glossoplatine arch, also disagrees with the Agungpriyono et al. (1995) in the lesser deer which is absent.

The lenticular papillae are specific mechanical papillae for ruminants. They are convex round lens-like in shape and few in number with different sizes on the middle part of torus linguae (Fig. 7). Their diameter is arranged at 2.0±5 to 2.4±0.3mm (Table 2). Our results is agreed to the findings of Sreeranijinil et al. (2010) in samber deer. The lenticular papillae play a role in crashing food mechanically through pressed it against the hard palate.

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