Age-related gross anatomical changes on the lips of sheep

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Abstract

The present study was carried out to provide age-related information on gross anatomical features as well as biometrical measurements of the upper and lower lips of non-descript sheep of Jammu region. Samples of healthy sheep (young, adult, and senile), regardless of gender, were collected from the slaughter house located in and around Jammu city. The upper lip was more mobile than the lower lip. The upper lip featured a philtrum that was surrounded by multiple labial projections. The free borders of both the upper and lower lips showed labial projections which were more square-shaped and became more pointed towards the angle of the mouth, where they merged with the buccal papillae. The lower lip had a single row of projections, while the upper lip had two rows of projections towards the philtrum that became single facing the oral commissure. The upper lip was found to be longer than the lower lip in all three age groups, but the length was significantly more in the senile group. Both the lips increased in length as they aged, although the difference was most noticeable in the upper lip. In all age groups, the upper and lower lips were thicker along the oral angle than at the centre. The senile group had the longest philtrum (2.95 ± 0.14 cm), but this difference was statistically non-significant. Lower lip projections were significantly more in number than upper lip projections across all the three age groups.

Key words: Age, Labial projections, Lip, Philtrum, Sheep

Introduction

Sheep is said to be one of the first domesticated animal in Mesopotamia, dating back to 9,000 BC (Weaver, 2011). There are 74.26 million sheep in India, accounting for around 13.8% of total livestock (Livestock Census 2019). The union territory of Jammu and Kashmir is generally equipped with an environment and socio-cultural system that promotes small ruminant production. Sheep farming is popular among economically disadvantaged people, and it is seen as a "mortgage lifter" for poor farmers (Poonia et al. 2012; Djimon et al. 2024). They are vital to the livelihoods of many small and marginal farmers as well as landless labourers who work in the sheep industry. On the basis of foraging behaviour, cattle and horses are grazers, sheep is classified as intermediate whereas goats are browsers (Mosavat and Chamani 2013).

According to Klein et al. (2021), healthy behaviour of animal influences its productive performance. Small ruminants have movable lips (labia oris), which are utilized for selecting an assortment of nourishments (Konig and Liebich 2013). Thus, the lip is vital for food prehension and mastication. A better comprehension of ingestive behaviour, food choices, and pasture adaptation is critical for effective animal management. There is scant information on the specific structure of the lips in small ruminants, particularly sheep. Thus, the current study was undertaken to gain a better understanding of the anatomical features of the lips of non-descript sheep of Jammu region.

Materials and Methods

Heads of freshly slaughtered sheep were collected from local slaughter houses in and around Jammu city and immediately brought to the laboratory of Division of Veterinary Anatomy, F.V.Sc. & A.H., SKUAST-J, R.S. Pura. Sheep were divided into three age groups (young: below 1 year; adult: 2-3 years and senile: 4 years and above) as per the dentition. Minimum 6 samples from each group of non-descript sheep were collected. The temporomandibular joints of the heads were carefully dislocated for easily exposing of the upper (UL) and lower (LL) lips for morphological examination as per Madkour and Mohammed (2020). For morphometric analysis, different measurements (in cm) of the lips were done on fresh heads using using scale, Vernier calliper and non-stretchable thread. Data were expressed as mean ± standard error (SE). The following biometrical parameters were recorded.

1. Length (cm) of upper and lower lip
2. Thickness (cm) of upper lip at center and towards oral angle
3. Thickness (cm) of lower lip at center and towards oral angle
4. Length (cm) of philtrum
5. Distance (cm) between oral angle and caudal commissure of right and left nostril
6. Number of labial projections in upper lip, lower lip and around the philtrum

Results and discussion

Gross morphology

The upper and lower lips bordered the rima oris. Both lips unite laterally at the angle of the mouth, as also noticed by Madkour and Mohammed (2020) in Rahmani sheep. The lips of small ruminants are extremely movable, but those of ox have little freedom of movement. Similar observation was made by Dyce et al. (2010).

The lips were covered by skin on the outside and labial mucosa on its inner part. The skin of both the upper and lower lips was distinguished by the presence of ordinary hairs, which were short and dense, and tactile hairs, which were fewer but longer. Tactile hairs were very few towards the oral commissure. Similar findings were reported by Madkour and Mohammed (2020) in Rahmani sheep. According to Mahdy et al. (2020), the presence of tactile hairs around the entrance acted as a natural protection against any dangerous objects or insects in the surrounding area during feeding prehension in small ruminants.

The upper lip was divided by a conspicuous median cleft known as philtrum (Fig. 1 and 4). It originated on the upper lip and expanded dorsally to terminate in the central section of the planum nasale between the nostrils, as previously documented by Madkour and Mohammed (2020) in Rahmani sheep. Philtrum was surrounded by several labial projections grouped on either side. These projections were grouped in a single row towards the lip, while there were multiple rows towards the nostrils.

The free borders of both the upper (Fig. 2) and lower lips (Fig. 3 and 5) showed labial projections. These projections were more square-shaped and became more pointed towards the angle of the mouth, where they merged with the buccal papillae (Fig. 3). Madkour and Mohammed (2020) also observed square-shaped projections in Rahmani sheep. The lower lip had a single row of projections, while the upper lip had two rows of projections towards

the philtrum (Fig. 2) that became single row towards the oral commissure. Madkour and Mohammed (2020) found a single row on both the lips in Rahmani sheep, with a small second row on the lower lip. According to Mahdy et al.
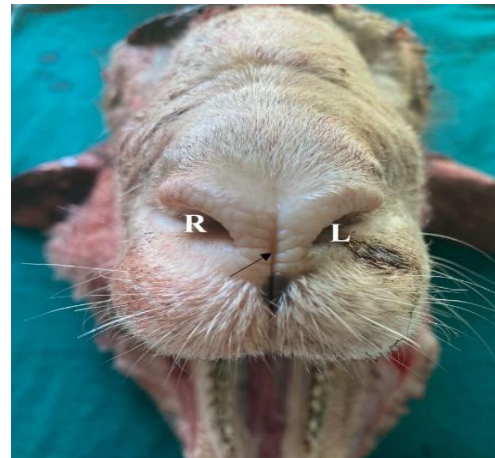

Fig. 1 Gross anatomy of upper lip of adult sheep showing philtrum (arrow), right (R) and left (L) nostril

Fig. 2 Gross anatomy of upper lip of young sheep showing labial projections (*). Towards philtrum, two rows of projections were seen

Fig. 3 Gross anatomy of lower lip of adult sheep showing labial projections (*). Caudally they merge with conical buccal papillae (B)

Fig. 4 Gross anatomy of upper lip of senile sheep showing philtrum (arrow) surrounded by projections, right (R) and left (L) nostril. Tactile hairs are also evident.
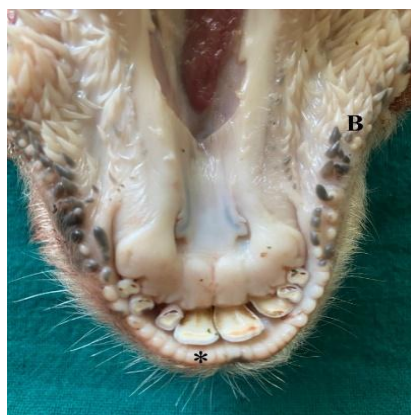
Fig. 5 Gross anatomy of lower lip of senile sheep showing labial projections (*). Caudally they merge with conical buccal papillae (B)

Table 1: Age related biometrical parameters of upper and lower lips of non-descript sheep of Jammu region

Parameter (cm)		Young	Adult	Senile
Length	Upper lip	14.76 ± 0.30^a	16.04 ± 0.38^b	18.10 ± 0.43^{cP}
	Lower lip	13.78 ± 0.24^a	14.71 ± 0.53^a	14.89 ± 0.24^{aQ}
Thickness	Upper lip at center	0.72 ± 0.07^a	0.79 ± 0.05^a	0.71 ± 0.05^a
	Upper lip towards oral angle	0.79 ± 0.01^a	0.83 ± 0.01^{ab}	0.93 ± 0.07^b
	Lower lip at center	0.60 ± 0.05^a	0.53 ± 0.02^a	0.55 ± 0.01^a
	Lower lip towards oral angle	0.72 ± 0.04^a	0.62 ± 0.05^a	0.67 ± 0.04^a
Length of philtrum		2.53 ± 0.12^a	2.52 ± 0.17^a	2.95 ± 0.14^a
Distance between oral angle & caudal commissure of right nostril		4.52 ± 0.18^a	4.73 ± 0.11^a	5.88 ± 0.14^b
Distance between oral angle & caudal commissure of left nostril		4.23 ± 0.07^a	4.67 ± 0.15^a	5.72 ± 0.25^b
Number of labial projections	Upper lip (up to dental pad)	26.33 ± 0.67^{aA}	24.67 ± 1.36^{aA}	27.50 ± 1.06^{aA}
	lower lip (Corner incisors)	31.33 ± 0.99^{aB}	33.67 ± 2.64^{abB}	37.17 ± 1.01^{bB}
	Around philtrum	29.67 ± 1.71^{aB}	31.17 ± 1.58^{aB}	30.83 ± 0.95^{aC}

Mean value with same superscript (a, b, c) within row do not differ significantly (p>0.05)
Mean value with same superscript [(P,Q), (A, B,C)] within column do not differ significantly (p>0.05)

(2020), in small ruminants, labial projections may aid in fodder selection by attaching leaves to pinch them off the plant, while labial conical papillae aid in directing food caudally into the oral cavity.

Biometry

The biometrical parameters of the upper and lower lips of non-descript sheep have been depicted in Table 1. The upper lip was longer than the lower lip in all three age groups, but only the senile group had a significant difference (p<0.05). Madkour and Mohammed (2020) reported similar findings in Rahmani sheep. Both lips increased in length with age, but the difference was significant (p<0.05) in the upper lip, which could be attributed to the fact that the upper lip is more movable than the lower lip.

In all age groups, the upper and lower lips were thicker along the oral angle than in the centre. Only the thickness of the upper lip towards the oral angle varied significantly (p<0.05). The pattern increased with age (0.79 ± 0.01 cm in young, 0.83 ± 0.01 cm in adult, and 0.93 ± 0.07 cm in senile). Madkour and Mohammed (2020) in Rahmani sheep also concluded that the upper and lower lips were thicker laterally.

The senile group had the longest philtrum (2.95 ± 0.14 cm), but this difference was statistically non-significant (p>0.05). In Rahmani sheep, the philtrum length was 29.68 ± 2.21 mm (Madkour and Mohammed 2020). The distance between the oral angle and the caudal commissure of the right and left nostrils increased with age. The senile group showed a significant difference (p<0.05) in regard to this parameter.

The number of labial projections in the upper lip was 26.33 ± 0.67 in young, 24.67 ± 1.36 in adults, and 27.50 ± 1.06 in the senile group. The number of lower lip labial projections were 31.33 ± 0.99 in young, 33.67 ± 2.64 in adults, and 37.17 ± 1.01 in the senile group. The number around the philtrum was 29.67 ± 1.71 in young, 31.17 ± 1.58 in adults, and 30.83 ± 0.95 in senile. Madkour and Mohammed (2020) found that Rahmani sheep had 31 ± 3 upper lip

projections, 36 ± 6 lower lip projections, and 33 ± 2 projections around the philtrum. The number of lower lip projections increased significantly with age (p<0.05). Lower lip projections were significantly higher than upper lip projections across all three age groups (p<0.05).

Conclusion

The present study provided comprehensive age-related information on gross anatomical features as well as biometrical measurements of the upper and lower lips of non-descript sheep of Jammu region which further adds to the literature. Projections on the lips may be critical for their mechanical adaptation to their roughages-based diet and feeding behaviour.

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