

Gross anatomical studies on the lips of non-descript goats of Jammu region-An age related study

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ABSTRACT

The present study was carried out to provide age-related information on gross anatomical features and biometrical measurements of the upper and lower lips of non-descript goats of Jammu region. Samples of healthy goats (young, adult, and senile), regardless of gender, were collected from the slaughter house located in and around Jammu city. 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 characterized by the presence of tactile hair along with ordinary hairs. The upper lip was divided by a vertical median philtrum surrounded by labial projections grouped on either side. Projections in upper lip were arranged in 3-4 rows. These projections were more rounded and smaller rostrally, became larger and arranged in single row caudally, finally merged with the conical buccal papillae. The free border of lower lip was thinner and presented single row of labial projections. The upper lip was longer than the lower lip in all the three age groups. In all age groups, the upper and lower lips were thicker along the oral angle than in the centre. The senile group had the longest philtrum but this difference was statistically non-significant ($p>0.05$). The number of lower lip projections were significantly greater in adult goats ($p<0.05$). Lower lip projections were higher than upper lip projections across all the three age groups.

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

INTRODUCTION

The union territory of Jammu and Kashmir is generally equipped with an environment and socio-cultural system that promotes small ruminant production. Goats are important livestock species in developing countries and sometimes referred to as "Poor Man's Cow" in India and 'wet nurse' of infants in Europe (Iqbal *et al.*, 2008). Goats are important because of their ability to convert forages, crops and household residues into meat, fibre, skin and milk. A number of large and small farmers rear goat for their livelihood (Singh *et al.*, 2006). On the basis of foraging behavior, ruminants can be classed as grazers, browsers, or intermediate grazers (Gordon, 2003). Goats generally prefer to browse (Mosavat and Chamani, 2013). The feeding habits of ruminants, (Hofmann and Stewart; 1972) can induce physical changes in their digestive systems.

Oral cavity is mainly concerned with food prehension, selection and mastication. Small ruminants (sheep and goats) use their lips and tongue to select plant parts that are easier to digest or contain more nutrients (Pugh, 2001). Small ruminants have

movable lips (labia oris), but large ruminants have less or immobile lips (König and Liebich, 2007). Thus, the lip is vital for food prehension and mastication (Seeley *et al.*, 2006). A better comprehension of ingestive behavior, 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 goats which prompted to undertake this study to gain a better understanding of the anatomical features of the lips of non-descript goats of Jammu region.

MATERIALS AND METHODS

Heads of freshly slaughtered goats were collected from local slaughter houses in and around Jammu city and immediately brought to the laboratory at Division of Veterinary Anatomy, F.V.Sc. & A.H., SKUAST-J, R.S. Pura. Goats 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 goats were collected. The temporomandibular joints of the heads were carefully dislocated for exposing upper (UL) and lower (LL) lips for morphological examination as per Madkour and Mohammed (2020). For morphometric analysis, different measurements (cm) of the lips were done

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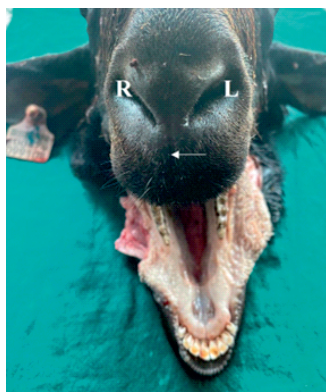


Fig 1. Gross anatomy of upper lip of senile goat showing philtrum (arrow), right (R) and left (L) nostril; **Fig 2.** Gross anatomy of upper lip of adult goat showing labial projections (*) arranged in 3-4 rows. Caudally, the projections were arranged in single row (arrow head); **Fig 3.** Gross anatomy of lower lip of young goat showing single row of labial projections (*). Caudally they merge with conical buccal papillae (B)

on fresh heads using scale, Vernier calliper and non-stretchable thread. The following biometrical parameters were recorded.

1. Length of upper and lower lip (Right oral commissure to left oral commissure)
2. Thickness of upper lip at center and towards the oral angle
3. Thickness of lower lip at center and towards the oral angle
4. Length of the philtrum
5. Distance 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 described by Madkour and Mohammed (2020) in Rahmani sheep and Mahdy *et al.*, (2020) in goat. According to Schummer *et al.* (1979), lips of domestic mammal aid in sucking and prehension of food, or they may also function as touch organs. Goats use their upper movable lip to pick plant sections with higher protein, energy, and mineral content (Sinn and Rudenberg, 2008). The lips of small ruminants are extremely movable, but those of ox have little movement. Similar observation was made by Dyce *et al.* (2010). Mahdy *et al.* (2020), Madkour and Mohammed (2020) and Farrag *et al.* (2021) reported that upper lip was more mobile and wider than the lower lip in goats, Rahmani sheep and Egyptian water buffalo, respectively.

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 tactile hairs along with ordinary hairs as also reported earlier by Mahdy *et al.* (2020) in goat. Tactile hairs were mainly located in rostral part of upper lip around the philtrum which decreased towards the oral commissure. Similar findings were reported by Madkour and Mohammed (2020) in Rahmani sheep and Farrag *et al.* (2021) in Egyptian water buffalo. Yildiz *et al.* (2004) in bovine found tactile hairs were primarily present on the lateral side of upper. 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 prehension in goat.

The upper lip was divided by a conspicuous median cleft known as philtrum (Fig. 1). Schummer *et al.* (1979) found philtrum in the upper lip of carnivores and small ruminants. 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. Mahdy *et al.* (2020) in goat reported that upper lip presented vertical hairless philtrum. Philtrum was surrounded by labial projections grouped on either side. Weaver (2020) reported that upper lip of sheep has a deep vertical groove which helps it nibble grass close to the ground. Goats are browsers rather than grazers and their upper lip is not deeply grooved. Goats are therefore able to use their lips and tongue to select and rip off choice plant parts, pick bits of hay from a pile, or even separate additives they don't like from the grain in their feed.

The free borders of both the upper (Fig. 2) and lower lips (Fig. 3) showed labial projections. Projections in upper lip were arranged in 3-4 rows and were closely related to each other. These projections were more rounded and smaller rostrally. More caudally, the projections were larger and arranged in single row. Caudal to the level of dental pad, these projections merged with the conical buccal papillae. Similar observations were made by Mahdy *et al.* (2020) in goat. These projections were more square-shaped in Rahmani sheep (Madkour and Mohammed, 2020) Schummer *et al.* (1979) made a similar observation in small ruminants. Free border of lower lip was thinner and presented single row of labial projections (Fig. 3) as earlier reported by Mahdy *et al.* (2020) in goats. Madkour and Mohammed (2020) found a single row on both the lips in Rahmani sheep, with a small second row on the lower lip. Mansour *et al.* (2007) found blunt short papillae in buffalo with small fissures between them. According to Mahdy *et al.* (2020), in goats, 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 goats have been described in Table 1. The upper lip was longer than the lower lip in all the three age groups. Mahdy *et al.* (2020) reported similar findings in goats, as did Madkour and Mohammed (2020) with Rahmani sheep. Both the lips increased in length with age and the lips of the senile group was found to be significantly long ($p < 0.05$).

In all age groups, the upper and lower lips were thicker along the oral angle than in the centre. Thickness of the both the lips towards the oral angle varied significantly ($p < 0.05$). The pattern increased with age. Madkour and Mohammed (2020) in Rahmani sheep and Mahdy *et al.* (2020) in goats also concluded that the upper and lower lips were thicker laterally.

The senile group had the longest philtrum (2.07 ± 0.16 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), while in goats, it was 17.70 ± 1.11 mm (Mahdy *et al.*, 2020). The distance between the oral angle and the caudal commissure of the right and left nostrils increased with age. The difference showed a significant difference ($p < 0.05$) in regard to this parameter.

The number of labial projections in the upper

Table 1: Biometrical measurements of upper and lower lips of non-descript goats of Jammu region

Parameter (cm)		Young	Adult	Senile
Length	Upper lip	14.11 ± 0.33^a	14.50 ± 0.58^a	16.73 ± 0.15^b
	Lower lip	11.90 ± 0.40^a	12.89 ± 0.35^b	13.46 ± 0.18^b
Thickness	Upper lip at center	0.42 ± 0.02^a	0.43 ± 0.02^a	0.45 ± 0.03^a
	Upper lip towards oral angle	0.55 ± 0.04^a	0.56 ± 0.04^a	0.69 ± 0.03^b
	Lower lip at center	0.51 ± 0.07^a	0.58 ± 0.05^a	0.68 ± 0.04^a
	Lower lip towards oral angle	0.74 ± 0.02^a	0.76 ± 0.02^a	0.85 ± 0.02^b
Length of philtrum		1.93 ± 0.10^a	1.95 ± 0.16^a	2.07 ± 0.16^a
Distance between oral angle & caudal commissure of right nostril		4.16 ± 0.06^a	4.93 ± 0.27^b	5.67 ± 0.12^c
Distance between oral angle & caudal commissure of left nostril		3.90 ± 0.09^a	4.80 ± 0.20^b	5.37 ± 0.19^c
Number of labial projections	Upper lip (up to dental pad)	27.00 ± 0.82^a	28.33 ± 1.54^a	29.50 ± 1.52^a
	lower lip (Corner incisors)	33.67 ± 0.88^a	38.17 ± 1.64^{ab}	36.67 ± 1.45^a
	Around philtrum	30.17 ± 1.49^a	30.67 ± 3.08^a	34.50 ± 4.18^a

lip was 27.00 ± 0.82 in young, 28.33 ± 1.54 in adults, and 29.50 ± 1.52 in the senile group. Similarly, the number of lower lip labial projections were 33.67 ± 0.88 in young, 38.17 ± 1.64 in adults, and 36.67 ± 1.45 in the senile group. The number around the philtrum was 30.17 ± 1.49 in young, 30.67 ± 3.08 in adults, and 34.50 ± 4.18 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 were significantly greater in adult goats ($p < 0.05$). Lower lip projections were higher than upper lip projections across all the three age groups.

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