

International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693

ISSN Online: 2617-4707

NAAS Rating (2026): 5.29

IJABR 2026; 10(6): 537-540

www.biochemjournal.com

Received: 03-03-2026

Accepted: 08-04-2026

Anjali

Veterinary Officer, Veterinary
Dispensary, Jambagi, Aurad
(Tq), Bidar, Karnataka, India

Ashok Pawar

Head of the Department,
Department of Veterinary
Anatomy, Veterinary College,
Bidar, Karnataka, India

Girish MH

Assistant Professor,
Department of Veterinary
Anatomy, Veterinary College,
Bengaluru, Karnataka, India

Biradar SM

Veterinary Officer, Veterinary
Dispensary, Wadgoan (D),
Aurad (Tq), Bidar, Karnataka,
India

Preeti

Assistant Professor,
Department of Veterinary
Clinical Complex, Veterinary
College, Bidar, Karnataka,
India

Comparative histological and histochemical study of thyroid cartilage in Deccani sheep and Bidri goat

Anjali, Ashok Pawar, Girish MH, Biradar SM and Preeti

DOI: <https://www.doi.org/10.33545/26174693.2026.v10.i6g.8676>

Abstract

The present comparative histology and histochemistry of thyroid cartilage was carried out to know the structural differences between thyroid cartilage of Deccani sheep and Bidri goat. The thyroid cartilage of Deccani sheep and Bidri goat consisted of lamina epithelia, lamina propria-submucosa, muscular layer, cartilaginous layer and tunica adventitia. The epithelium of thyroid cartilage in the both species was lined by pseudostratified columnar epithelium. The lamina propria-submucosa were continues and composed of loose connective tissues mainly consisted of elastic fibers, collagen fibers, reticular fibers, tubulo-acinar types of glands, fibroblast, fibrocytes, mast cells and macrophages. Plasma cells were more in number in the lamina propria-submucosa region of Deccani sheep compared to Bidri goat. The presence of diffuse lymphatic tissue beneath epithelium and large amount of fat cells were also noticed in lamina propria-submucosa. The submucosa consisted of tubulo-acinar type, sero-mucous glands in nature in both species. Serous secreting units were more compared to mucous secreting units. The lobules were separated from each other by loose connective tissue fibers consisted of elastic, collagen and reticular fibers. The muscular layer was observed between submucosa and cartilagenous layer consisted of skeletal muscle in both the species. The cartilage was of Hyaline type surrounded by perichondrium in both species. The perichondrium consisted of two layers chondrogenic layer made up of elliptical lacunae and the other consisting of collagen and elastic fibers. Tunica adventitia consisted of loose connective tissue with the presence of blood vessels were observed in both the species. Histochemical observation of both species all cells of the glands revealed moderate PAS positive reaction in Deccani sheep and weak PAS positive reaction in Bidri goat. Few cells and the cartilage showed Alcian Blue reaction at pH 2.5 in both the species.

Keywords: Thyroid cartilage, histology, histochemistry, Bidri Goat, Deccani Sheep

Introduction

Socioeconomic growth and national economy of the country has been significantly backed by small ruminants sector. Small ruminants contribute about 10% GDP in the total value of livestock sector. Sheep and goat are the important source of food (milk & meat) and main source of income for small and marginal farmers. The heavy mortality in the small ruminants especially in goats has been reported due to respiratory tract disease. The larynx is a conducting part of respiratory system which protects the lower respiratory passage against inundation. Thyroid cartilage being one of the important cartilage and unpaired one. The predominant breeds of sheep and goat in Bidar district are Deccani sheep and Bidri goat respectively and limited scientific work has been carried out, hence the present study was undertaken to study and to correlate any histological and histochemical variations in the thyroid cartilage of Deccani sheep and Bidri goat.

Materials and methods

The materials for the study were collected from Six Deccani sheep and Six Bidri goat immediately after slaughter from local slaughter house. The collected thyroid cartilage samples were washed in normal saline and fixed in different fixatives like 10% Neutral buffered formalin, Zenker's fluid and Bouin's fluid. The samples were processed in isopropyl alcohol- xylene sequence and embedded in paraffin by routine method (Luna, 1968) [9]. Sections were cut at 5-6µm thickness and were utilized for histomorphological and histochemical studies. The thyroid cartilage tissue fixed in Neutral buffered formalin were

Corresponding Author:**Anjali**

Veterinary Officer, Veterinary
Dispensary, Jambagi, Aurad
(Tq), Bidar, Karnataka, India

pre-frozen for 1-2 hrs and embedded in freezing media; using cryostat 6-7 μ m thickness sections were cut and utilised for lipid studies. The histomorphological study of thyroid cartilage was carried out by Ehrlich's Haematoxylin and Eosin stain (Luna, 1968) [9], Van Geison's stain for collagen fibers (Bancroft *et al.*, 2008) [3], Gomori's method for reticular fibers (Luna, 1968) [9], Verhoeff's method for elastic fibers (Bancroft *et al.*, 2008) [3] and Toluidine blue method for mast cells (Singh and Sulochana, 1996) [10] whereas histochemical study was carried out using PAS technique for mucopolysaccharides (Bancroft, *et al.*, 2008) [3], Alcian blue pH 2.5 for sulphated sulfomucins and sialomucins (Bancroft *et al.*, 2008) [3] and Oil red O for lipids (Luna, 1968) [9].

Results & discussion

Histomorphology The thyroid cartilage in Deccani sheep and Bidri goat showed lamina epithelia, lamina propria-submucosa, muscular layer, cartilaginous layer and tunica adventitia (Eurell and Frappier, 2006 and Alsadi 2006) [1, 6] (Fig.1, Fig 2 and Fig.8). The thyroid cartilage of Deccani sheep and Bidri goat was lined by pseudostratified columnar epithelium (Eurell and Frappier, 2006 Alsadi, 2006 and Arup, 2014) [1, 2, 6] (Fig.1, Fig 8). However, it differ with earlier report in goat (Kahwa and Purton, 1996) [7], in buffaloes, camels and donkeys (Eshra *et al.*, 2016) [5] where it is lined by pseudostratified ciliated columnar epithelium and in Bactrian Camel pseudostratified ciliated columnar epithelium with numerous goblets and basal cells (Chunhui *et al.*, 2009) [4]. This may be due to change in climatic condition or variation in breed and species.

The lamina propria-submucosa were continues and composed of loose connective tissue containing elastic fibers, collagen fibers, reticular fibers. Fibroblast, fibrocyte, mast cells, macrophages and more number of plasma cells were also observed (Fig.3, Fig 4 and Fig.5). Large amount of fat cells were also noticed in this region (Trautmann and Fiebiger, 2002 Eurell and Frappier, 2006 Chunhui *et al.*, 2009 and Eshra *et al.*, 2016) [4, 5, 6, 12] (Fig.1, Fig 7). The presence of large number of plasma cells and diffuse lymphatic aggregation below the epithelium indicates the role in immune response against the infection and also play role in defense mechanism (Fig.1, Fig 6 and Fig 8). The glands were sero-mucous in nature. The lobules were separated from each other by loose connective tissue fibers consisted of more collagen fibers, few elastic and reticular fibers (Fig.3, Fig 4). Serosal secretory cells were more compared to mucous secretory cells. The sero-mucous glands help in secretion of the watery and mucous fluids that moistens the surface epithelium and the air (Alsadi, 2006 and Sinha *et al.*, 2012) [1, 11] (Fig.1). However, it differed with the earlier report in camels where serous glands were observed (Eshra *et al.*, 2016) may be due to species variation. In Deccani sheep and Bidri goat the acini and tubules of serous secreting units were lined by pyramidal to columnar shaped cells containing oval to spherical shaped basal nuclei with indistinct cell boundaries. The mucous acini and tubules were lined by pyramidal shaped cells with basally placed flattened nuclei with indistinct cell boundaries. The acini consisted of small round lumen whereas, the tubular portion contained long narrow lumen. The myoepithelial cell at the base of secretory unit was noticed which indicates its role in contraction and release of secretory product in the duct system. (Eurell and Frappier,

2006) [6] (Fig.1, Fig 6 and Fig.8). The muscular layer was observed below the submucosa which consisted of skeletal muscle in thyroid cartilage of Deccani sheep and Bidri goat (Trautmann and Fiebiger, 2002 and Alsadi, 2006) [1, 12] (Fig 2). The thyroid cartilage in Deccani sheep and Bidri goat was hyaline in nature surrounded by perichondrium (Fig.1, Fig 2). The chondrocytes were present in the lacunae, these lacunae were elliptical towards the perichondrium and pyramidal shaped in the deeper part of the cartilage. The chondrocytes were separated by interterritorial matrix; some lacunae were present as groups (cell nests). The perichondrium consisted of two layers chondrogenic layer made up of elliptical lacunae and the other consisting of collagen and elastic fibers. Tunica adventitia consisted of loose connective tissue with the presence of blood vessels were also observed (Trautmann and Fiebiger, 2002 Eurell and Frappier, 2006 Alsadi, 2006 Konig and Liebich, 2009 Chunhui *et al.*, 2009 Sinha *et al.*, 2012 Arup, 2014 and Eshra *et al.*, 2016) [1, 2, 4, 5, 6, 11, 12] (Fig.2, Fig 5 and Fig.10).

Histochemistry. The glands of thyroid cartilage in Deccani sheep showed moderate PAS positive reaction whereas in Bidri goat all cells of the glands showed weak PAS positive reaction indicating presence of mucopolysaccharides and variation in the secretory nature of the glands (Fig.9). Few cells of the gland and the cartilage showed strong reaction for Alcian Blue at pH 2.5 in the present study indicating presence of sulfated sialomucins and sulfomucins in the gland and the ground substance of cartilage (Kahwa and Purton, 1996 and Sinha *et al.*, 2012) [7, 11] (Fig.7).

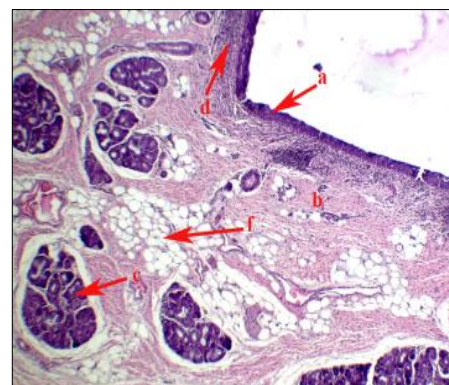


Fig 1: Photomicrograph of thyroid cartilage of Deccani sheep showing lamina epithelia (a), lamina propria-submucosa (b), seromucous glands (c), lymphatic aggregation (d) and fat cell (F). H&E stain X 4

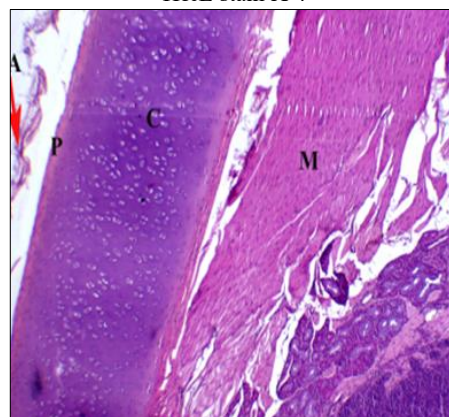


Fig 2: Photomicrograph of thyroid cartilage of Deccani sheep showing muscular layer (M), cartilage (C), perichondrium (P) and tunica adventitia (TA). H&E stain X 10

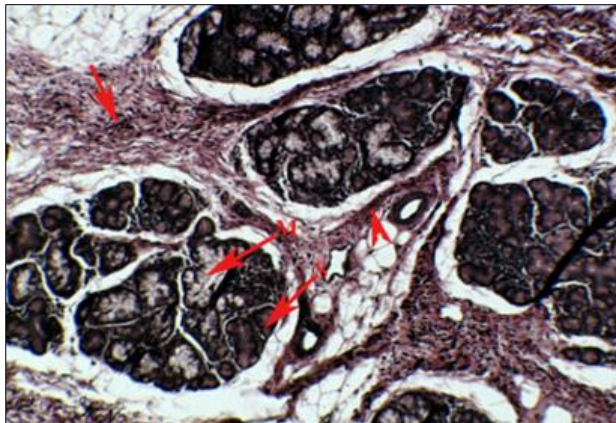


Fig 3: Photomicrograph of thyroid cartilage of Deccani sheep showing serous (S), mucous (M) secretory unit and elastic fibers in the lamina propria (arrow) and surrounding the glands (arrowhead). Verhoeff's stain X 10

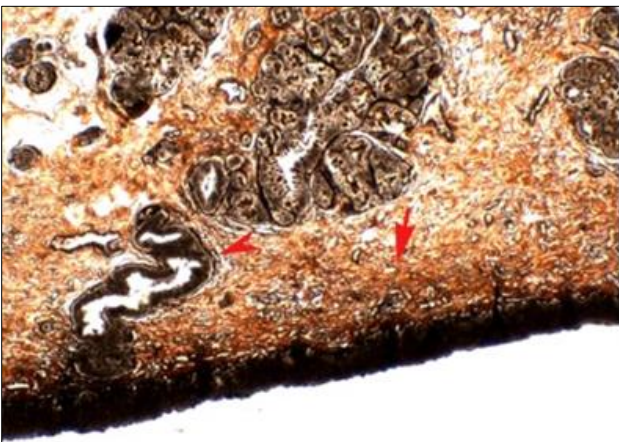


Fig 4: Photomicrograph of thyroid cartilage of Deccani sheep showing reticular fibers separating the lobules (arrowhead) in the lamina propria (arrow). Gomori's stain X 10

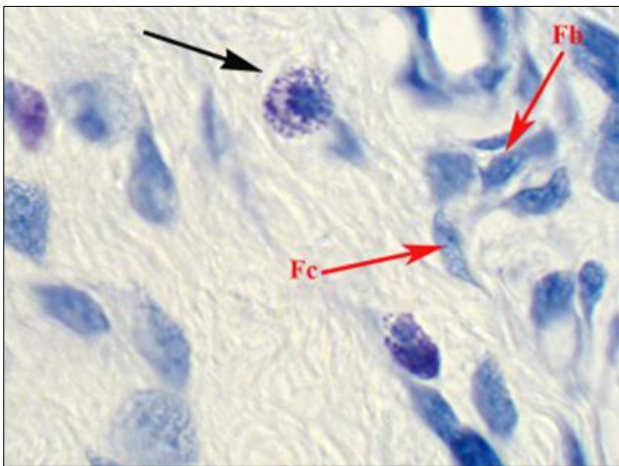


Fig 5: Photomicrograph of thyroid cartilage of Deccani sheep showing mast cell (arrow), fibrocyte (Fc) and fibroblast (Fb) in the lamina propria. Toluidine blue stain X 100

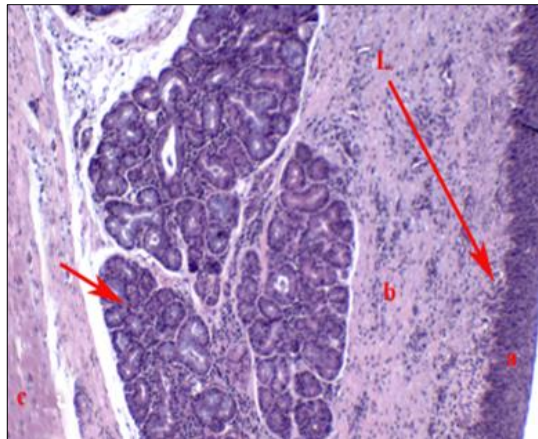


Fig 6: Photomicrograph of thyroid cartilage of Bidri goat showing lamina epithelia (a), lamina propria-submucosa (b), muscular layer (c), lymphatic aggregation (L) and seromucous gland (arrow). Szc H&E stain X 4

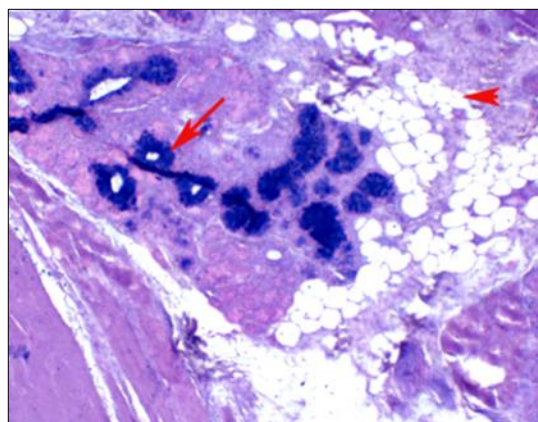


Fig 7: Photomicrograph of thyroid cartilage of Bidri goat showing fat cell (arrowhead) and strong positive reaction for Alcian blue in few secretory units (arrow). Alcian blue at pH 2.5 X 4

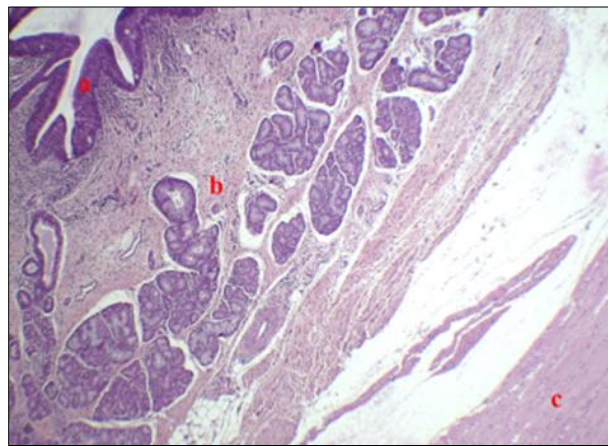


Fig 8: Photomicrograph of thyroid cartilage of Bidri goat showing lamina epithelia (a), lamina propria-submucosa (b), muscular layer (c), lymphatic aggregation (L) and seromucous gland (arrow). H&E stain X 4

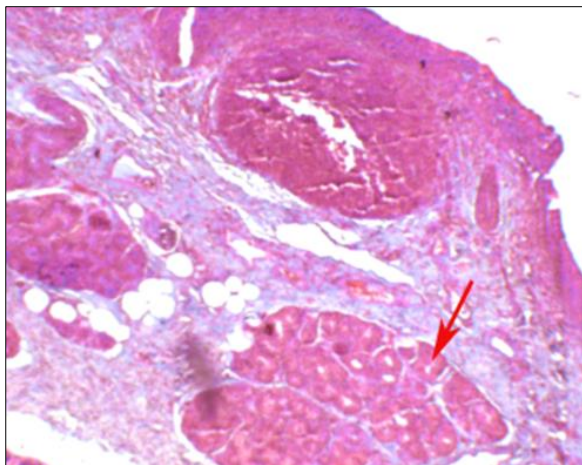


Fig 9: Photomicrograph of thyroid cartilage of Bidri goat showing weak PAS positive reaction in a secretory unit (arrow).
PAS stain X 4

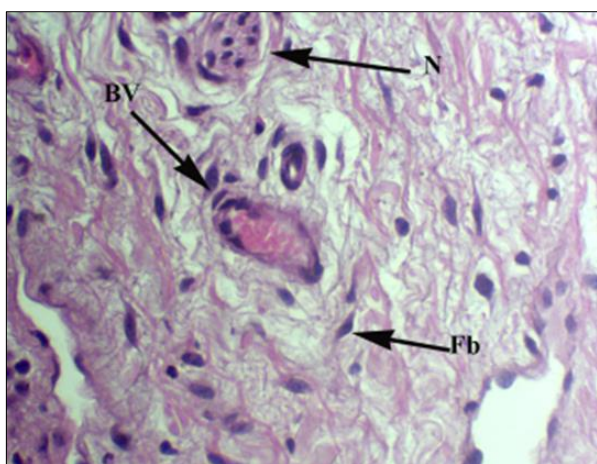


Fig 10: Photomicrograph of thyroid cartilage of Deccani sheep showing fibroblast (Fb), blood vessel (BV), nerve fiber (N) in the lamina propria

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