

Comparative histomorphometric studies on spleen in adult sheep (*Ovis aries*) and goat (*Capra hircus*)

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Received : 30.01.2026; Accepted: 30.04.2026

ABSTRACT

The study was conducted on the histology and micrometry of the spleen of six adult sheep and goat in Western Maharashtra region. The samples were collected from the slaughter houses near by the Shirwal village. The spleen of sheep was triangular, whereas, in goat it was roughly quadrangular in shape. Histological study revealed that the red and white pulps were enclosed by thick capsule and was subdivided by trabaculae. The splenic capsule was composed of collagen, elastic and smooth muscle fibers. The red pulp was consisted of sinuses and splenic cord, which contain reticular fibers, cells, macrophages, erythrocytes, lymphocytes and plasma cells. The white pulp was consisted of lymphatic nodules and diffused lymphatic tissues. The thickness of trabaculae was significantly higher in goat ($217 \pm 09.06 \mu$) as compared with that of sheep ($118.83 \pm 05.05 \mu$). The number of white pulp per mm^2 was slightly higher in goat (01.83 ± 00.30) as compared with sheep (01.33 ± 00.21). The thickness of capsule in sheep and goat was $260 \pm 09.76 \mu\text{m}$ and $137 \pm 09.72 \mu\text{m}$, respectively. The diameter of white pulp in sheep and goat was $335.16 \pm 22.37 \mu\text{m}$ and $307 \pm 12.29 \mu\text{m}$, respectively. The level of significance was 5%.

Key words: Histology, Micrometry, Spleen, Sheep, Goat

INTRODUCTION

In India, small ruminants like sheep and goat plays very important role in the food and nutritional security of landless, marginal and small farmers in all agro climatic zones. The small ruminants are important source of meat, milk, wool and manure. It is well known that the lymphoid tissue plays an important role in the defense mechanism against the micro- organism (Suri *et al.*, 2017). Spleen involved in filtration of blood and preserves iron for hemoglobin synthesis (Samuelson, 2007). These important functions were carried out by the peculiar stroma and parenchyma components of spleen (Onkar and Govardhan, 2013). It is soft, highly vascular and bright red to dark purple in color. The spleen has a reticular framework suspended with in a collagenous framework consisting of a capsule thickened at hilus. The lymphatic vessels are present only in the capsule and larger trabaculae and they drain into adjacent

nodes (Gardner *et al.*, 1969). Relative scant literature on comparative gross, histological and micrometrical features of spleen of sheep and goat prompted the present study.

MATERIAL AND METHODS

The present study was conducted on spleen of healthy six adult sheep and goat of either sex. The fresh tissue samples of spleen were collected from local slaughter house. For histological study, spleen tissues were fixed in 10 % neutral buffer formalin and processed by using Alcohol – xylene method, obtained paraffin sections and stained with hematoxyline and eosin stain (Luna, 1968). The comparative histological micrometrical observations were recorded under light microscope using micrometer software. The measurements viz., spleen capsule thickness (μm), average diameter of white pulp (μm), number of white pulp per mm^2 maximum thickness of trabaculae (μm) were recorded. The data generated were statistically analyzed by one way ANOVA method (Snedecor and Cochran, 1994).

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RESULT AND DISCUSSION

Histological study revealed that the spleen of sheep and goat was similar in architecture and consisted of red and white pulps was enclosed by thick capsule. The splenic parenchyma from the capsule was subdivided by trabeculae. The thickness of spleen capsule varied among the sheep and goat (Figure 1, 2, 3 and 4). The thickness of capsule was higher in goat ($260.66 \pm 09.76 \mu$) as compared to that of sheep ($137.33 \pm 09.72 \mu$). Similar findings were recorded by Khalel (2010) in sheep and Alim *et al.*, (2012) in goat was ($251.44 \pm 12.56 \mu$). The inner zone of the capsule consisted of parenchyma in the form of bands. The parenchyma in sheep and goat was observed similar type. The splenic capsule was composed of dense irregular connective tissue and smooth muscle fibers. The trabeculae has smooth muscle fibers, collagen fibers, elastic fibers, blood vessels, lymphatics and nerve endings. The trabeculae were extended from capsule in the parenchyma (Figure 1, 2, 3 and 4). Similar findings were recorded by Trautman and Fibiger (1957) in domestic animals.

The thickness of trabeculae was significantly higher in goat ($217.00 \pm 09.06 \mu$) as compared with sheep ($118.83 \pm 05.05 \mu$). However, Suri *et al.*, (2017) reported that the thickness of trabeculae in goat was $224.67 \pm 20.19 \mu$ was significantly higher than in sheep $104.35 \pm 08.92 \mu$.

The parenchyma was consisted of red and white pulp. Red pulp consisted venous sinuses and

splenic cords. The splenic cord located between the sinuses and form a three dimensional network. It contained the reticular fibers, reticular cells, erythrocytes, macrophages, lymphocytes, plasma cells and other leucocytes. These observations were in agreement with Trautman and Fibiger (1957) in goat.

White pulp of spleen was composed of lymphatic nodule and diffused lymphatic tissue that appears like peri-arterial lymphatic sheath. Similar observations were reported by Devi *et al.* (2016) in Marwari goat. The lymphatic nodule were consisted of B lymphocytes and germinal centres. The diffused lymphatic tissue was organized along the arteries of white pulp. The similar observations were recorded by Khalel (2010) in sheep. The average diameter of white pulp was higher in goat ($355.16 \pm 22.37 \mu$) as compared with that of sheep ($307.00 \pm 12.29 \mu$). Similar finding was recorded by Gnanadevi *et al.* (2019) in spleen of sheep and goat. However, Suri *et al.* (2017) reported that the white pulp diameter was $501.00 \pm 32.81 \mu$ in goat and $456.00 \pm 14.31 \mu$ in sheep. This difference in diameter value of white pulp was might be due to climate, nutrition and breed variation.

The number of white pulp was slightly higher in goat (01.83 ± 00.30 per mm^2) than in sheep ($01.33 \pm 00.21 \text{mm}^2$). The similar observation was recorded by Trautman and Fibiger (1957) in goat. Whereas Gnanadevi *et al.* (2019) recorded that the number of white pulp in goat was $02.40 \pm 00.26 \text{mm}^2$ and in sheep $01.96 \pm 00.2 \text{mm}^2$, respectively.

Table – 1 Micrometrical Observations of Spleen in Sheep and Goat

S. No.	Parameters	Mean $\pm$ S.E. Sheep	Mean $\pm$ S.E. Goat	Significant Level
1.	Thickness of capsule (μ)	137.33 ± 9.72	260.66 ± 9.76	5% and 1%
2.	Diameter of white pulp (μ)	307 ± 12.29	355.16 ± 22.37	5% and 1%
3.	Maximum thickness of trabeculae (μ)	118.83 ± 5.05	217 ± 9.06	5% and 1%
4.	Number of white pulps per mm^2	1.33 ± 0.21	1.83 ± 0.30	Non - significant

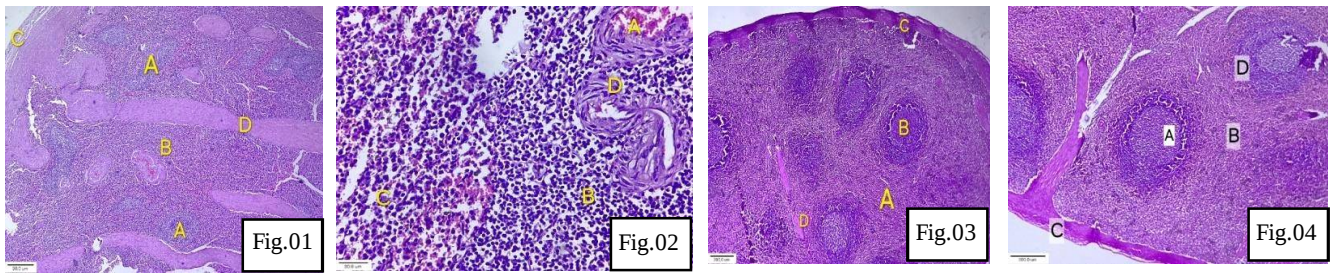


Fig.1 Microphotograph spleen of goat (H&E - 10 X) A. white pulp B. Red pulp C. capsule D. Sinus, **Fig.2** Microphotograph spleen of goat (H&E - 40 X) A. blood cells B. white pulp C. red pulp D. Sinus, **Fig.3** Microphotograph spleen of sheep (H&E- 10 X) A. red pulp B. white pulp C. capsule D. Sinus, **Fig.4** Microphotograph spleen of sheep (H&E - 10 X) A. white pulp B. Red pulp C. capsule D. marginal zone

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