Himachal Journal of Agricultural Research 37 (1):81-84, 2011

Biometrical studies on the intestine and adjoining lymph nodes of *Gaddi* sheep

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Manuscript Received: 03.07.2010; Accepted: 21.10.2010

Abstract

The intestine of *Gaddi* sheep began at the pyloric end of the stomach and terminated at the anus. The jejunum was significantly longest and widest segment of small intestine. The colon and caecum were the longest and widest part of the large intestine respectively. The large intestine was significantly shorter in length as compared to small intestine. In the spiral loop of colon 3 to 3 ½ centripetal and centrifugal turns were present in *Gaddi* sheep. The last centrifugal gyrus was more closely related to the jejunum than to the rest of the colon. The mesenteric lymph nodes were present most commonly in the mesentery along the jejunum and spiral colon. Some lymph nodes present in the mesentery between the coil of jejunum and last centrifugal gyrus of the spiral colon and were narrow and very long, up to 15.40 cm.

Key words: Gross morphology, biometry, intestines, lymph nodes, *Gaddi*, sheep.

Introduction

The gross morphology of the intestine has been described in sheep (May, 1970; Habel, 1975; Schummer and Nickel, 1979), goat (Habel, 1975; Schummer and Nickel, 1979). The present research reports biometrical studies on the intestine and adjoining lymph nodes of *Gaddi* sheep.

Materials and Methods

The intestines from 30 apparently healthy *Gaddi* sheep were collected from the slaughter houses in and around Palampur for the purpose of study. Whole of the specimen was washed under running tap water. The intestines were examined grossly. Necessary dissections were conducted when and wherever required. The length of the ileocaecal ligament along the ileum and caecum, and its maximum breadth were measured separately. The lymph nodes were located along the intestines and were grouped into small, medium and large depending upon their size. The length, breadth and thickness of individual lymph nodes were recorded with the help of vernier calipers.

Small and large intestinal segments were identified and the messentry and other attachments were removed. The length of duodenum, jejunum, ileum, caecum, colon and rectum was measured using a thread and measuring tape. In the colon, proximal loop, spiral loop (centripetal and centrifugal gyri), transverse colon and descending colon were measured separately. The outer diameter was taken from the initial, middle and caudal region of all the above mentioned segments of the intestine using vernier calipers.

Results and Discussion

The intestine of *Gaddi* sheep began at the pylorus of the stomach and terminated at the anus. The external surface of intestine was highly vascular and appeared reddish brown in color. The small intestine was subdivided into duodenum, jejunum and ileum. The jejunum was by far the longest of the

three segments of the small intestine. The large intestine consisted of the caecum, the colon and the rectum. The anal canal was the short end portion of the digestive tract. The total length of intestine of *Gaddi* sheep was 1730.72 ± 23.60 cms which is slightly smaller than the 2200 to 4300 cm long intestine described by Schummer and Nickel (1979) in sheep and goat. The small intestine has an average length of 1270.37 ± 17.98 cm in *Gaddi* sheep which is shorter than the 2500 cm long small intestine described by Habel (1975) and 1800 to 3500 cm by May (1970) in sheep and goat. The average outer diameter of small intestine was 1.44 ± 0.03 cm however May (1970) has observed the diameter of 2.5 cm and Habel (1975) 2 to 3 cm. The large intestine was very short in length as compare to the small intestine having average length of 460.35 ± 9.01 cm which is in confirmation of the findings of Schummer and Nickel (1979) who described 400 to 800 cm long large intestine in sheep and goat. The average outer diameter of 2.31 ± 0.05 cm was significantly larger than that of the small intestine.

In the small intestine the duodenum was a short and curved portion extending from the pylorus to the duodeno-jejunal junction. The length of duodenum was 67.43 ± 1.48 cm which is in confirmation with Schummer and Nickel (1979) who have described 60 to 120 cm long duodenum of sheep and goat; but smaller 100 cm long duodenum reported by Habel (1975) in ruminants. The jejunum was the longest and highly coiled mesenteric part of the small intestine. Habel (1975) and Schummer and Nickel (1979) have also described the jejunum as the longest part of the small intestine. The average length of jejunum and ileum was 1180.10 ± 16.95 cm and 22.83 ± 1.27 cm respectively which is smaller then the 1750 to 3400 cm long jejunum and ileum reported by Schummer and Nickel (1979) in sheep and goat. Although grossly, there was no demarcation between the jejunum and ileum but the last portion of the small intestine to which the ileocaecal ligament attached was considered as ileum. The average outer diameter of jejunum (1.70 ± 0.05 cm) was significantly larger than that of ileum (1.41 ± 0.04 cm) which in turn was significantly larger that that of duodenum (1.19 ± 0.02 cm).

The large intestine had no longitudinal bands or sacculations. With the exception of the free end of the caecum, large intestine lied in the supraomental recess with the small intestine. The large intestine was further divisible into caecum, colon and rectum. The caecum had an average length of 31.22 ± 1.22 cm which confirms the findings of Habel (1975) and Schummer and Nickel (1979) who have described 30 cm and 25 to 42 cm long caecum respectively in sheep and goat. The caecum was the widest part of the whole intestine with a maximum average diameter of 4.91 ± 0.11 cm which was lesser as compare to 8.0 cm reported by Habel (1975) in sheep and goat. At the junction of ileum with the large intestine, the caecum was directly continuous cranially with the colon. Dorsally it was attached to the part of colon by a short caecocolic fold. Ventrally caecum was attached to the ileum by ileocaecal fold as described earlier by Schummer and Nickel (1979). The length of the ileocaecal fold was 22.83 ± 1.27 cm and 19.93 ± 0.71 cm along ileum and caecum respectively. The maximum breadth of ileocaecal fold was 10.81 ± 0.41 cm between ileum and caecum at its free margin. The colon had proximal colon.

spiral colon (centripetal colon, central flexure and centrifugal colon), distal loop, transverse colon and descending colon (Table 1) as described by Habel (1975). The spiral loop of colon was hemispherical in shape in *Gaddi* sheep as reported by Habel (1975) in sheep. The average outer diameter of the colon varied greatly at different points. At its origin it was 5.5 cm in diameter, similar to that of caecum. This was reduced up to 0.8 cm at certain points along its length. Habel (1975) has described that the diameter of colon was at first the same as that of the caecum, diminished in the course of the proximal loop from 8 to 2 cm in sheep and goat. The proximal loop of colon began as the direct continuation of the caecum at the ileocaecal orifice. In the spiral loop there were three and a half each centripetal and centrifugal turns. At the junction of centripetal and centrifugal coils central flexure was present. The last centrifugal gyrus was closely related to the jejunum than the rest of the colon. The average outer diameter of proximal colon varied significantly from rest of the segments of the colon (Table 1). The rectum was smallest segment of the large intestine 10.67 ± 0.57 cm length.

The average outer diameter of caecum (4.91 ± 0.11 cm) was significantly greater than that of rectum (2.91 ± 0.03 cm), which in turn was significantly greater than that the colon (1.98 ± 0.05 cm).

The mesenteric lymph nodes were present throughout along the small intestine; but their most common occurrence was in the mesentery along the jejunum and spiral colon in *Gaddi* sheep. The lymph nodes were encountered rarely in the mesentery along descending colon and rectum and were very small whenever present. May (1970) has described that the small duodenal lymph nodes being located in the cranial part of the mesoduodenum whereas, jejunoileal lymph nodes were present in the mesentery attached to the jejunum and the ileum.

In the mesentery along the jejunum small, medium and large sized lymph nodes were encountered. The large lymph nodes were present in the mesentery between coil of jejunum and last centrifugal gyrus of the spiral colon, which were narrow and long. They were found up to 15.40 cm long. Saar and Getty (1975) have also observed two to three long and narrow jejunal lymph nodes

Table 1. Mean biometrical observations (cm) on different segments of colon of *Gaddi* sheep

Region of colon	Length	Outer Diameter
Proximal loop	33.45 ± 1.06 (24-45)	3.47^{b} ± 0.10 (1.8-5.5)
Spiral loop	284.08 ± 4.60 (243-337)	1.71^{a} ± 0.06 (0.8-3.5)
Centripital gyri	95.85 ± 1.76 (80-115)	1.69^{a} ± 0.08 (0.8-3.5)
Centrifugal gyri	188.23 ± 3.22 (154-222)	1.73^{a} ± 0.08 (0.8-3.0)
Transverse colon	17.70 ± 0.75 (11-26)	1.54^{a} ± 0.03 (1.0-2.0)
Descending colon	83.23 ± 2.46 (58-110)	1.46^{a} ± 0.02 (1.0-1.9)

Values in parentheses are range

Values having different superscripts in column of outer diameter vary significantly ($P < 0.001$)

which may reach 8 to 10 cm in length and 1 to 2 cm in width in sheep (Table 2). May (1970) has also described jejunoileal lymph nodes of about 8 to 10 cm in length in sheep. In the mesentery along the spiral part of colon few small lymph nodes were found as reported by Saar and Getty (1975). Saar and Getty (1975) have reported two to three caecal lymph nodes were present in ileocaecal ligament in sheep; however in the present study, none was found.

Table 2. Mean biometrical observations (cm) on lymph nodes present along the intestine of *Gaddi* sheep

Region	Type of Lymph node	Length	Breadth	Thickness
Along spiral colon	Small	1.42 ± 0.10	1.10 ± 0.05	0.92 ± 0.04
		(0.7-2.5)	(0.7-1.7)	(0.6-1.3)
Along Jejunum	Small	1.74 ± 0.11	1.23 ± 0.06	0.93 ± 0.04
		(1.0-2.9)	(0.8-1.9)	(0.6-1.2)
	Medium	4.50 ± 0.36	1.47 ± 0.10	1.10 ± 0.06
		(3.3-6.5)	(1.0-1.9)	(0.8-1.4)
	Large	12.36 ± 0.69	1.20 ± 0.07	0.81 ± 0.03
		(8.9-15.4)	(0.8-1.6)	(0.81-0.03)

Values in parentheses are range

References

Habel RE 1975. Ruminant digestive system. In Sisson and Grossman's *The Anatomy of the Domestic Animals*. Getty, R. 5th ed. Vol. I. W. B. Saunders Company, Philadelphia, pp 861-915.

May NDS 1970. *The Anatomy of the Sheep, a dissection manual*. 3rd ed. University of Queensland Press, Saint Lucia, Queensland, Australia pp. 67-101, 336.

Saar LJ and Getty R 1975. Ruminant lymphatic system. In Sisson and Grossman's *The Anatomy of the Domestic Animals*. Getty, R. 5th ed. Vol. I. W. B. Saunders Company, Philadelphia, pp 1024-64.

Schummer A and Nickel R 1979. *The Viscera of Domestic Mammals*. 2nd revised ed. Verlag Paul Parey, Berlin, pp 107-13.