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# Concurrent Infection of *Oesophagostomum* species in a Slaughtered Goat: A Case Report

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

The morbidity and mortality of gastrointestinal nematodes in goats made them one of the most significant parasites in the world, causing huge economic loss for farmers. It has been reported that the economic loss due to gastrointestinal parasitism was Rs. 372.35 per goat annually. In the

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present study, the intestinal sample was collected from a local slaughter house at Izatnagar, Bareilly, Uttar Pradesh, for screening the gastrointestinal nematodes. Initially, the pathological lesions like nodules, cyst and haemorrhagic patches etc. were examined for any parasitic infection. The found worms in the intestinal content were subjected for microscopic examination for the identification of the nematode and identified them as *Oesophagostomum* spp. based on buccal capsule with cephalic and cervical structures. Interestingly, both *Oesophagostomum columbianum* and *O. asperum* species were found in the same sample. The male and female *Oesophagostomum* species were also differentiated by examining the spicule and gubernacular length, position of the vulva and anus. This study reports the infection of *Oesophagostomum* spp. in a goat and the first case report of concurrent infection of *O. columbianum* and *O. asperum* in the Bareilly region of Uttar Pradesh.

*Keywords: Pimply gut; Oesophagostomum; faecal examination; spicule.*

## 1. INTRODUCTION

Gastrointestinal nematode infection (GIN) is one of the major threat in small ruminant farming causing significant loss of production and economic importance. The morbidity and mortality of gastrointestinal nematodes make them one of the most significant parasites in the world, causing considerable economic losses for animal owners. According to Rajpoot et al. [1] and Das et al. [2], the economic loss resulting from GI parasitism in goats was Rs. 372.35 per goat annually.

Goats and sheep have been documented to be infected globally by more than 150 kinds of internal and external parasites. One of the most prevalent and widely dispersed nematodes of livestock and wild ruminants is the *Oesophagostomum*, often known as the nodular worm. It is a nematode of the large intestine that belongs to the *Chabertiidae* family [3,4]. The predominant species include *Oesophagostomum columbianum*. *O. asperum*, *O. venulosum*, and *O. kansuensis*. Animals typically acquire the disease from contaminated food, water, or soil. Most of the cases are reported in tropical climates, while there are also reports frequently in subtropical places [3,5].

*Oesophagostomum columbianum* mature worms live in the mucosa of the host's digestive tract and feed on blood, causing hypoproteinemia, oedema, weight loss, pernicious anemia, and even death. When larvae penetrate the intestinal mucosa, it can result in severe diarrhoea and dark, green stools that are filled with mucus and blood. Furthermore, it has been suggested that these worm's larval stage is the main cause of nodular enteritis, also known as knotty gut or pimply gut. These lesions can vary in size from small, gritty nodules with a diameter of 2-3 mm to pea-sized cysts [6]. Such lesions can cause partial or complete intestinal condemnation. Economic losses are due to weight loss, decreased production, medication and mortality in severe cases [7,8,9].

Rarely the *Oesophagostomum asperum* or *O. indicum* from goats in India have been reported [10, 11]. In the study of parasitic epidemiology and its management, the species identification of parasite is crucial [12].

## 2. MATERIALS AND METHODS

The complete large intestine (includes caecum, colon and rectum) of the male goat aged 4 yrs was collected from local slaughter house at Izzatnagar, Bareilly, Uttar Pradesh in the month of December 2023. The collected intestine was screened for intestinal nematodes. The outer surface of the large intestine was examined for pathological lesions like nodules, cyst and haemorrhagic patches related to any parasitic infection.

The intestine was cut open by using a clean sterile scissors to collect the gut contents. The collected contents of caecum and colon were mixed with distilled water and strained using a sieve of particular pore size. The process was repeated several times to collect the intestinal nematodes. A total of around 50 worms were collected from gut contents and washed with distilled water and phosphate buffered saline (PBS). Finally kept the worms in lactophenol solution overnight at 4$^{o}$C for clearing and morphologically identified by microscopic examination at 10X magnification. The worm characteristics like, buccal capsule with cephalic and cervical structures were examined for

species identification, and, the spicule length, gubernaculum, position of the vulva and anus were also studied for sex identification.

## 3. RESULTS

The large intestine sample was noticed with knotty pathological lesions in the outer surface suggestive of nodules in the lumen, The large intestine found with numerous, hard and pale-yellow nodules of variable size on the surface (Fig. 1).

Around 40-50 worms were collected in the straining process and kept in phosphate buffered saline (PBS) until observation (Fig. 2). The microscopic examination for morphological identification of the worms showed the characteristic features of *Oesophagostomum* Spp. Based on examination of the worm characteristics like, buccal capsule with cephalic and cervical structures, spicule, gubernacular length, and position of the vulva and anus, the worms were found to be *Oesophagostomum columbianum* and *O. asperum*.

The *O. columbianum* was confirmed by large cervical alae and the anterior extremities of cervical alae pierced by cervical papillae (Fig. 3a). The male bursa was well developed and there were two equal alate spicules (Fig. 3b). The female tail tapers to a fine point and the vulva were situated anterior to anus (Fig. 3c).

The *O. asperum* was identified by inflated cephalic vesicle, absence of lateral alae and cervical papillae (Fig. 4a). In males, spicules were unequal and comparatively longer than *O. columbianum* (Fig.4b). In female worms, the anus and vulva were close to each other.


**Fig. 1. Pimply nodules on large intestine (Caecum)**

**Fig. 2. Adult *Oesophagostomum* spp. Worms**

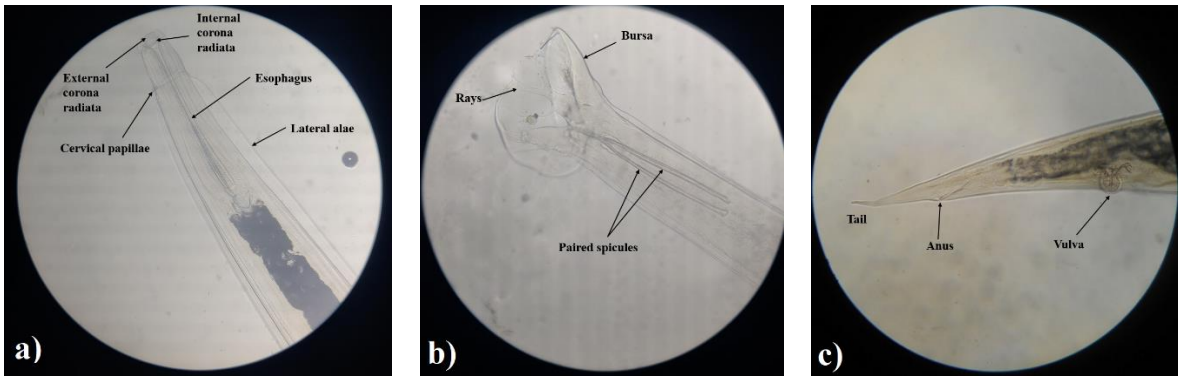


**Fig. 3. Picture showing the a) anterior end of *O. columbianum*; b) posterior end of male *O. columbianum*; and c) posterior end of female *O. columbianum***

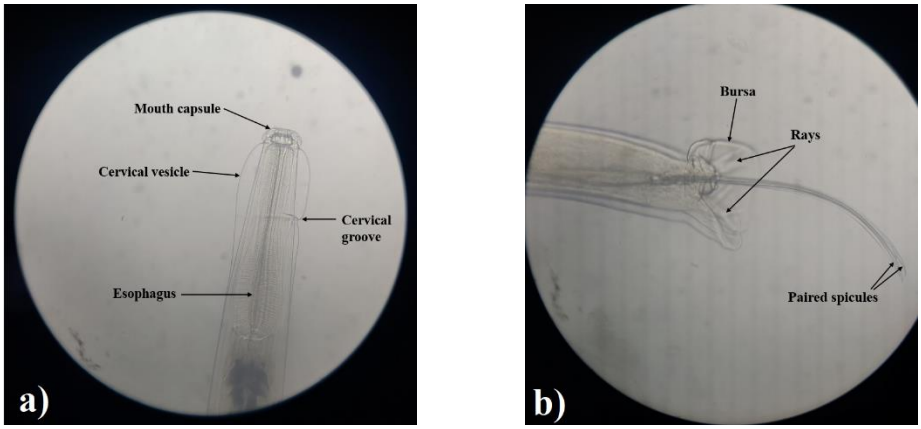


**Fig. 4. Picture depicting the a) anterior end of O. asperum; and b) posterior end of male O. asperum**

## 4. DISCUSSION

The large intestine collected from a male goat in a slaughter house showed the clear pathognomonic lesions of *Oesophagostomum*. The collected worms were identified as *Oesophagostomum columbianum* and *O. asperum*, based on cephalic and cervical structures. The male and female of *O. columbianum* and *O. asperum* were identified based on the posterior end characteristics like spicules, position of vulva. The spicules were unequal and comparatively longer in male *O. asperum* whereas well developed bursa with two equal alate spicules in male *O. columbianum*. In female *O. asperum* worms, the anus and vulva were close to each other where as in *O. columbianum* tail tapers to a fine point and the vulva were situated anterior to anus [3].

According to Rajpoot et al. [1], there was a study conducted on slaughtered goats in the Malwa region of Madhya Pradesh that revealed a 65% incidence of *Oesophagostomum* infection and a 29.5% incidence of mixed parasite illness. The gross intestinal lesions of Oesophagostomosis were described by Satish et al. (2018) as firm nodules with a yellowish to green tint. Additionally, they noted a number of elevated, fibrotic, spherical, irregular, large, and microscopic nodules [6]. These lesions are typical to our findings.

In a 2017 study, Gaddam et al. found 594 *Oesophagostomum* positive intestines in the Chengicherla slaughterhouse in Hyderabad. The study was done to determine the occurrence of *Oesophagostomum* worms using a light microscope and three species of *Oesophagostomum* worms—*Oesophagostomum columbianum*, *O. venulosum*, and *O. asperum*—were found [13].

A study conducted to ascertain the frequency of *Oesophagostomum* infection in four agroclimatic zones of Sikkim, and found that a total infection rate in 13 Sikkim villages was 31.12%. When compared, the subtropical high humid area had a

higher prevalence than the temperate humid zone, sub-alpine low humid zone (13.01%), and alpine dry zone (7.14%). Summer had the highest infection rate, which was followed by autumn and spring [14].

According to a thorough study by Singh et al. (2016), the generic composition of nematode larvae by month showed that *Haemonchus* sp. predominated from July to September, *Trichostrongylus* sp. from October to February, *Oesophagostomum* sp. from July to August and in October, *Strongyloides* sp. from July to October, and *Bunostomum* sp. from July to November [15]. But our current study reports the incidence of Oesophagostomosis in the month of December.

## 5. CONCLUSION

In our study we are reporting infection of *Oesophagostomum* spp. in goat in local area of Uttar Pradesh and first case report of the concurrent infection of O. *columbianum*, which is more pathogenic and the *O. asperum,* in the Bareilly region of Uttar Pradesh in December month of 2023. It is concluded that the goats are to be dewormed time-to-time especially during winter season.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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