

## Case report

### Occurrence of concurrent infection of *Oesophagostomum* species in slaughtered Goat in area of Izatnagar, Uttar Pradesh

**Comment [DA1]:** The title should be change, as this is a case report, not the epidemiological study

### Concurrent infection of *Oesophagostomum* species in a slaughtered Goat-A

### Case Report

**Comment [DA2]:** You may select the title as given in the text

#### Abstracts

The morbidity and mortality of gastrointestinal nematodes make them one of the most significant parasites in the world, causing ongoing economic losses for animal owners. It is reported that the economic loss resulting from ~~G~~ gastrointestinal parasitism in goats was Rs. 372.35 per goat annually. In ~~this study~~ the present study, the intestinal sample was collected from a local slaughter house at Izatnagar, Bareilly, Uttar Pradesh for screening the gastrointestinal nematodes. ~~Initially we examined for pathological lesions on the surface of intestine like nodules, cyst and haemorrhagic patches etc. for any parasitic infection.~~ **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 ~~we~~ identified them as *Oesophagostomum* spp. based on buccal capsule with cephalic and cervical structures. Interestingly, ~~we found~~ both *Oesophagostomum columbianum* and *O. asperum* species ~~were found~~ in the same sample. ~~We differentiated~~ **The male and female *Oesophagostomum* species were also differentiated by** ~~examining~~ examine the spicule and gubernacular length, position of the vulva and anus. This study reports ~~that the~~ infection of *Oesophagostomum* spp. in a goat ~~in local areas of Uttar Pradesh~~ and the first case report of concurrent infection of *O. columbianum* and *O. asperum* in the Bareilly region of Uttar Pradesh.

**Comment [DA3]:** area

**Comment [DA4]:** it may be remove

**Keywords:** Pimpily gut, *Oesophagostomum*, faecal examination, spicule

#### Introduction

One of the major issues in ruminant farming is gastrointestinal nematode (GIN) infection and it results in significant economic losses. 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 (Skryabin et al., 1952; Yamaguti, 1959). The

**Comment [H5]:** If possible provide current eferences

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 (Nath et al., 2021; Shelton and Griffiths, 1967; Curtice, 1890).

Comment [H6]: These reference may be removed

*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 diarrhea 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 (Satish et al., 2018). Such lesions can cause partial or complete intestinal condemnation. Economic losses are due to weight loss, decreased production, medication and mortality in severe cases (Zhao et al., 2013; Johal and Joshi, 1994).

Rarely the *Oesophagostomum asperum* or *O. indicum* from goats in India have been reported (Yadav and Tandon, 1989; Choubisa and Jaroli, 2013). In the study of parasitic epidemiology and its management, the species identification of parasite is crucial (Savita et al., 2022).

## Materials and Methods

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

Afterwards, 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°C for clearing. Later, the worms were morphologically identified by microscopic examination at 10X magnification. We tried to observe the worm characteristics like, buccal capsule with cephalic and cervical structures of the worm for species identification, spicule length, gubernaculum, position of the vulva and anus for species identification.

Comment [DA7]: Add comma

## Results

Immediately after collecting the large intestine sample, ~~we observed~~ the outer surface **was observed** for pathological lesions. ~~We found~~ **There was** numerous, hard and pale-yellow nodules of variable size on the surface of large intestine (Fig. 1).

Comment [DA8]: Clearly write whether all structure are important for species identification or not.



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

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 shown the characteristic features of *Oesophagostomum* Spp. ~~We tried to observe~~ The worm characteristics like, buccal capsule with cephalic and cervical structures, spicule, gubernacular length, and position of the vulva and anus ~~were observed~~. Interestingly, ~~we found~~ both *Oesophagostomum columbianum* and *O. asperum* was observed.



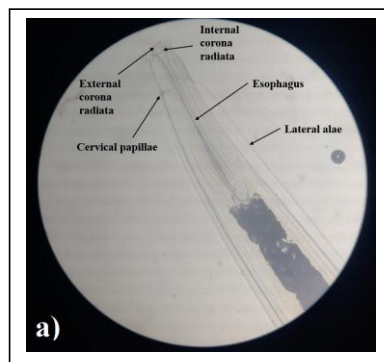
**Fig. 2: Picture showing the Adult *Oesophagostomum* spp. worms**

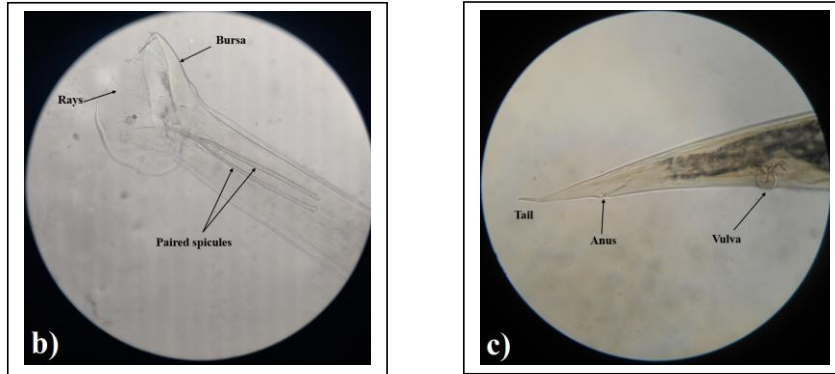
The *O. columbianum* was confirmed by large cervical alae and the anterior extremities of cervical alae pierced by cervical papillae (Fig. 3a). The male bursa was well developed and there were two equal alate spicules (Fig. 3b). The female tail tapers to a fine point and the vulva were situated anterior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

**Comment [DA9]:** As per figure it should be 3a

**Comment [DA10]:** As per figure it should be 3b

**Comment [DA11]:** As per figure it should be 3c

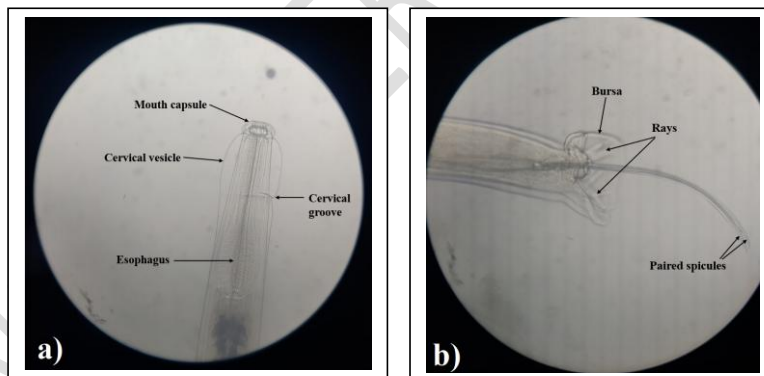




**Fig. 3:** Picture showing the a) anterior end of *O. columbianum*; b) Posterior end of male *O. columbianum*; and c) Posterior end of female *O. columbianum*

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

**Comment [DA12]:** Where is 4a & 4b, put it them in correct place



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

## Discussion

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. (2021) and Das et al. (2013), the economic loss resulting from GI parasitism in goats was Rs. 372.35 per goat annually.

In our study for the gastrointestinal parasites in a goat sample, collected in December month in a local slaughter house (Izatnagar, Bareilly, Uttar Pradesh), the clear pathognomonic lesions of *Oesophagostomum* were observed. After collecting the worms and studied for

**Comment [DA13]:** Discussion should be as per the result

microscopic features they were identified as *Oesophagostomum columbianum* and *O. asperum*, based on cephalic and cervical structures. In addition, ~~we identified~~ the male and female of *O. columbianum* and *O. asperum* **was 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.

Comment [DA14]: Was identified

Comment [DA15]: Give reference if any

*Haemonchus* sp. was found to be the most common nematode larvae in a coproculture investigation of pool faecal samples from cattle in the Mahakaushal region of Madhya Pradesh, followed by *Oesophagostomum* sp., *Trichostrongylus* sp., *Strongyloides* sp., and *Bunostomum* sp. The monsoon season (25.91%) had a considerably greater seasonal prevalence of GI parasite infection than the summer (21.40%), whereas the winter (12.50%) had a lower prevalence (Das et al., 2018).

According to Rajpoot et al. (2021), 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. In a 2017 study, Gaddam 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.

Comment [DA16]: Is it correct according to your finding?

Comment [H17]: et al.

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 (Pal et al., 2015).

## Conclusion

~~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.~~ In our study we are reporting infection of *Oesophagostomum* spp. in goat in local areas 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. We conclude and suggest to go for time-to-time proper deworming in the animals.

Comment [H18]: Write only conclusion

Comment [DA19]: area

## Reference

Comment [H20]: Follow the journals guidelines for reference style

Choubisa, S.L. and Jaroli, V.J., 2013. Gastrointestinal parasitic infection in diverse species of domestic ruminants inhabiting tribal rural areas of southern Rajasthan, India. *Journal of parasitic diseases*, 37(2), pp.271-275.

Curtice, C., 1890. *The animal parasites of sheep*. US Government Printing Office.

Comment [H21]: No volume/give the details

Das G, Roy B, Nath S, Singh AK, Katuri RN and Chalotra SK, 2013. Economic losses in young goats due to gastrointestinal nematodiosis. In: 31st Annual convention of Indian Society for Veterinary Medicine and National Symposium, College of Veterinary Science and Animal Husbandry Mhow, Madhya Pradesh, India, Jan 9-11, 2013. pp. 118.

Das, G., Kumbhakar, N.K., Verma, R., Lata, K. and Saiyam, R., 2018. Prevalence of gastrointestinal parasitic infections in cattle of Mahakaushal Region of Madhya Pradesh, India. *Indian Journal of Veterinary Sciences & Biotechnology*, 13(4), pp.88-91.

Gaddam, R., Murthy, G.S. and Kommu, S., 2017. Occurrence of *Oesophagostomum* species in slaughtered sheep in area of Hyderabad, Telangana State. *Journal of Parasitic Diseases*, 41, pp.809-813.

Johal, M., and Joshi, A., 1994. Histomorphology of female organ system of a nematode *Oesophagostomum columbianum*. *Uttar Pradesh Journal of Zoology*, 14(1), 7–12. <https://mbimph.com/index.php/upjoz/article/view/1260>

Nath, T.C., Lee, D., Park, H., Choe, S., Ndosi, B.A., Kang, Y., Bia, M.M., Eamudomkarn, C., Mohanta, U.K., Islam, K.M. and Bhuiyan, J.U., 2021. Morphometrical and Molecular Characterization of *Oesophagostomum columbianum* (*Chabertiidae: Oesophagostominae*) and *Haemonchus contortus* (*Trichostrongylidae: Haemonchinae*) Isolated from Goat (*Capra hircus*) in Sylhet, Bangladesh. *Journal of Parasitology Research*, 2021.

Pal, P., Chatlod, L.R., Kumar, B. and Avasthe, R.K., 2015. Prevalence of Oesophagostomosis in goats in humid North-East Himalayan region Sikkim, India. *The Indian Journal of Animal Sciences*, 85(2).

Rajpoot, J.S., Jatav, G.P., Shukla, S., Jayraw, A.K., Rajpoot, N., Agrawal, V. and Shakya, M., 2021. Incidence of Oesophagostomosis in goats of Malwa region of Madhya Pradesh. *Veterinary Practitioner*, 22(1).

Comment [H22]: Page??

Satish, A.C., Nagarajan, K., Balachandran, C., Soundararajan, C. and Legadevi, R., 2018. Gross, histopathology and molecular diagnosis of Oesophagostomosis in sheep. *Journal of Parasitic Diseases*, 42, pp.315-320.

Savita, Mishra, S., and Jaiswal, K., 2022. Scanning Electron Microscopic (SEM) study of nematode parasites of goat in Lucknow district Uttar Pradesh. *Uttar Pradesh Journal of Zoology*, 43(5), 86–91. <https://doi.org/10.56557/upjoz/2022/v43i52970>

Shelton, G.C. and Griffiths, H.J., 1967. *Oesophagostomum columbianum*: Experimental Infections in Lambs: Effects of Different Types of Exposure on the Intestinal Lesions. *Pathologia veterinaria*, 4(5), pp.413-434.

Singh, A.K., Das, G., Roy, B., Nath, S., Naresh, R. and Kumar, S., 2016. Prevalence of strongyle infections in goat of Maha Koushal region, Madhya Pradesh, India. *Journal of parasitic diseases*, 40, pp.289-291.

Skryabin, K.I., Shikhobalova, N.P., Schulz, R.S., Popova, T.L., Boev, S.N. and Delyamure, S.L., 1952. Descriptive catalogue of parasitic nematodes. Vol. 3. Strongylata. *Descriptive catalogue of parasitic nematodes. Vol. 3. Strongylata*.

Yadav, A.K. and Tandon, V., 1989. Gastrointestinal nematode infections of goats in a sub-tropical and humid zone of India. *Veterinary Parasitology*, 33(2), pp.135-142.

Yamaguti, S., 1959. *Systema helminthum* (Vol. 2). Interscience Publishers.

Zhao, G.H., Hu, B., Cheng, W.Y., Jia, Y.Q., Li, H.M., Yu, S.K. and Liu, G.H., 2013. The complete mitochondrial genomes of *Oesophagostomum asperum* and *Oesophagostomum columbianum* in small ruminants. *Infection, Genetics and Evolution*, 19, pp.205-211.

UNDER PEER REVIEW