

Morphological identification of different genus of paramphistomes available in Bangladesh

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Abstract

Paramphistomiasis is a common disease of ruminant causes heavy economic losses, distributed all over the world and caused by different genus and species of paramphistomes. This study was conducted to identify different genus of paramphistomes on the basis of morphology found in cattle and detection of more common genus available in Bangladesh. Adult flukes were recovered from 150 visceral samples of cattle slaughtered in various localities of different district of northern areas of Bangladesh during July, 2018 to October, 2019 and identified by preparation and examination of permanent slide of paramphistome. Morphologically three genera of paramphistomes viz. *Paramphistomum*, *Cotylophoron* and *Gastrothylax* were recorded in cattle.

Keywords: Paramphistome, Morphology, Genus, Viscera, Cattle

Date of Submission: 17-10-2020

Date of Acceptance: 02-11-2020

I. Backgrounds

Paramphistomiasis is one of the most important economic parasitic disease in cattle, distributed all over the world found to be associated with diarrhoea, loss of body condition, rough hair coat, dullness, weakness, loss of appetite, intestinal hemorrhages, denudation and destruction of rumen papillae, anemia, reduced milk and meat production, reduced productive capacity, submandibular swelling and death of the individual in severe cases¹. The economic losses due to paramphistomiasis in cattle may be produced in different ways, such as loss of milk and meat production, low quality skin, lower production performance, reduced draught power and losses due to death. Afazuddin³ estimated TK.108, 067 as an annual economic loss due to parasitic diseases at saver military dairy farm, Dhaka. Approximately 40 species of paramphistomes have been reported⁷, but the predominant species are *Paramphistomum cervi*, *Cotylophoron cotylophoron*, *Gastrothylax crumenifer*, and *Homologastor palonae*.

II. Materials and methods

2.1 Study period, area and animal

The study was conducted during the period from July, 2018 to October, 2019 in different district of northern areas of Bangladesh. Sample (viscera) was collected from slaughtered cattle of different age.

2.2 Collection of samples and preservation

150 viscera (GIT) from 150 cattle of both sexes, slaughtered in various localities of different district of northern areas of Bangladesh were collected and after removing the rumen content, rumen, reticulum & duodenum carried to the laboratory.

2.3 Examination of Viscera (GIT)

The rumen, reticulum and duodenum opened separately. The rumen opened through the lesser curvature with the help of scissors. After removing the content, the rumen reticulum and duodenum thoroughly washed and cleaned off ingesta and put in a separate jar containing luke warm normal saline and left for an hour or two to release the attachment of parasites from the wall of rumen reticulum and duodenum. Parasite found in the internal surface (usually in rumen) was scraped off with the finger and washing of both contents and scrapings were examined to record the parasite. The paramphistomes were preserved in 10% formalin.

2.4 Morphological identification of paramphistomes

The paramphistomes were preliminarily identified under microscope using low power objectives and then permanent slides of paramphistomes were prepared by Semichon's carmine staining for detailed morphological studies and identification as per standard method.

III. Results

3.1 Morphological identification of different genus of paramphistomes in cattle

Paramphistomum sp. was morphologically identified on the basis of size and shape of fluke and position of anterior and posterior sucker (acetabulum). In the present study *Paramphistomum* sp. were found in the rumen and reticulum which were light pink in color with a sucker at the tip of the cone and another sucker ventrally at the posterior end. The body of *Paramphistomum* sp. was pear-shaped, slightly concave ventrally (conical) and convex dorsally. Mouth was terminal, funnel-shaped, widened posteriorly. Caeca were wide, pursued a serpentine course and reached anterior level of acetabulum with blind ends more dorsal than lateral. Genital pore was situated behind intestinal bifurcation. Acetabulum (posterior sucker) was sub-terminal, about one-fourth to one-fifth of body length. Clusters of vitelline glands were extended from the pharynx to the posterior sucker and lie between the caeca and the lateral margins of the body. The uterus was wavy and runs dorsally to testes (Fig. 2).

Cotylophoron sp. was identified by morphological characteristics. The body was smooth, conical in appearance slightly bended to ventral surface. Oesophagus was oblique "J" shaped, dorso-ventral position. Caeca were lateral, forming ample convolutions and terminate at middle part of acetabulum with thin wall and large lumen. The posterior sucker was subterminal. Testes were strongly lobed, near to each other, at midline of body, diagonal in position; the anterior testis slightly to the left, the posterior one to the right side. Ovary was oval, situated on the right side between acetabulum and posterior testis. Genital sucker was present mid-ventral, near to esophageal bifurcation (Fig. 3).

Gastrothylax sp. was identified by morphological characteristics. The body was fleshy and red when fresh, elongated, circular in transverse section. It has very large ventral pouch, opening anteriorly and extending over the whole ventral surface up to the posterior sucker. Posterior sucker was large, terminal and has raised border. Oral sucker was small and terminal. Intestinal caeca terminated in front of the ovary. Testes were placed side by side and the ovary was placed behind the testes. Genital pore was open into pouch and half way between pharynx and intestinal bifurcation (Fig. 4).

3.2 Detection of more prevalent genus of paramphistomes in cattle

From slaughtered animals, a total of 150 viscera (digestive tract) were examined from which 180 paramphistomes were randomly selected and prepared permanent slide for morphological identification. Then the slides were examined under microscope. Three genera of paramphistomes viz. *Paramphistomum*, *Cotylophoron* and *Gastrothylax* were recorded in this study. Among the genera, *Paramphistomum* (47.22%) was significantly ($P < 0.01$) more prevalent than *Cotylophoron* (40.0%) and *Gastrothylax* (12.78%) (Table 2).

3.3 Morphology of amphistomes

It has discoidal body and backwardly projected tail. A cluster of cystogenous cells present at the side of intestinal bifurcation. It has two sucker, anterior sucker surrounding the mouth and ventral sucker very near to the posterior end (Fig. 5).

IV. Discussion

4.1 Morphological identification of different genus of paramphistomes in cattle

Paramphistomum sp. was morphologically identified on the basis of size and shape of fluke and position of anterior and posterior sucker (acetabulum). The color of fluke, shape and size of body, position of anterior and posterior sucker, presence of genital pore and vitelline glands were similar to the morphological identification system followed earlier by Choudhary *et al.*,⁴

Cotylophoron sp. was identified by morphological characteristics including smooth, conical body, oblique "J" shaped, dorso-ventral esophagus, lateral caeca, subterminal posterior sucker, lobed testis, oval ovary situated on the right side between acetabulum and posterior testis and mid-ventral genital sucker near to esophageal bifurcation. The morphological findings of *Cotylophoron* sp. were closely related to the findings of Sey and Graber⁶.

Gastrothylax sp. was identified by morphological characteristics. The body was fleshy and red when fresh, elongated, circular in transverse section. It has very large ventral pouch, opening anteriorly and extending over the whole ventral surface up to the posterior sucker. Posterior sucker was large, terminal and has raised border. Oral sucker was small and terminal. Intestinal caeca terminated in front of the ovary. Testes were placed side by side and the ovary was placed behind the testes. Genital pore was open into pouch and half way between pharynx and intestinal bifurcation⁶.

4.2 Detection of more prevalent genus of paramphistomes in cattle

In the present study, three genera of paramphistomes viz. *Paramphistomum*, *Cotylophoron* and *Gastrothylax* were identified. Among the genera, *Paramphistomum* (47.22%) was significantly ($P < 0.01$) more prevalent than *Cotylophoron* (40.0%) and *Gastrothylax* (12.78%). The present study is similar to the findings of Uddin *et al.* Uddin *et al.*,⁵ who reported relatively higher prevalence of *Paramphistomum cervi* (65.28%), followed by *Gastrothylax crumenifer* (54.17%) and lower with *Cotylophoron cotylophorum* (36.11%) in goat. So, it can be said that the risk of being infected of cattle of the species of *Paramphistomum* sp. is higher than that of any other species of paramphistomes. Availability of intermediate snail host of the *Paramphistomum* sp. in the research area may be one of the causes of high susceptibility of *Paramphistomum* sp. infection in cattle and it may be due to some genetic factor.

V. Conclusion

In morphological study, three genera of paramphistomes viz. *Paramphistomum*, *Cotylophoron* and *Gastrothylax* were recorded in cattle, among them *Paramphistomum* (47.2%) are more common than *Cotylophoron* (40.0%) and *Gastrothylax* (12.8%). In this study, through visceral (GIT) examination, it was found that adult paramphistomes only present in rumen, reticulum and bile duct with gall bladder, no adult fluke found in other parts of GIT.

Table-1. Comparative morphological study of paramphistomes

Characteristics	Paramphistomum	Cotylophoron	Gastrothylax
Body shape	Mainly conical	Mainly conical	Elongated
Normal color	Light pink	Light pink/redish	Red color
Ventral pouch	Absent	Absent	Present
Testes	Lobed & tandem	Rounded & tandem	Placed side by side
Ovary	Sub-spherical	Rounded	Rounded
Genital sucker	Absent	Strongly developed	Absent

Table 2: Detectio of more prevalent genus of paramphistomes

Genus identified	Positive no.	Prevalence (%)	Odds ratio	χ^2 value	P value
<i>Cotylophoron</i> sp.	72	40.0	P. vs C.= 1.34	53.45	<0.001
<i>Paramphistomum</i> sp.	85	47.22	P. vs G.=6.11		
<i>Gastrothylax</i> sp.	23	12.78	C. vs G.=4.55		
Total	180	100.0			

$P < 0.01$ means significant at 1% level of significance.

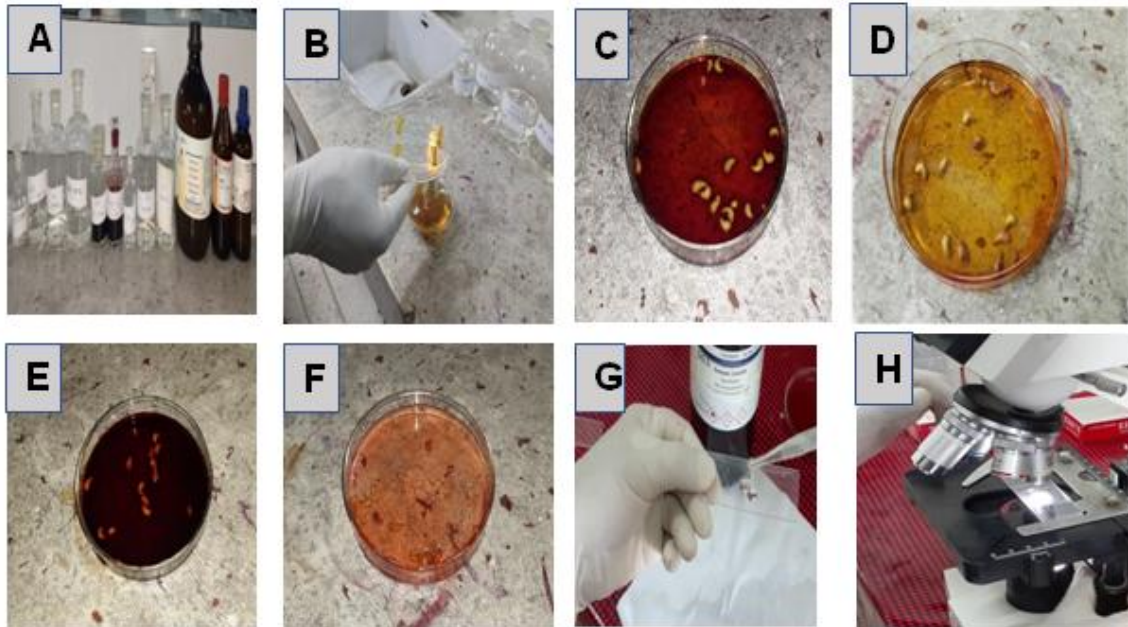


Figure- 1. Preparation of permanent slide. (A) Reagents (B) Fixation of sample in AFA solution (C) Treatment with Iodine solution (D) Washing in 70% alcohol (E) Staining with Semichon's carmine solution (F) Treatment with aniline oil (G) Specimen placed on slide and applying canada balsam, (H) Examination under light microscope.

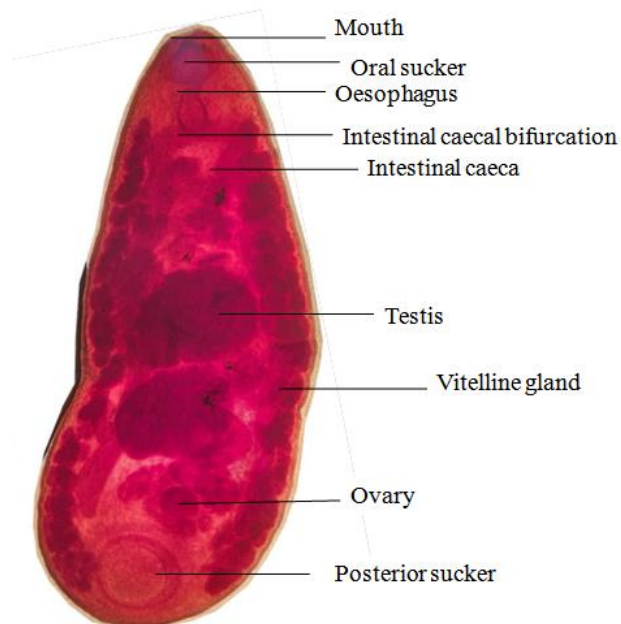


Figure 2: Morphology of Paramphistomum sp.

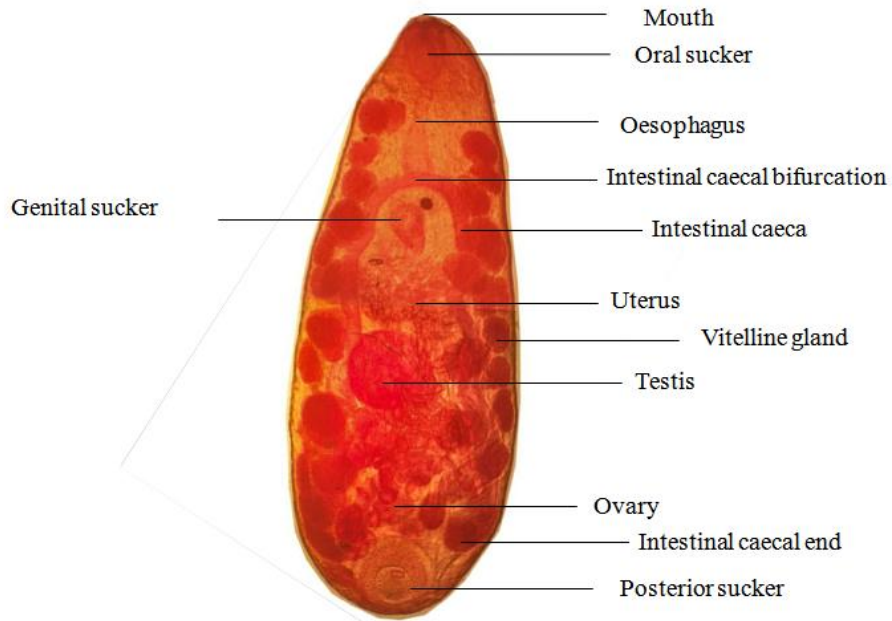


Figure 3: Morphology of Cotylophoron sp.

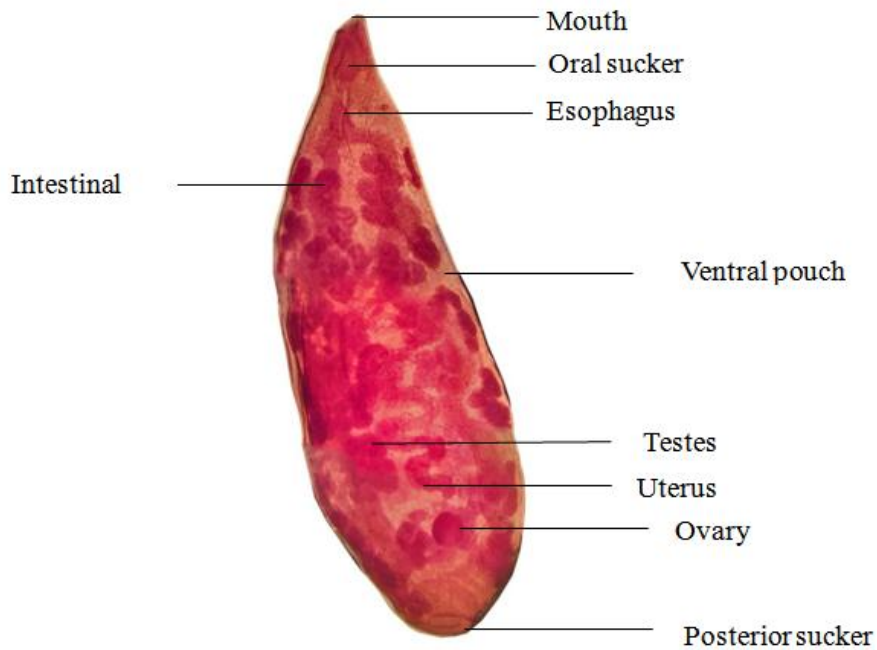


Figure 4: Morphology of Gatrothylax sp.

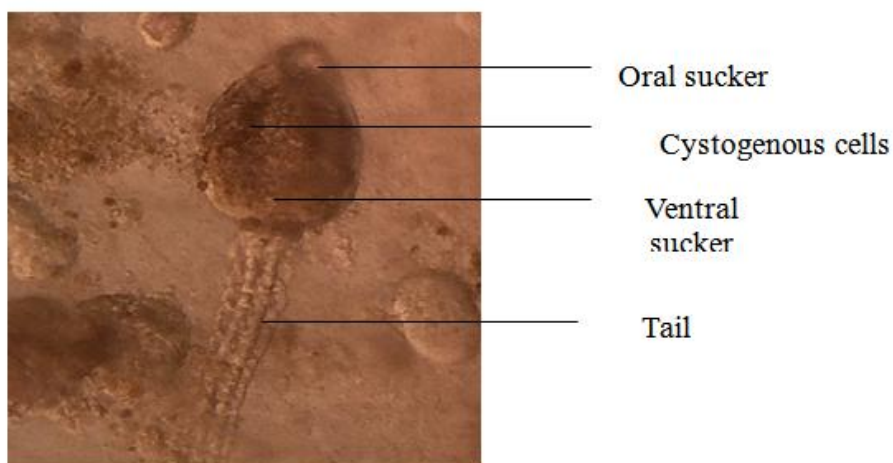


Figure 5: Morphology of amphistome (10X)

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Md. Golam Azam, et. al. "Morphological identification of different genus of paramphistomes available in Bangladesh." *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)*, 13(10), 2020, pp. 53-58.