

**STUDIES ON SOME LARVAL TREMATODES (CERCARIAE) OF FRESHWATER
SNAIL LYMNAEA ACUMINATA IN MEERUT REGION (U.P.) INDIA**

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ABSTRACT

Snails belong to a large group of invertebrates such known as the phylum – Mollusca, class – Gastropoda. Snails were collected during the monsoon period from various water bodies like ponds, pools, ditches, lake reservoirs, rivers (Garh Ganga) and crop fields in and around the Meerut region which were Ram TaalVatika, Chittora Power House, Diggishastri Nagar, Village Shobhapur, Village Kunda, Kankerghera, Bhola Power House, Pond near railway Cantt. Station, NanukiNeher near Sardhana, Pond in Ganga Nagar near Hastinapur. Snails were collected and identified by the method suggested by reference book of Subha Rao (1989) Hand Book of freshwater Molluscs of India. Identified snails were found to be *Lymnaea* and *Bellamyia*. Collected snails were thoroughly washed in running tap water, arranged species wise, counted and then kept in laboratory containers and beakers and maintained in aquariums and fed with natural food like lettuce leaf. A Total 420 snails were collected with species like *Lymnaeaacuminata*, *Lymnaealuteola* and *Bellamyabengalensis* in the Meerut region. The occurrence of the larval trematode parasite was found.

Keywords-Trematode, cercaria, *Lymnaea*

Introduction:

Studies on freshwater snails and larval trematodes has been receiving much attention since last three decades. With very few exceptions molluscs serve as the only or as one of the intermediate hosts of the digenetic trematodes. Among this group of endoparasites, a number of species are of public health and veterinary importance, since they are known to cause debilitating diseases, with some being more severe than others. The World Health Organization (WHO) is therefore, paying special attention to this dynamic host-parasite interaction of larval trematodes and snail control. Although the effects of digenetic trematodes on their vertebrate hosts have been studied, comparatively little attention has been paid towards the host-parasite relationship between the larval trematodes and their molluscan hosts.

Irrespective of whether the mollusc is the intermediate, definite or only host in the developmental cycle of the parasite, one can expect to find pathological manifestations induced by the parasite. Such alterations from the normal can be appreciated as histopathological, physiological as well as biochemical changes. Although many helminths have been reported as parasites of economically important molluscs all over the world. Freshwater snails serve as intermediate hosts for a variety of Trematodes that cause illness in the human and animal population (**FramunArdpairin, et. el., 2022**)

Material and Method:

A total of around 420 freshwater snails were collected monthly during May 2021 to July 2021 from various water reservoirs of Meerut region viz., Ram TaalVatika, Chittora Powerhouse, DiggiShastri Nagar, Village Shobhapur, Village Kunda, KankerKhera near 510 Army Workshop, BholaPowerHouse, Pond near Railway Cantt. Station, Nanu Ki Nahar near Sardhana, Pond in village Rohta, Kali Nadi near Medical College, Ashram Pond in ParikshitGarh, Pond in Ganga Nagar near Hastinapur. Snails were collected and identified by the method suggested by **SubbaRao (1989)**. The snails identified were found to be *Bellamyabengalensis* / *wypioa* (Lamarlo). *Lymnaea* (*Pseudosuccina*) *luteola* / *typica* (Lamarck).

Collected snails were thoroughly washed in running tap water, arranged specieswise, counted and then kept in 5 to 10ml dechlorinated tap water in large specimen bottles (5 x 3 cm) and placed beneath either a light source for twenty-four hours or exposed daily in the morning sunlight for one hour. The snails were then kept in individual tubes. Individual tubes were then examined by a hand lens for shedding of cercariae as it stimulates the positively phototrophic cercariae to come out of the infected snails. The snails which did not release cercariae were examined three times on alternate days as above and finally before discarding them, were crushed between two glass slides and examined under a compound microscope to determine for the presence of larval trematodes and developing stages of cercariae in the hepatopancreas. All the positive snails were maintained in the separate aquaria in dark corner of the room duly covered with black cloth. Pieces of calcium carbonate were added to aquaria.

Each snail that shed cercariae under these conditions was considered to have a patent infection. These snails were maintained in the laboratory in glass beaker and were fed a twig of Hydrilla plant of Spinaceaoleracea or lettuce. Distilled water was used in initiating and keeping a constant water volume in the aquaria. The water of beaker was changed daily. The snails which on repeated examination were found negative of trematode infection were separated species wise and transferred into big glass jars, enamel basins or big earthen tube and maintained in the laboratory on boiled algae and on well washed aquatic plants. From the beaker containing infected snails, cercariae were taken from the water for the study of various morphological structures. Cercariae were identified by the method suggested by **Schell (1985)**. For morphological studies cercariae were taken on a glass slide with the help of a fine dropper and covered under living condition under the microscope. The drawings were made with the help of camera lucida. Measurements were taken for at least 12 specimens for each cercarial species with the help of ocular micrometer. Uniform results were obtained by measuring heat killed cercariae.

Discussion:

Lamarck, (1822) and again described by **Mitra, Dey and Ramakrishna, (2005)**, genus *Lymnaea*. The present form of genus *Lymnaea* is recognized on the basis of following characters: Shell thin, ovate or elongate, primate or imperforate, spire exerted; body whorl large, aperture oval peristome thin and simple, columella spirally twisted; mantle not extending over the shell (Lamarck, 1799). Shell succiniform, prostrate unfolded shows the characters of subgenus *pseudosuccinea* (**Baker, 1908**).

Shell small to large dextral, ovately oblong thin and light, spire pointed and variable in height. Body whorl inflated and proportionately large columellar axis typically twisted, aperture rather large lip thin and simple. Stomach divided into three parts, the anterior oval crop, the middle stomach proper enclosed by the highly muscular bilobed gizzard and the posterior tapering pylorus genital opening two situated on the right side, copulatory organ with a slender penis sheath and simple penis. Eggs are deposited in clusters in enlarged

gelatinous capsule on the basis of these above character Lymnaea is classified into order Basommatophora and super family Lymnaeidae. The family Lymnaeidae shows these characters conical dextral shells with pneumostome and separate male and female gonophores on the right side. **Hubendick (1951)** studied the variation, morphology, taxonomy, nomenclature and distribution of Lymnaeidae. **Annandale and Rao (1925)** studied the material for a revision of recent Indian Lymnaeidae (Mollusca: pulmonata). Spire less acuminate outer lip not very much expanded almost straight in outline. According to this character it is classified into species *acuminata*.

Morphology of Cercariae:

***Cercariagranulosa* Baugh 1975**

Body aspinose, elongate oval, anterior end blunt, posterior end broad, measures 0.56-0.65 in length and 0.28-0.29 in maximum breadth in region of ventral sucker in live specimens and 0.22-0.25 in length and 0.14 in maximum breadth in fixed specimens; tail aspinose and tapers posteriorly, dorsal and ventral fin folds present at distal third, small invaginable process present at tip of tail, in live specimen tail almost as long as body, measuring 0.61-0.64 in length and 0.08 in breadth at base, in fixed specimen it appears longer than body and measures 0.46-0.53; oral sucker than broad, measures 0.07-0.08 in length and 0.05-0.06 in breadth in live specimen and 0.03-0.04 in length and 0.02-0.03 in breadth in fixed specimens; ventral sucker larger than oral sucker, situated approximately in middle of posterior half of body, measures 0.08 in diameter in live and 0.04 in fixed specimens; cephalic collar well developed, prominent with 43 spines arranged in two alternate rows, no spines arranged in groups in ventrolateral corners of collar, prepharynx distinct, measuring 0.04 in length, a mass of tiny spine like bodies present at beginning of prepharynx; pharynx lengthwise oval in shape, measures 0.03 in length and 0.01 in width in live specimens; esophagus long, measures 0.17 in length in live specimen, esophageal bifurcation lies in front of ventral sucker, intestinal caeca extend posteriorly up to level of excretory bladder. caeca and esophagus composed of number of coarsely granular cells arranged end to end, esophagus consists of nine to ten such cells and caeca of 14-15 cells; penetration gland cells four pairs, lobate, each with fine granules and a large round nucleus, arranged alongside of esophagus, ducts of cells open at anterior margin of mouth opening; from pharyngeal level up to posterior end packed with numerous round or oval cystogenous cells, each with round nucleus and fine characteristic granules. Excretory bladder oblong, placed transversely at posterior end of body, two main sinuous excretory canals open separately into anterior side of bladder each canal runs forward as ascending limb up to prepharynx wherefrom it turns back forming a loop and runs posteriorly as descending limb in a sinuous way much beyond ventral sucker and roughly midway between posterior border of ventral sucker and hind end of body where it divides into two secondary branches anterior and posterior collecting canals, of these two canals, anterior much longer than posterior one, ascending limbs of main excretory canals much dilated in preacetabular region and contain large number of round refractile excretory corpuscles, anterior as well as posterior collecting canal of each side of body have two short tertiary branches connected with capillaries of flame cells arranged in sets of three, flame cell formula represented by $2[(3+3) + (3+3)] - 24$ caudal excretory canal arises from middle of posterior side of excretory bladder and after covering a distance of about 1/6" length of tail dilates before bifurcating into fine canals which open outside by pores located at margins of tail.

Snail Host: *Lymnaea acuminata*

Locality: Village Shobhapur

No. of snails collected: 280

No. of snails found infected: 15

Percentage of infection: 5.35%

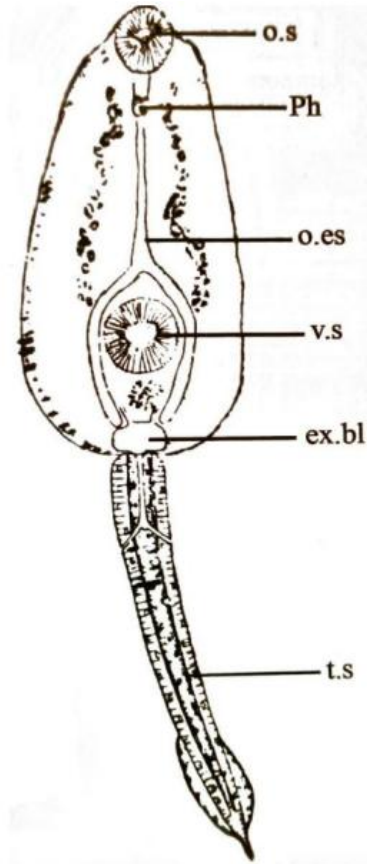


Fig. 2: *Cercariagranulosa* (Drawn from live sp.) 0.5.,
Oral sucker, Ph, Pharynx, o.es., Oesophagus V.s.,
Ventral sucker, Ex. bl., Excretory bladder.

***Cercariatelibaghensi* Srivastava, S., Saxena. V.1992**

The body of the cercaria is aspinose, narrow anteriorly and broader posteriorly, measuring 0.35-0.27 mm in length and 0.19-0.25 mm in width in live specimen and 0.34-0.27 mm in length and 0.08-0.09 mm in width in fixed specimen. The tail is almost equal to, or slightly longer than the body, measuring 0.32-0.61 mm in length and 0.04-0.06 mm in width near its base in live specimen and 0.27-0.29 mm in length and 0.04-0.05 mm in width in fixed specimen. The tail is without any fin fold or spines. Few rounded bodies are scattered throughout the tail. The tail appears striated throughout its length during the contraction and these striations are more prominent near the tip of the tail. The terminal oral sucker measures 0.04-0.06 mm X 0.05-0.06 mm in live specimen and 0.040-0.042 mm X 0.030-0.033 mm in fixed specimen. A round spinous body is present near the posterior margin of the oral sucker. The cephalic collar is well developed consisting of 58 collar spines which are arranged in double row. All these spines are equal in size. The ventral sucker is slightly larger than the oral sucker, located just behind the middle of the body and measures 0.05-0.07 X 0.06-0.08 mm in diameter live specimen and 0.04-0.05 mm in diameter in fixed specimen. The mouth leads into a short prepharynx measuring 0.04 mm in length in live specimen and 0.032 mm in length in fixed specimen. It is followed by a muscular pharynx measuring 0.05 mm in diameter in live specimen and 0.03 mm in diameter in fixed specimen.

The pharynx leads into an elongated esophagus measuring 0.13-0.15 mm in length in live specimen and 0.07-0.09 mm in length in fixed specimen. The esophagus bifurcates into two intestinal caeca, at a short distance in front of the ventral sucker. The intestinal caeca extend posteriorly upto the posterior end of the body, where they terminate blindly. Both the esophagus and the intestinal caeca appear to be cellular in nature. The penetration glands are present in two groups; one on each side of the esophagus and three numbers is approximately 22 pairs. Each penetration gland contains a nucleus and fine granules which take pink stain with neutral red. All the penetration glands of one side open collectively by a duct near anterior end of the body. The cystogenous cells are scattered through the body. They are irregular in shape and contain coarse granules. The rudiments of the genital organs are found in the form of a mass of dark staining cells just posterior to the ventral sucker. The excretory bladder is large in size, broadly oval in shape and situated at posterior end of the body. The anterior collecting canal, on each side, is formed by the union of the capillaries of three flame cells near anterior region of the body, in the pharyngeal region. It runs posteriorly on each side and receives capillaries from three flame cells in the region of intestinal bifurcation.

The posterior collecting canal is formed by the union of the capillaries of three flame cells near posterior end of the body. It runs anteriorly and receives, on each side, capillaries from three flame cells in the region of the excretory bladder, capillaries from three flame cells, a short distance anterior to the excretory bladder, capillaries from three flame cells near the posterior margin of the ventral sucker and capillaries from three flame cells at the level of the ventral sucker. The anterior and posterior collecting canals, on each side, meet together at the level of the middle of the ventral sucker to form the main collection canal. The main collecting canal, on each side, runs anteriorly upto posterior border of the oral sucker turns back forming a loop and then it all widens, and posteriorly upto the level of the anterior margin of the ventral sucker, where it again becomes narrow and runs posteriorly further and open into the excretory bladder at its anterior end. The widened portion of both the main collecting canals is filled with approximately 60-70 excretory granules. The flame cells are arranged in group of three and the cell formula is 263 (333) 42. A caudal excretory canal arises from the posterior margin of the excretory bladder and runs in the middle region of the tail upto about a short distance before the tip of the tail. The flame cells could not be seen in the tail. On dissecting the infected snail all numerous red lines were recovered from the hepatopancreas of an all.

Radial are elongated sea like structures and show active movement of contraction and expansion. They measure 0.36-0.61 mm in length and 0.14-0.25 mm in width in live specimen and 0.29-0.46 mm in length and 0.09-0.14 mm in width in mixed specimen. The terminal mouth leads into a muscular pharynx which measures 0.04-0.06 mm X 0.01-0.06 mm in live specimen and 0.30-0.32 mm X 0.021-0.022 mm in fixed specimen. The pharynx is followed by a very long gut which contains blackish material. A well-developed collar is present at a distance of 0.09-0.12 mm from anterior and in live specimen and at 0.06-0.08 mm from anterior end in fixed specimen. The birth pore is located posterior to the collar at a distance of 0.09-0.13 mm from the anterior and in live specimen and at 0.07-0.085 mm from the anterior end in fixed specimen. A pair of procoxula is present at a distance of 0.23-0.50 mm from the anterior end in live specimen and at 0.17-0.42 mm from the anterior end in fixed specimen. The radii are fully filled with numerous cercariae in various stages of development, few well developed cercariae and many germ balls.

Host: *Lymnaea acuminata*

Locality: Chittora Powerhouse

Number of snails collected: 253

Number of snails found infected: 09

Percentage of infection: 7.90%

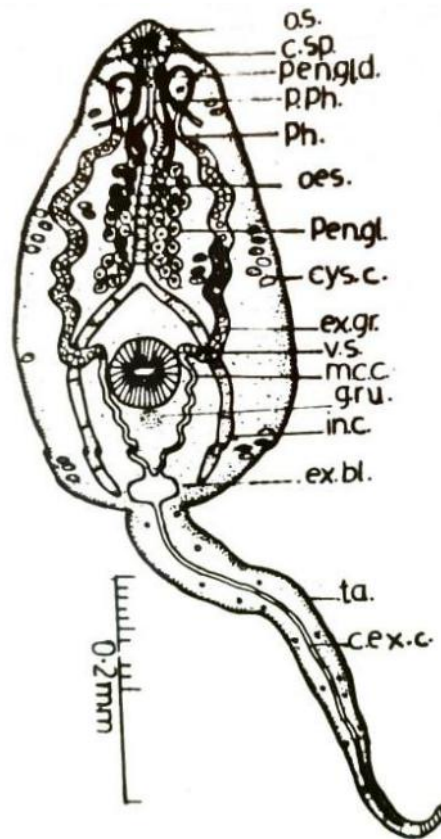


Fig. 3: *Cercariatelibaghensis* (Drawn from a live sp.)
 C.ex.c., Caudal excretory canal, C.sp., Collar spines,
 Cystogeneus cell, Ex.bl., Excretory bladder, Ex.gr., Eicra
 granules, G.ru., Genital rudiments, In.c., Intestinal caeca,
 Main collecting canal, O.es., esophagus, O.s., Oral &
 Pen.gl., Penetration gland, Pen.gl.d., duct of penetration:
 P.Ph., Prepharynx, Ph., Pharynx, Ta, Tail, V.s., Ventral suck.

Cercariadistomi I

The body of the cercariae is small, aspinose, somewhat elongated, with posterior end of the body slightly wider than the anterior end. It measures 0.17-0.35 mm in length and 0.08-0.12 mm in width in live specimen and 0.14-0.18 mm in length and 0.04-0.06 mm in width in fixed specimen. The tail is slightly longer than the body, measuring 0.21-0.41 mm in length and 0.03-0.05 mm in width in live specimen and 0.19-0.26 mm in length and 0.020-0.021 mm in width in fixed specimen. The furcace are shorter than the tail stem, measuring 0.10-0.13 mm in length and 0.01-0.02 mm in width in live specimen and 0.07-0.09 mm in length and 0.005-0.01 mm in width in fixed specimen. The tail is without any fin fold and spines. Numerous small rounded bodies are found in the tail, which are arranged in two linear rows, one on each side of the caudal excretory canal.

The anterior protrusible organ is pyriform in shape and its posterior one fourth part appears to be muscular. It measures 0.05-0.08 mm X 0.03-0.04 mm in live specimen and 0.03-0.05 mm X 0.012-0.022 mm in fixed specimen. The ventral sucker is smaller than the anterior protrusible organ and is located in the last quarter of the body and measures 0.03-0.04 mm X 0.02-0.03 mm in the last quarter of the body and measures 0.03-0.04 mm X 0.02-0.03 mm in live specimen and 0.02-0.03 mm X 0.02-0.025 mm in fixed specimen. The

mouth leads into a short prepharynx, measuring 0.02mm in length in live specimen and 0.014 mm in fixed specimen. The prepharynx opens into a muscular pharynx which measures 0.021mm in diameter in live specimen and 0.019 mm in diameter in fixed specimen. The pharynx leads into an elongated esophagus, measuring 0.07 mm in length in live specimen and 0.05 mm in length in fixed specimen. It bifurcates into two intestinal caeca, about midway between the posterior margin of the anterior protrusible organ and anterior border of the ventral sucker. Both the intestinal caeca run posteriorly on the sides of the ventral sucker and terminate blindly near posterior end of the body, in front of the excretory bladder.

The penetration glands are four pairs, located just anterior to the ventral sucker. Each penetration gland contains a prominent nucleus and numerous fine granules, which take dark stain with neutral red. The penetration glands open to the outside at the anterior end of the body by two pair of ducts, one pair on each side. The cystogenous cells are scattered all over the body. They are few in number, irregular in shape and contain fine granules. The rudiments of the genital organs are present in the form of two masses of dark staining cells, one mass is located, a little posterior to the intestinal bifurcation and other mass is located just posterior to the ventral sucker.

The excretory bladder is small in size, broadly oval in shape and situated at the posterior end of the body. The anterior collecting canal is formed, on each side, by the union of capillaries from two flame cells, just posterior to the anterior protrusible organ. It runs posteriorly, on each side, and receives capillaries from two flame cells in the middle region of the body. The posterior collecting canal is formed, on each side, by the union of capillaries of two flame cells in the tail near its proximal part. It runs anteriorly into the body and receives, on each side, capillaries from two flame cells in the region of the excretory bladder. The anterior and the posterior collecting canals, on each side, unite together in the middle region of the body to form the main collecting canal. The main collecting canal runs posteriorly, on each side, and opens into the excretory bladder from the lateral side. A caudal excretory canal arises from the posterior margin of the excretory bladder and runs in the middle of the tail stem up to its distal part, where it bifurcates and runs up to the tip of the furcase. The flame cells are arranged in doubles and the flame cell formula is $2|(2+2) + (2) + (2)) = 16$.

Host: *Lymnaea acuminata*

Locality: Shastri Nagar, Diggi Colony, Meerut City

Number of snails collected: 140

Number of snails found infected: 10

Percentage of infection: 7.14%

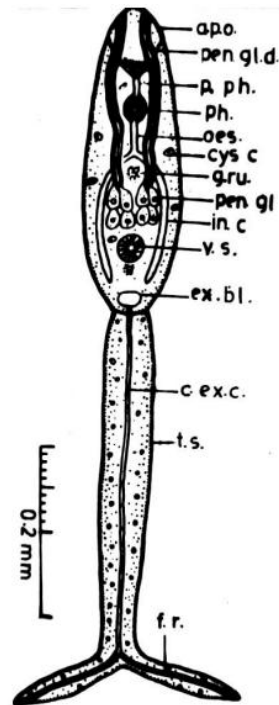


Fig. 4: Cercariadistomi I (Drawn from a live sp.) A.p.o., Anterior protrusible organ, C.ex.c., Caudal excretory Cys, c., Cystogene cells, Ex.bl., Excretory bladder, F.r., ramus, G.ru., Genital rudiments, In.c., Intestinal caecum, Oesophagus, Pen.gl. Penetration gland, Pen.gl.d., ducpenetratioin glands, P. Ph, Prepharynx, Ph., Pharynx, Is stem, V.s. Ventral sucker.

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