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Study on Morphology of freshwater Snail and larval trematodes (Cercariae) present on *Lymnaea luteola* in and around Meerut District (UP), India

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ABSTRACT
Snail is known to serve as an intermediate host for several species of larval trematodes some of which are highly pathogenic for their second intermediate host i.e., fishes. If we want the fisheries development programmes to be successful, we need to intensive research on the fish parasites and their intermediate host. These parasites also provoke remarkable mortality to human and cause serious damages to aquaculture, which is a valuable source of food and employment in developing countries, basically deals with the studies on effect of parasite i.e. cercariae that were found in various water bodies of Meerut region infecting the host *B. bengalensis*. Recent investigations have shown that some of the molluscs are sources of important bio medical compound. 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.

Keywords- Lymnaea, Cercaria, Host, Trematodes

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.

Material and Method:

A total of around 450 freshwater snails were collected monthly during May 2016 to April 2017 from various water reservoirs of Meerut region viz., Ram Taal Vatika, Chittora Powerhouse, Diggi Shastri Nagar, Village Shobhapur, Village Kunda, Kanker Khera near 510 Army Workshop, Bhola PowerHouse, Pond near Railway Cantt. Station, Nanu Ki Nahar near Sardhana, Pond in village Rohta, Kali Nadi near Medical College, Ashram Pond in Parikshit Garh, Pond in Ganga Nagar near Hastinapur.

Snails were collected and identified by the method suggested by **Subba Rao (1989)**. The snails identified were found to be Bellamya bengalensis / wypioa (Lamarlo). Lymnaea (Pseudosuccina) luteola / typica (Lamark).

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 cercarine 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 discording 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 cererise 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 Spinacea oleracea 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 specimen for each cercarial species with the help of ocular micrometre. Uniform results were obtained by measuring heat killed cercariae.

Morphology of snails:

Systematic position of *Lymnaea luteola* (Lamarck, 1822)
Phylum: Mollusca
Class: Gastropoda

Sub class: Pulmonata
Order: Basommatophora
Super family: Lymnaeoidea
Family: Lymnaeidae
Genus: Lymnaea (Lamarck,1799)
Sub genus: Pseudosuccinea (Baker,1908)
Species: luteola (Lamarck, 1822)

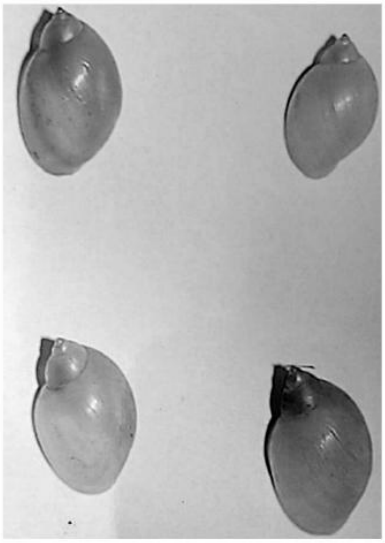

Fig. 1: *Lymnaea luteola* f. typica (Lamark)

Shell less infated, thin and glossy, relatively smaller and laterally compressed, Spire comparatively longer and gradually tapering aperture angulately narrows above. Tentacles flat and triangular. On the basis of above morphological characters the present form is, therefore, regarded as Lymnaea luteola, Lamarck, (1982).
Type Species : Lymnaea luteola
Locality : Kankerkhera, Makbara Diggi, Village Rohta, Diggi Shastri Nagar
Measurements : Height (mm) 24.25-16.75
Diameter (mm) 14.80-10.60
Height of Aperture (mm) 16.75–11.60

Discussion:

Lamarck, (1822) and again described by **Mitra, Dey and Ramakrishna, (2005)**, genus Lymnaea luteola.

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 Lymnaeoidea

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 luteola (Lamarck,1822).

Morphology of Cercariae:

Cercaria chauhani (Pandey and Jain, 1971)

Body pigment in form of small granules distributed all over body; body measures 0.40-0.85 X 0.25-0.48 in living and 0.32-0.72 X 0.20-0.40 in fixed conditions; tail measures 0.82-0.94 in living and 0.71-0.83 in fixed conditions; eye spot cone shaped; oral sucker measures 0.04-0.05 X 0.04-0.06 in living and 0.03-0.04 X 0.03-0.05 in fixed conditions; elongated pear shape gland present near oral sucker; oesophagus elongate, measures 0.05-0.07 in fixed specimens; caeca extend posteriorly up to level of acetabulum; transverse excretory canal with small median diverticulum, anterolateral diverticulum of main excretory canal present, main excretory canal, transverse duct and lateral diverticula filled with excretory granules; testes diagonally tandem, genital pore behind caecal bifurcation.

Radia measures 0.40-0.70 X 0.04-0.06 in living and 0.31-0.60 X 0.02-0.03 in fixed conditions; pharynx measures 0.01-0.02; salivary glands present; gut extends up to anterior fourth of body; three pairs of flame cells present; 4-7 germ balls and 1-2 developing cercariae present; birth pore at level of pharynx. Locality: Diggi colony, Shastrinagar

Snail Host: Lymnaea luteola. f. australis

Locality: Chittora Powerhouse

No. of snails collected: 100

No. of snails found infected: 03

Percentage of infection: 3.00%

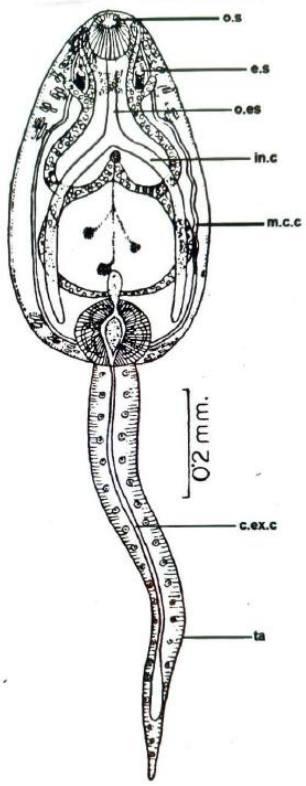

Fig. 2: Cercaria chauhani (Drawn from a live sp.)
O.s. - Oral sucker, O.es. - Oesophagus, In.c. - Intestinal caeca,
M.c.c. - Main collecting canal, C.ex.c. - Caudal excretory canal, Ta - Tail

***Cercaria sp VI* (Kerala Mohandas, 1981)**

Body pyriform, aspinose, slightly brown in colour and measures 350-350 u X 210-280 u; oral sucker 56-70 u in diameter; protrusible acetabulum 70-100 u, equatorial or post equatorial; collar 125-155 u wide, bearing 47 spines-5 corner spines on each side (3 oral and 2 aboral), 7 lateral spines in a single row on each side and 23 dorsal (12 oral and 11 aboral), spines of equal size of 12-18 u long; sensory hairs 11-14 pairs, one pairs, at oral sucker region and remaining at anterior half; 65-85 upwardly directed spines present dorsal to pre-pharynx cystogenous cells with granular protoplasm; tail aspinose, slightly longer than body, measures 400-630 u X 60-85 u; fin folds present, lateral fin fold at proximal end and dorsoventral at posterior half of body; sensory hairs 12-14 pairs in posterior half; mouth subterminal; short pre-pharynx; slightly oval pharynx; oesophagus long and solid with 10 cells; caeca extend up to posterior end of body; penetration glands three on either side of oesophagus and with coarsely granular protoplasm; excretory vesicle bipartite, each main duct accommodates 60-90 concretions, retrograde duct with ciliated patches and 18 pairs of flame cells in three groups, with flame cell formula of 2[(3+3+3) + (3+3+3)] 36, caudal excretory duct opens through lateral excretory pores; genital primordia consists of two groups of cells situated anterior and posterior to acetabulum and connected by

cord of cells; two small nerve masses situated on either side of pre-pharynx and connected by transverse nerve fibres.

Host: Lymnaea luteola. f. typica

Locality: Ganga Sagar Colony, Near Hastinapur

Number of snails collected: 135

Number of snails found infected: 11

Percentage of infection: 8.14%

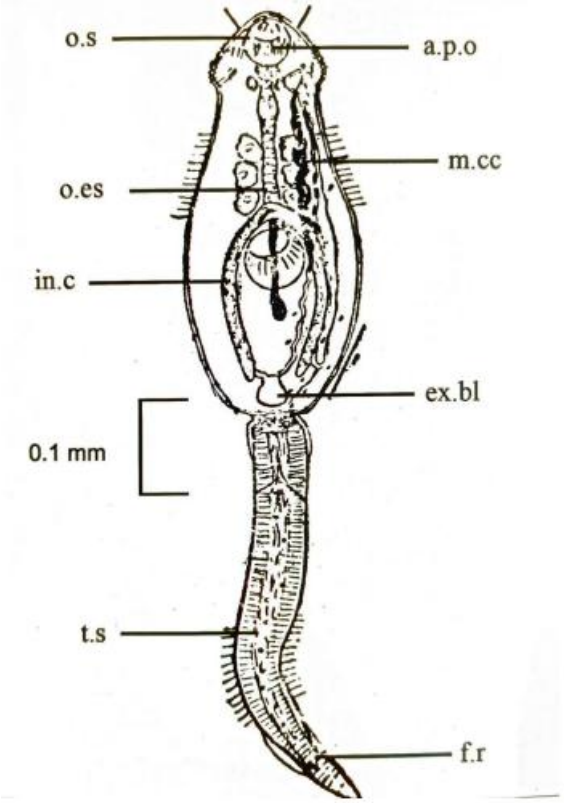

Fig. 3: Cercaria sp. VI kerala Mohandas (Drawn from a live sp.)
O.es. - Oesophagus, In.c. - Intestinal caecum, A.po. - Anterior protrusible organ, M.c.c. - Main collecting canal, Ts. - Tail stem ExbL. - Excretory bladder, F.r. - Furcal ramus

***Cercaria sp VIII* (Kerala Mohandas, 1981)**

Ovoid body measures 310-440 µ X 170-210 µ; oral sucker 40-50 µ in diameter ventral sucker post equatorial; 60-75 µ wide; collar prominent, 100-125 µ wide, collar spines 51 in number-two groups of 5 corner spines (3 oral and 2 aboral), two groups of 6 laterals in a single row and 29 dorsal in a single row two types of integumentary papillae present; sensory hairs two pairs at oral sucker region; cystogenous cells with granular protoplasm; tail aspinose, 310-450 µX 50-75 µ and devoid of fin folds; one type of integumentary papillae present; mouth subterminal pre-

pharynx short and stumpy; pharynx well developed; oesophagus solid and straight with 8 columnar cells and caecum with 9-11 cells; caeca extend to posterior end; penetration glands two pairs, situated below ventral sucker and between it and excretory vesicle, each gland with well-developed nucleus and granular protoplasm excretory vesicle bipartite, each main duct dilates from mid-level of ventral sucker anterior ward to accommodate 175-225 concretions, retrograde excretory duct with ciliated patches, flame cells 21 pairs in triplets, caudal excretory duct opens through lateral ducts; nervous system represented by two masses situated on either side of pre-pharynx, nerve masses connected by nerve fibres, one pair of nerve arises from nerve masses, runs anterio-dorsally and other pair runs posterio-ventrally genital rudiments consist of two groups of cells situated anterior and posterior to ventral sucker and connected by a strand of cells.

Host: Lymnaea luteola. f. typica lamark

Locality: Village Kunda

Number of snails collected: 300

Number of snails found infected: 31

Percentage of infection: 10.33%

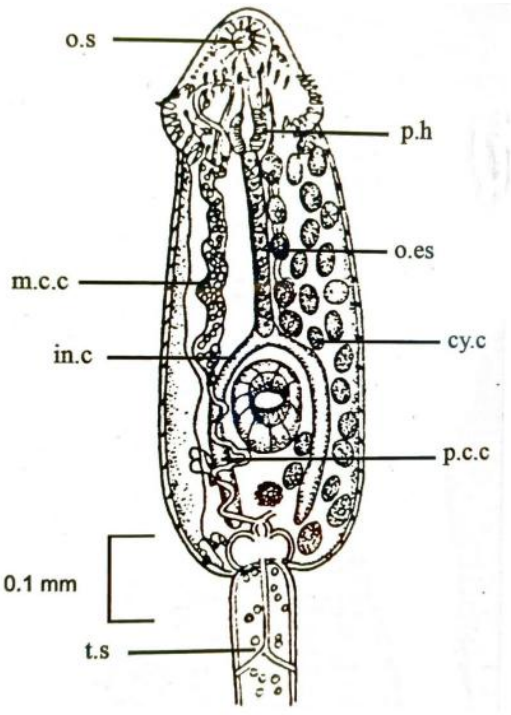

Fig. 4: Cercaria sp. VIII kerala Mohandas (Drawn from a live sp.)
O.s. - Oral sucker, P.h. - Pharynx, O.es. - Oesophagus, In.c. - Intestinal caecum, Cy.c. - Cystogeneous cells, P.c.c. - Post collecting canal, Ts. - Tail stem.

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