Snails as Bio-indicators for Dreaded Trematodiasis Diseases

Snails (Mollusca: Gastropoda) are an ideal bio-indicators for palaeo-environments and water quality (pollution) and are much more useful in the classification of ecological diverse aquatic habitats. These aquatic snails also complete the life cycle of digenetic trematode parasites causing various dreaded trematodiasis diseases in vertebrates including men. Indeed these snails are an intermediate hosts of these highly pathogenic endoparasites and develop their larval stages (sporocysts, rediae, and cercariae). One of these larvae, “cercariae” are most active, non-feeding, and free swimming stage and become infective in some cases, otherwise these further undergo another infective stage, “metacercariae”.

The most common dreaded trematodiasis in ruminants and human beings are amphiostomiasis, fascioliasis and schistosomiasis caused by infection of digenean trematode parasites viz., Amphitostomes, Fasciola, and Schistosomes respectively. Cercariae of these highly pathogenic digeneans are known as amphiostome, gymnocephalous, and furcocercous respectively.

It is well known that most of the cercarial species have their strong host-specificity and released from the specific snail species in a particular season or in months of a year. However, some cercarial species have their wide range of host-specificity.

To find out a host-specificity and seasonality of amphitostome, gymnocephalous and furcocercous cercariae, a survey was conducted in the southern Rajasthan where number of seasonal and perennial lentic and lotic habitats are existing. Different snail species (Table 1 and Figs. 1-14) were collected month-wise in a year (2006) from these aquatic habitats and reared them in a separate laboratory aquarium containing tap water. On the next day of their collection the individuals of the same species were isolated and kept in separate cleaned glass beakers (1000 ml.) having tap water and then they were exposed to light (electric bulbs) for cercarial emergence. Snails were also dissected to observe whether their hepatopancreas (digestive gland) is infected with digenetic trematode larvae (sporocysts, rediae and cercariae) or not. These live larvae were collected by dropper and examined under microscope according to methods adopted and reported as earlier. Cercariae for amphiostomiasis, fascioliasis, and schistosomiasis were identified as described elsewhere.

Amphitostomes, gymnocephalous and furcocercous cercariae were released from their respective snail species throughout the year. But in the post rainy season, September and October (Fig.-1) these cercariae emerged maximum in number from their intermediate snail hosts or their incidence of infection is relatively high. These cercarial species (type) were also showed the strong host-specificity (Table-1) or emerged out from specific snail species. Such as genera of Lymnaeidae family.
Table 1: Snail species infected with pathogenic cercariae of amphistomes, fasciola and schistosomes digenetic trematode parasites

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Snail species</th>
<th>Cercariae of</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Amphistomes</td>
<td>Fasciola</td>
<td>Schistosomes</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td><em>Lymnaea acuminata</em> f. patula</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td><em>L. acuminata</em> f. chlamys</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td><em>L. acuminata</em> f. typical</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td><em>L. luteola</em> f. australis</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>5.</td>
<td><em>L. luteola</em> f. typical</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>6.</td>
<td><em>L. luteola</em> f. impura</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>7.</td>
<td><em>L. luteola</em> f. rufescens</td>
<td>–</td>
<td>++</td>
<td>–</td>
<td></td>
</tr>
<tr>
<td>8.</td>
<td><em>Planorbis</em> (Indoplanorbis) exustus</td>
<td>++</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>9.</td>
<td><em>Anisus</em> (Gyraulus) convexiusculus</td>
<td>++</td>
<td>–</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td><em>Faunus ater</em></td>
<td>–</td>
<td>–</td>
<td>++</td>
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<tr>
<td>11.</td>
<td><em>Melania</em> (Plotia) scabra</td>
<td>–</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>12.</td>
<td><em>Thiara</em> (Tarebia) lineata</td>
<td>–</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td><em>M. striatella</em> tuberculata</td>
<td>–</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>14.</td>
<td><em>Vivipara bengalensis</em> race gigentea</td>
<td>–</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td><em>V. bengalensis</em> race mandiasis</td>
<td>–</td>
<td>–</td>
<td>++</td>
<td></td>
</tr>
</tbody>
</table>

++, commonly infected; +, rarely infected; –, non infected

Legend

1. *Lymnaea acuminata* f. patula
2. *L. acuminata* f. chlamys
3. *L. acuminata* f. typical
4. *L. luteola* f. australis
5. *L. luteola* f. typical
6. *L. luteola* f. impura
7. *L. luteola* f. rufescens
8. *Planorbis* (Indoplanorbis) exustus
9. *Faunus ater*
10. *Melania* (Plotia) scabra
11. *Thiara* (Tarebia) lineata
12. *M. striatella* tuberculata
13. *Vivipara bengalensis* race gigentea
14. *V. bengalensis* race mandiasis
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(Physa species) were found to be infected and released gymnocephalous cercariae of Fasciola. Similarly furcocercous cercariae of Schistosomes were released from the snails belonging to Viviparidae and Melaniidae families (Table-1). Other snail species, Planorbis exustus and Anisus convexiusculus were found to be infected with amphistome cercariae. Although these snails also infected with furcocercous cercariae but their incidence was found very poor.

On the basis of strong host-specificity, snail species of Lymnaeidae, Planorbidae, and Melaniidae and Viviparidae families are an ideal bio-indicators for the epidemic of facioliasis, amphistomiasis, and schistosomiasis parasitic diseases. In fact seasonality of amphistome, gymnocephalous, and furcocercous cercariae is a potential and an ideal period in which these dreaded diseases can easily spread. Therefore, where there is these snail species are inhabiting in aquatic habitats, a forecasting of epidemic of these parasitic diseases can be done and preventive measures can be taken in advance.

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