Gastrointestinal nematodes of *Rattus rattus* from, Indore region, India

S. Gaherwal*, M.M. Prakash and N. Wast

Department of Biotechnology, Government Holkar Science College, Indore (M.P.).

**ABSTRACT**

*In the present study, diversity of gastrointestinal nematodes in Rattus rattus was studied. Seven species were recorded in the studied rodents. They were Syphacia muris, Trichinella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrus, Nematospiorideus dubius, Aspiculuris tetraptera. Among them, Syphacia muris dominated throughout the study, while Aspiculuris tetraptera was least available parasite. Incidence of infection, intensity of infection, density of infection, relative density and index of infection has been discussed in the present communication.*

**Keywords:** Diversity, Nematodes, H. S. C. Campus, Abundance.

**INTRODUCTION**

Nematodes are the most abundant and one of the most diverse groups of multicellular animals on the planet (May 1988; Groombridge 1992; Wilson 2000). They are thread-like, unsegmented worms, found both in the plant and animal kingdoms. Nematodes differ in their size, shape, and habitat. All nematodes live in an "aquatic" (wet or liquid) environment and are only active in moist habitats (Maggenti, 1981). The total number of living species of Nematodes is estimated as 1,000,000 (May, 1988) and 50,000 (Hammond, 1992), and they could be the second most important group beneath the Arthropods. Powers *et al.* (2009) described that comparison of nematode communities among ecosystem and have indicated that unlike many organisms, nematode communities have less diversity in the tropical than in temperate ecosystems.

Some nematodes are cosmopolitan while the distribution of others is restricted by geographical or environmental conditions. The distribution of many species has been influenced by human activities. The parasite diversity is linked to their specificity towards their hosts (Brooks & McLennan, 1993b). After comparison of nematode diversity across broad ecosystem, some authors found that tropical ecosystem have less nematode diversity than temperate broadleaf forest, temperate grassland, or even cultivated soil (Procter 1984, Groombridge 1992, Giller 1996, Maraun *et al.* 2007). 20th century nematologists have tried to interpret the pattern of parasite species richness among several groups of host including birds, mammals and fishes (Bush *et al.*, 1990; Poulin, 1995; Gregory *et al.*, 1996; Sasal *et al.*, 1997; Morand and Poulin, 1998).

Recently, Chaisire *et al.*, (2010) have described gastrointestinal helminth infection in Asian house rats (*Rattus tanezumi*) from northern and northeastern Thailand. Available literature suggest that no record is present on the nematodes of Indore region especially in wild rats. Looking to this fact an initial level study of the rats (Rattus rattus) of Holkar Science College Campus, was conducted to record their gastrointestinal nematodes.

**MATERIAL AND METHODS**

For the present investigation *Rattus rattus* (Wild rat) were collected from the campus of Govt. Holkar Science College, Indore (M.P.), which is having 34 acres of land area.

**Nematodes collected from Rattus rattus:**

*Rattus rattus* were sacrificed under the local anesthesia. Gastrointestinal tracts was removed from the body and cut longitudinally. They were then left in tap water in Petri dishes till the parasites left the tissue. Obtained nematodes were fixed in 70% alcohol for the taxonomic studies.

**Identification of nematodes:**

Collected nematodes were identified by Yamaguti's method (Yamaguti, 1959).

**Calculation:** Following parameters were calculated from the following formulas:-

1. **Incidence of infection:** - It is the frequency of infection of host by the parasite expressed in terms of per cent i.e.

   \[
   \text{Incidence} = \frac{\text{Infected host}}{\text{Total host examined}} \times 100
   \]
The incidence of infection: - The Rattus rattus collected during present study showed the presence of seven species of nematodes. It includes Syphacia muris, Trichenella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrous, Nematospoirideus dubius, Aspiculuris tetraptera. The per cent incidence of deferent parasite nematodes were found 100%, 40%, 60%, 40%, 60%, 40% and 20% respectively. The species having highest incidence was Syphacia muris and lowest incidence was Aspiculuris tetraptera.

Intensity of infection: - It is the quotient from the number of parasite divided by the number of infected hosts i.e.

\[
\text{Intensity} = \frac{\text{Number of parasite obtained}}{\text{Number of infected host}} \times 100
\]

Density of infection: - It is the concentration of the parasite in term of parasite (single host) per unit space i.e.

\[
\text{Density} = \frac{\text{Number of parasite collected}}{\text{Number of host examined}} \times 100
\]

Relative density: - It is the concentration of one individual nematode burden in relation to total nematode burden and is expressed in term of percentage i.e.

\[
\text{Relative Density} = \frac{\text{Individual burden}}{\text{Total burden}} \times 100
\]

Index of infection: - It is expressed by the following formula

\[
\text{Index of infection (IF)} = \frac{\text{NPC} \times \text{NHF}}{(\text{NHE})^2}
\]

Where,

\[
\begin{align*}
\text{NPC} &= \text{Number of parasite collected} \\
\text{NHF} &= \text{Number of host infected} \\
(\text{NHE})^2 &= (\text{Number of host examined})^2 \\
\text{IF} &= \text{Index of infection}
\end{align*}
\]

RESULTS AND DISCUSSION

Various parameters recorded during present study are summarized in table-1.

(A) The incidence of infection: - The Rattus rattus found 100%, 40%, 60%, 40%, 60%, 40% and 20% respectively in rats. The parasite Syphacia muris showed highest intensity of infection and Ancylostoma duodenum presented lowest intensity of infection.

(B) Intensity of infection: - The intensity of infection of different nematode i.e. Syphacia muris, Trichenella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrous, Nematospoirideus dubius, Aspiculuris tetraptera were showing 6.6, 4.4, 3.66, 1.5, 3.66, 3.5 and 5 respectively in rats. The parasite Syphacia muris showed highest intensity of infection and Ancylostoma duodenum presented lowest intensity of infection.

(C) Density of infection: - In the present study observed parasite Syphacia muris, Trichenella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrous, Nematospoirideus dubius, Aspiculuris tetraptera were presented 6.6, 1.6, 2.2, 0.6, 2.2, 1.4 and 1.00 density of infection respectively in rats. Syphacia muris showed highest density of infection and Aspiculuris tetraptera showed lowest density of infection.

(D) Relative density: - In the present study relative density of observed nematode Syphacia muris, Trichenella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrous, Nematospoirideus dubius, Aspiculuris tetraptera were 42.3, 10.25, 14.10, 3.84, 14.10, 8.97 and 6.41 respectively. Highest relative density was received by Syphacia muris and lowest by Aspiculuris tetraptera.

(E) Index of infection: - Present study showed index of infection of Syphacia muris, Trichenella spiralis, Trichuris muris, Ancylostoma duodenum, Heligmosomoides polygyrous, Nematospoirideus dubius, Aspiculuris tetraptera as 6.6, 0.64, 1.32, 0.24, 1.32, 0.56 and 0.2 respectively. The highest index of infection was with Syphacia muris and lowest with Aspiculuris tetraptera.

The present study adds to our knowledge regarding the presence of nematodes in urban rodents in Indore (India). Milazzo et al., (2010) have reported 10 species in Rattus rattus. In the present study authors observed 7 species from the same species of rat. The observed species were Syphacia muris (Oxyuroidae), Trichenella spiralis (Trichinellidae), Trichiurismuris (Trichuro- idae), Ancylostomaduodenum (Ancylostomatoidea), Heligmosomoides polygyrous (Heligmosomoidae), Nematospoirideus dubius (Heligmosomoidae), Aspiculuristetraptera (Oxyuroidae). Syphacia muris and Trichuris muris were also reported by Milazzo et al., (2010) in their obsevation in Rattus rattus. However, Heligmosomoides polygyrous found in the present observed Rattus rattus was not reported by Milazzo et al., (2010) in Rattus rattus. Feliu et al., (1997); Pulido-Flors et al., (2005); Warner, (1998); Behnke et al., (2000); Singla et al., (2008); and Parmasvaran et al., (2005) have described the prevalence of GI helminths parasites in Europe, America, Australia, Africa and Asia including Southeast-Asia. Literature on research on helmith in sympatric urban population of Rattus rattus and Mus muscularis showed that past studies are scarce and they have been performed mainly in tropical
areas (Rafigue et al., 2009). Milazzo et al., (2010) described 61.64 per cent prevalence of infection in house mouse (M. muscularis) while 92.68 per cent in wild rats (Rattus rattus). Chaisarie et al., (2010) described prevalence of gastrointestinal helminth and stated that the incidence of infection was 66.2%, but in the present study prevalence of infection was observed 100 per cent, as all studied rats were found infected with one or other species of nematodes. Chaisarie et al., (2010) in their study have also reported incidence of infection of Syphacia muris 14.7%, but in the present study this species showed 100 % incidence of infection and it dominated among the all the nematodes observed in the present study. Similarly Milazzo et al., (2010) have showed Syphacia muris as most prevalent (78.05%) in Rattus rattus.

In the present study Syphacia muris showed higher incidence of infection, higher intensity of infection, higher density of infection, higher relative density and higher index of infection. On the other hand Aspiculuris tetraptera shown lower incidence of infection, lower density of infection and lower index of infection. However, lower intensity and relative density was showed by Ancylostoma duedenum. This lead us to conclude that this college campus and its vicinity area (i.e. Indore region) is becoming the place of nematode infection, suggesting that humans of this area/region are at potential risk.

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Table-1: - Various parameters of nematodes observed and calculated in Rattus rattus from campus of Holkar Science College Indore

<table>
<thead>
<tr>
<th>S. No</th>
<th>Parasite species</th>
<th>No of Hosts Examined</th>
<th>No of Hosts Infected</th>
<th>No of Parasite collected</th>
<th>% of Incidence of infection</th>
<th>Intensity of Infection</th>
<th>Density of Infection</th>
<th>Relative density</th>
<th>Index of Infection</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Syphacia muris</td>
<td>10</td>
<td>10</td>
<td>66</td>
<td>100 %</td>
<td>6.6</td>
<td>6.6</td>
<td>42.3</td>
<td>6.6</td>
</tr>
<tr>
<td>2.</td>
<td>Trichenella spiralis</td>
<td>10</td>
<td>04</td>
<td>16</td>
<td>40 %</td>
<td>4.4</td>
<td>1.6</td>
<td>10.25</td>
<td>0.64</td>
</tr>
<tr>
<td>3.</td>
<td>Trichuris muris</td>
<td>10</td>
<td>06</td>
<td>22</td>
<td>60 %</td>
<td>3.66</td>
<td>2.2</td>
<td>14.10</td>
<td>1.32</td>
</tr>
<tr>
<td>4.</td>
<td>Ancylostoma Duodenum</td>
<td>10</td>
<td>06</td>
<td>06</td>
<td>40 %</td>
<td>1.5</td>
<td>0.6</td>
<td>3.84</td>
<td>0.24</td>
</tr>
<tr>
<td>5.</td>
<td>Heligmosomoides polygyrus</td>
<td>10</td>
<td>06</td>
<td>22</td>
<td>60 %</td>
<td>3.66</td>
<td>2.2</td>
<td>14.10</td>
<td>1.32</td>
</tr>
<tr>
<td>6.</td>
<td>Nematosporoides dubius,</td>
<td>10</td>
<td>04</td>
<td>14</td>
<td>40 %</td>
<td>3.5</td>
<td>1.4</td>
<td>8.97</td>
<td>0.56</td>
</tr>
<tr>
<td>7.</td>
<td>Aspiculuris tetraptera</td>
<td>10</td>
<td>02</td>
<td>10</td>
<td>20 %</td>
<td>5</td>
<td>1</td>
<td>6.41</td>
<td>0.2</td>
</tr>
</tbody>
</table>

REFERENCES


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