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Prevalence of Arthropods Intermediate Host Infected with Parasitic Larval Stage in and Around Ranchi

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ABSTRACT

The study was conducted to find out the prevalence of different arthropod intermediate hosts infected with different parasitic larval stages in and around Ranchi. A total of eighteen hundred different arthropods intermediate host *viz.*, Ticks, Mites, and Ants (600 each) were examined microscopically to find out the prevalence of parasitic stage of different parasite. 3.17 % ticks were found infected with different parasites, out of which 2.29% *Hyalomma* and 4.40% *Boophilus* were found harbouring parasites. Amongst oribatid mites, overall prevalence was found to be 2.83 %.with the percentage of infection in *Oppia* spp. and *Mesostigmata* oribitid mites were 2.52% and 4.07% respectively. Amongst ants, 26 (4.33%) were found infected with parasitic larval stage. The percentage of infection in *Camponotus compressus* and *Myrmicaria brunnea* ants were 5.79% and 4.97% respectively.

Keywords: Prevalence, intermediate host, ticks, oribatid mites, ants

Intermediate hosts deals with various arthropods infesting livestock and poultry. Many protozoa, tapeworm, trematodes and nematodes need to go through the specific stages of their life cycle in the body of a vertebrate or an invertebrate hosts. Some intermediate host acquire the parasites from an infected animal when they feeds, after development of the parasite in the intermediate host it becomes infective and can transmit the parasites when it feeds to next animals.

Ants, tick and oribatid mites act as intermediate hosts of trematodes, cestodes, and nematodes. Many species of oribatid mites possess the role of acting as intermediate hosts of certain anoplocephaline cestodes (Denegri, 1993; Schuster *et al.* 2000; Denegri *et al.* 2002; McAloon, 2004; Shimano, 2004; Akrami *et al.* 2007).

Ticks are the most common vector that can affect both humans and animals, transmit many pathogens, including viruses, bacteria and parasites. *Babesia* spp. or *Theileria* spp. are two well-known parasites responsible for many diseases that impact both human and animal health worldwide (Hunfeld *et al.* 2008; Morrison, 2009). *Anaplasma* spp. is also transmitted by Ixodid ticks, although tick transmissibility of *A. centrale* has been recently questioned (Shkap *et al.* 2009).

Ants play an important role of transmission of different poultry cestodes. 5 ant species namely *Pheidologeton diversus, Tetramorium caespitum, Camponotus nicobarensis, Camponotus treubi, Anoplolepis gracilipes* known as intermediate hosts of tapeworm *Raillietina* spp. in backyard chickens in Thai Nguyen province. These species are belongs to *Formicidae* family (Nguyen,

et al. 2012). The common house hold ants of the genus *Monomorium* spp., *Phidole* spp. and *Tetramorium* spp. also play as intermediate host of poultry tapeworms *Raillietina* spp. and *Cotugnia* spp.

Formica fusca is an intermediate host of *Dicrocoelium dendriticum,* lancet liver fluke of ruminants reported by Murleedharan (2000). Chellapa *et al.* (1993) described that *Monomorium* spp. of ants act as the natural intermediate host for *Cotugnia digonopora*.

The objective of this study was to know the prevalence of arthropods intermediate host affected with different parasites larval stage.

MATERIALS AND METHODS

To know the prevalence of Ticks, Oribatid mites, and Ants, acting as the intermediate hosts of different parasitic infections, 600 specimen of each was collected month wise from different farms of R.V.C, organized and unorganized farms situated in and around Ranchi.

The percentage prevalence of various intermediate hosts was calculated by using the formula:

Percent prevalence = No. of positive samples/No. of samples collected × 100

Collection of different intermediate hosts

Collection of Tick

To collect ticks, from the animal body, a thorough search was conducted particularly in soft skinned areas with less hair (brisket, groin, anal region below the tail, ear, eyebrows etc.). Ticks were handpicked and kept in bottle for further study. For detection of infective stage in tick salivary glands, unfed adult ticks or moulting nymphs were collected from the hiding places in the animal houses. For the dissection, the ticks were given a three day (partial) feeding on ears of rabbit using cloth ear bags in order to stimulate maturation of protozoan parasites, if present in the salivary glands of the ticks. On third day the partially fed ticks were removed from the ears and transferred to a test tube for further processing.

Collection of Oribatid mites

For oribatid mites, the soil samples were collected at a fixed time in the morning in plastic bags and were brought to the laboratory for further extraction. The extraction was carried out using Tullgren funnel. A replaceable electric bulb (100 watt) with a shed at the

Table 1. Overall prevalence of different ticks having infective stages of parasites in and around Ranchi

Ticks spp.	No. of ticks examined	No. of positive ticks	Prevalence %	χ^2 Value
Boophilus spp.	250	11	4.40	
Hyalomma spp.	350	8	2.29	2.12^{NS}
Total	600	19	3.17	

** = p< 0.01, *= p<0.05, NS= Non significant.

Table 2. Month wise prevalence of different ticks having infective stages of parasites in and around Ranchi

Different months	No. of ticks examined	No. of positive ticks	Prevalence %	χ^2 Value
May	100	3	3.00	
June	100	3	3.00	
July	100	4	4.00	
August	100	4	4.00	1.029^{NS}
September	100	2	2.00	
October	100	3	3.00	
Total	600	19	3.17	

** = p< 0.01, *= p<0.05, NS= Non-significant.

top was used. At the lower end of the cylinder a round wire gauge was fitted with wooden frame. A beaker half filled with water was placed near the lower end of the funnel for the collection of mites.

Collection of Ants

The ants were collected from surrounding farm areas, the collected ants were kept in small glass vials containing 70% alcohol.

Identification of intermediate host

Identification of Ticks

The collected ticks were identified up to the genus according to their morphological characters as described by Sen and Fletcher (1962) and Soulsby (1982).

Identification of oribatid mites and ants

Oribatid mites and ants were identified on the basis of characters by Zoological Survey of India, Kolkata report.

Identification of infective stage of the parasite in the intermediate hosts.

Ticks

The collected ticks were fixed in wax and dissected under stereomicroscope. Salivary glands were teased apart on the slide under the stereomicroscope with the help of dissecting needles and then the salivary glands were stained by Giemsa staining method as described by Singh *et al.* (1980) with slight modification.

Oribatid mites

Collected living Oribatid mites were placed on a slide with a drop of normal saline and covered with cover slip, by applying gentle pressure on the cover slip the mites ruptured to release the contents of its body cavity.

Ants

The ants were collected and screened for the presence of cysticercoids by pressing them gently between 2 glass slides with the help of normal saline and internal part were separated out and then seen it under microscope.

Statistical analysis

Statistical analysis was performed according to the method described by Snedecor and Cochran (1994).

Table 3. Overall prevalence of different oribatid mites having infective stages of parasites in and around Ranchi

Mites spp.	No. of mites	No. of positive mites	Prevalence %	χ^2 Value
Oppia spp..	477	12	2.52	
Mesostigmata spp.	123	5	4.07	0.85^{NS}
Total	600	17	2.83	

** = p< 0.01, *= p<0.05, NS= Non significant.

Table 4. Month wise prevalence of different oribatid mites having infective stages of parasites in and around Ranchi

Different months	No. of mites examined	No. of positive mites	Prevalence %	χ^2 Value
May	100	1	1.00	
June	100	1	1.00	
July	100	2	2.00	
August	100	3	3.00	5.388^{NS}
September	100	3	3.00	
October	100	2	2.00	
Total	600	12	2.00	

** = p< 0.01, *= p<0.05, NS= Non significant.

Table 5. Month wise prevalence of different ants having infective stages of parasites in and around Ranchi

Different months	No. of ants examined	No. of positive ants	Prevalence %	χ^2 Value
May	100	0	0	
June	100	0	0	
July	100	4	4.00	
August	100	7	7.00	15.776^{NS}
September	100	6	6.00	
October	100	9	9.00	
Total	600	26	4.33	

** = p< 0.01, *= p<0.05, NS= Non significant.

Table 6. Overall prevalence of different ants having infective stages of parasites in and around Ranchi

Ants spp.	No. of ants examined	No. of positive ants	Prevalence %	χ^2 Value
C. compressus	259	15	5.79	
M. brunnea	221	11	4.97	6.985^{NS}
L. ocellifera	120	0	0	
Total	600	26	4.33	

** = p< 0.01, *= p<0.05, NS= Non significant.

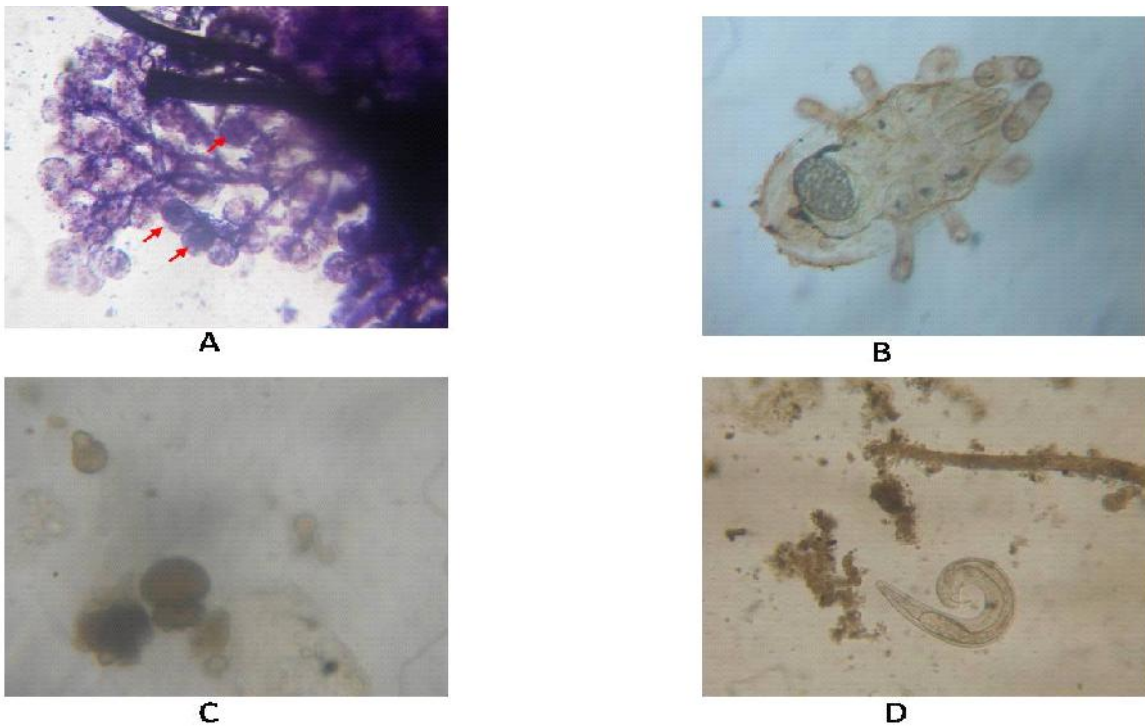

Fig. 1. Infective stages found in different intermediate hosts (A: Infective stage in salivary glands of ticks, B: Infective stage in body cavity of oribatid mites, C: Cysticercoid stage in the body cavity of ants, D: Nematode larvae in the body cavity of ants)

RESULTS AND DISCUSSION

Ticks

The prevalence of different ticks having infective stages in them was observed in and around Ranchi and belonged to the Genus of *Boophilus* spp. and *Hyalomma* spp.The overall month wise prevalence of infective stage of parasites indicated in the table-2. The table indicated that overall prevalence of ticks was 3.17%. In month of July and August maximum numbers of infection were observed. The overall prevalence of different infective stages in salivary glands was 4.40% in *Boophilus* spp. and 2.29% in *Hyalomma* spp (Table 1). Chi square test revealed that there is no significant difference in prevalence rate.

The prevalent ticks in Ranchi were *Boophilus* spp. and *Hyalomma* spp. Kumar *et al*. (1989) and Kumar (2002) also reported similar type of ticks prevalent in Jharkhand. Some workers also reported that higher degree of ticks infestation in animals was found in summer and rainy seasons which is due to increased temperature and humidity which cause favorable condition for breeding of ticks (Singh and Singh 1999; Kumar 2002). Ranchi and its surrounding area are situated under the tropical region of India, where there are existences of high humidity and temperature during May to October. This microclimate is suitable for the survival of different tick's species, especially for *Boophilus* spp. and *Hyalomma* spp.

Oribatid mites

The collected oribatid mites belonged to *Oppia* spp. and suborder *Mesostigmata*.

Out of 600 mites, 17 (2.83%) were found infected with cysticercoids. Cysticercoids stages appeared oval to pyriform in shape. Result indicated that overall 2.52 % *Oppia* spp. were infected with cysticercoid whereas in *Mesostigmata*, prevalence rate was 4.07% (Table 3).

The maximum no. of infection was observed in month of August and September (3%).Chi square test indicated that there is no significant difference in prevalence rate.

Gupta and Sanyal (1986) also observed similar types of oribatid mites from South Bihar (now in Jharkhand). The present study indicated that the population of *Oppia* spp. was found in large number from May to October, Where as Mesostigmata was available in fewer numbers in May and July and after rainy season. It may be due to microclimatic factors, like soil temperature, maximum and minimum environmental temperature and soil water content.

Ants

Identified ants belonged to *Camponotus compressus, Myrmicaria brunnea* and *Leptogenys ocellifera*.

Out of 600, 26(4.33%) were found to be infected with different stages of cysticercoids. Month-wise prevalence of ants infected with different cysticercoid stage illustrated in table 5. The percentage of infections in different species of ants was in month of August, September and October were 7.00%, 6.00%, and 9.00% respectively. In month of October maximum prevalence rate was observed. Chi square test showed significant ($p< 0.01$) difference in prevalence rate month wise.

The overall incidence of cysticercoids stages and nematode larvae in different species of ants in and around Ranchi indicated that percentage of infections was (5.79%) in *Camponotus compressus* and (4.97%) in *Myrmicaria brunnea* whereas *Leptogenys ocellifera* did not showing any infection presented in Tables 6.

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