Site preference of two phthirapteran ectoparasites on the body of red munia, *Estrilda amandava amandava.*

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Received: 08.06.05 Accepted: 16.06.05

Abstract : The feather feeding ischnoceran louse, *Brueelia* sp. exhibited wide spread distribution on the body of red munias. The order of abundance of the louse on different regions of the body (in order of decreasing frequency) was- back (24%) > neck (23%) > abdomen (19%) > breast (17%) > wings (7%) > nape (5%) > head (3%) > legs (2%) > tail (1%). In contrast, the amblyceran louse *Myrsidea amandava* exhibited more or less restricted distribution on the host body. Most of its population occurred on the feathers belonging to nape (45%), head (32%) and neck (10%). Small percentage of lice were seen on back and breast feathers (6%). Other areas of the body were practically devoid of *M. amandava*.

Keywords: Phthiraptera, Mallophaga, Lice distribution.

Resumen: El piojo ischnocero *Brueelia* sp., demuestra un distribución muy amplia sobre el cuerpo del Bengalí rojo, hospedador del que se alimentan, fundamentalmente en base a sus plumas. El orden de abundancia del piojo en las diferentes regiones del cuerpo (en orden de intensidad decreciente) fue – la espalda (24%) > el cuello (23%) > el abdomen (19%) > el pecho (17%) > las alas (7%) > la nuca (5%) > la cabeza (3%) > las patas (2%) > la cola (1%). Por el contrario, el piojo amblycero *Myrsidea amandava*, exhibió una distribución más o menos restringida en el cuerpo de estos hospedadores. La mayoría de la población amblycera se concentró en las plumas de la nuca (45%), de la cabeza (32%) y del cuello (10%). Una pequeña proporción de piojos se observó en las plumas de la espalda y del pecho (6%), mientras que el resto de las zonas corporales observadas aparecieron prácticamente desprovistas de *Myrsidea amandava*.

Palabras Clave: Phthiraptera, Mallophaga, distribución de piojos en zonas coporales.

1. Introduction

Most of the phthirapteran ectoparasites exhibit considerable site specificity on the avian hosts. Information on the distribution of adult lice on the body of selected birds viz. domestic fowl, *Gallus gallus domesticus* (Kalamarz, 1963; Brown, 1970; Trivedi *et al*., 1991; Saxena *et al*., 1997), black bird, *Turdus m. merula* (Baum, 1968), mallard duck, *Anas platyrhynchos* (Strilchuk, 1976), polygnous peacock, *Pavo cristatus* (Stewart *et al*., 1996), white scavanger vulture, *Neophron percnopterus* (Agarwal, 1982), common Myna, *Acridotheres tristis* (Chandra *et al*., 1989), willow Ptarmigan, *Lagopus lagopus* (Stock & Hunt, 1989), domestic pigeon, *Columba livia* (Eichler, 1963; Nelson & Murray, 1971; Singh *et al*., 2000) and house crow, *Corvus splendens* (Beg, 2004) has become available. Information available on the site preference of phthirapterans on the host body has been reviewed from time to time (Rothschild & Clay, 1952; Blagovestchensky, 1959; Eichler, 1963; Nelson *et al*., 1975; Marshall, 1981).

2. Material and Methods

The infested birds were examined under stereozoom trinocular microscope to record the distribution of phthirapteran ectoparasites on the body of host birds. In addition, feathers bearing

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eggs were also observed. The body of bird was arbitrarily divided into nine regions (viz. head, nape, neck, back, breast, abdomen, legs, tail and wings). The numbers of lice or egg present (each species) were noted in tabular fashion. Regionwise percentage of lice / eggs was calculated by dividing the number of lice/ egg found in any region by the total number of lice / eggs counted on the bird. The region of the body carrying maximum percentage was considered most popular site.

3. Results and Discussion

3.1. Brueelia sp.

The ischnoceran louse *Brueelia* sp. exhibited wide spread distribution on the body of red munias. Lice belonging to *Brueelia* sp. were observed on almost every region of the body. Maximum percentage of this species (24.0%) was observed on the feathers belonging to back region, narrowly followed by neck region (23.0%). Feathers belonging to abdomen (19.0%) and breast (17.0%) were the next preferred sites (Fig. 1). Wings (which are generally the most popular site of occurrence of elongated flat bodied, sluggish ischnoceran lice) carried only 7% lice population. As many as, 5% lice were encountered on nape feathers. Feathers of head and legs carried very small percentage of lice (3.0 and 2.0%, respectively). The tail feathers appeared to be the least preferred site (1.0%). Thus, the distribution of *Brueelia* sp. on the feathers belonging to different regions of body, in order of decreasing frequency remained- back > neck > abdomen > breast > wings > nape > head > legs > tail (Fig. 1).

Feathers belonging to breast (26%), back (22%), abdomen and neck (16% each), harboured most of the eggs (80%) of this species (Fig. 1). Small percentage of eggs were also found on tail, wings and nape feathers (5% each). Lastly, the feathers of head and legs carried very few eggs of the *Brueelia* sp. (3 and 2%) respectively (Fig.2).

The popular oviposition sites of *Brueelia* sp. on the body of *Estrilda amandava amandava* have been indicated in Fig. 2. This ischnoceran louse exhibits wide spread oviposition sites, as the eggs are found on feathers belonging to most of the part of body. However, feathers belonging to breast and back carry nearly half of the egg load of louse.

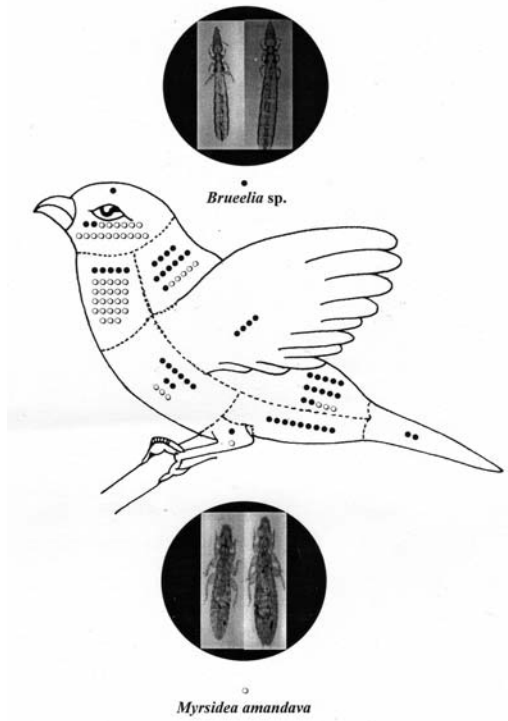

Fig 1. Showing the distribution of two munia lice on different regions of the body of host bird (one ● / ○ = 2% of the total lice; rounded off).

3.2. Myrsidea amandava

Lice belonging to amblyceran louse, *M. amandava* are generally rounded, flat bodied, active and fast running creatures. The amblyceran species are supposed to exhibit wide spread distribution on their host body. However, *M. amandava* exhibited more or less restricted distribution on the body of red munias. Nearly half of the total population of this louse (45.0%) was observed on the feathers belonging to nape. Head feathers remained the next preferred site (32.0%) (Fig. 1). Small percentage of lice (10.0%) were encountered on neck feathers. Thus, the aforesaid three areas carried more than 87.0% population of *M. amandava*. Feathers belonging to back and breast carried negligible percentage (6.0% each). Lastly, 1.0% lice were observed on leg feathers and the feathers belonging to abdomen. Wings and tail were practically devoid of *M. amandava*. Thus, *M. amandava* tries to occupy the feathers belonging to foreparts of the body. The overall distribution of *M. amandava* on host body, in order to decreasing frequency remained - nape > head > neck > back > breast > legs> abdomen.

M. amandava exhibited restricted ovipostion sites on the host body. Maximum condensations of the eggs of this louse were observed on the feathers belonging to nape (55%), followed by head feathers (36%). Small percentage of eggs were found on feathers of neck region also (3%). Thus, the feathers of foreparts of the body carried more than 90% of the louse eggs. On the other hand, negligible percentage of eggs was seen on head, back, breast, legs and abdomen (2, 2, 1and 1% respectively) (Fig. 2).

M. amandava prefers to lay the eggs on the feathers belonging to foreparts of the body (as indicated in Fig. 2). In other words, feathers of nape, head and neck carry more than 90% of eggs of lice. Feathers of other areas are rarely used for oviposition purpose.

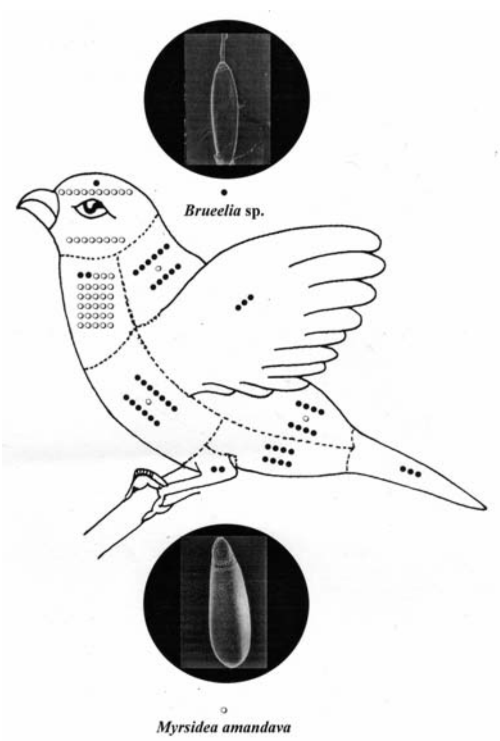

Fig 2. Showing sites of ovoposition of two kinds of lice (one ● / ○ = 2% of total eggs; rounded off) occurring on red munia.

The requirement of suitable microhabitat (for completing the life cycle) on host body appears to dictate the distribution of phthirapteran ectoparasitic insect. In fact, the host body provides a microclimate within plumage / pelage to lice and also insulates it from external environmental fluctuation. However, some factors (i.e. self and mutual grooming, thickness of skin, skin temperature and presence of other pest or species) may restrict the distribution of parasite. The distribution pattern is a result of long association between ectoparasite and host that has allowed the survival of both animals. Some information on the distribution pattern of selected phthirapteran species on the body of few avian host viz. domestic fowl, *Gallus gallus domesticus* (Brown, 1970; Trivedi et al., 1991; Saxena *et al*., 1997), domestic pigeon, *Columba livia* (Eichler, 1939; Nelson & Murray, 1971; Singh *et al*., 2000), white scavanger vulture, *Neophron percnopterus* (Agarwal, 1982), common Myna, *Acridotheres tristis* (Chandra *et al*., 1989), Willow ptarmigan, *Lagopus lagopus* (Stock & Hunt, 1989), Mallard duck, *Anas platyrhynchos* (Strilchuk, 1976), black bird, *Turdus m. merula* (Baum, 1968), peacock, *Pavo cristatus* (Stewart *et al*., 1996) has become available. In general, the distribution pattern of most of species studied so far appears to conform with general pattern guidelined by Rothschild & Clay (1952), Clay (1957) and Marshall (1981).

Avian lice are quite species specific and often site specific (Marshall, 1981). Ischnoceran lice generally exhibit more site specificity than amblycerans, which rely on their greater speed to protect themselves from preening by the host bird. Clay (1957) noted that in Ischnocera, different morphological types occupy different areas on the body of host bird. According to Clay (1957), the short round-bodied types are found on shorter feathers of head and neck (where they cannot be crushed during preening). On the other hand, on back and wings are found flat-bodied lice, which can slip sideways across the feathers. In this context the distribution of *Brueelia* sp. (an elongated flat bodied form) did not conform to prescribed pattern.

In fact, *Brueelia* sp. exhibited more or less widespread distribution on host body. Although the feathers belonging to back region harboured maximum percentage of *Brueelia* sp. (24%) but good percentage of lice were also encountered on neck (23%), abdomen (19%), breast (16%) and nape (5.0%). Other areas of body carried negligible percentage of lice. Furthermore, the amblyceran species (*M. amandava*) exhibited more or less restricted distribution pattern. More than 85% of *Myrsidea* population was confined on feathers belonging to nape, head and neck regions (45.0, 32.0 and 10.0%, respectively). Small percentage of this louse occurred on back and breast feather (6% each) while other areas were practically devoid of *M. amandava.*

4. Acknowledgements

The authors are indebted to the Principal, Govt. Raza P. G. College, Rampur (U.P.) for providing laboratory facilities and to the Department of Science & Technology, New Delhi for providing financial support to Dr. A. K. Saxena, in the form of project no. SP/SO/AS-30-2002.

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Evaluation of a fasciolosis hyper-infection model in mice for vaccination trials.

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Received: 28.06.05 Accepted: 29.06.05

Abstract: The use of large animals for preliminary vaccination trials against *Fasciola hepatica* presents inherent difficulties related with costs, space and manipulations. Thus, we wanted to develop a system of initial sifting, based on a murine hyper-infection experimental model using lethal doses of *F. hepatica* metacercariae for infections. With this objective we performed assays using two strains of mice (BALB/c and CD1), with increasing infection doses in order to establish the minimum optimum dose of lethal infection. With four-five metacercariae per animal, all the mice died between 28 and 43 days post-infection. In addition, we also studied the behavior of different *F. hepatica* geographical isolates. We found small -not statistically significant- differences in the behavior of the different *F. hepatica* strains in our fasciolosis model. We find an increase of IgG and IgG1 but any increase of IgG2a after the experimental infection, which indicate the predominant Th2 response against *F. hepatica* in our model of infection.

Key words: *Fasciola hepatica*, mice model, vaccine.

Resumen: El uso de animales grandes para estudios de vacunación preliminares contra *Fasciola hepatica* muestra dificultades obvias derivadas del costo, espacio y manejo. Por todo ello nosotros queremos desarrollar un sistema de cribado inicial basado en un modelo experimental murino de hiperinfección en el que se utilizan dosis letales de metacercarias de *F. hepatica*. Con este objetivo realizamos experimentos con dos estirpes de ratones (BALC/c y CD1), con dosis de infección crecientes para establecer la dosis óptima mínima de infección letal. Con cuatro o cinco metacercarias por animal, todos los ratones murieron entre los días 28 y 43 post-infección. Además estudiamos el comportamiento de aislados de diferentes lugares. Encontramos pequeñas diferencias, estadísticamente no significativas, entre las distintas estirpes en nuestro modelo de fasciolosis. Encontramos un aumento de IgG e IgG1 pero no de IgG2a después de la infección experimental, lo que indica una respuesta predominante Th2 contra *F. hepatica* en nuestro modelo de infección.

Palabras clave: *Fasciola hepatica*, modelo murino, vacunas.

1. Introduction

Fasciola hepatica is a widespread parasite which produces important economic losses in cattle and sheep livestock. At the same time, the number of reports of *F. hepatica* human infections has significantly increased since 1980 and several geographical areas have been described as endemic for human fasciolosis, with prevalence and intensity ranging from low to very high (Mas-Coma *et al*., 1999). Current control programs against fasciolosis are based on drug treatment. Nevertheless, treatment of fasciolosis with the current anti-*F. hepatica* drugs is not enough to abolish damage and losses produced by this parasite. In this regard, *F. hepatica* resistance to triclabendazole, the most adequate pharmaceutical product against this infection, has been already reported (Fairweather and Boray, 1999; Robinson *et al*., 2002).

Vaccination presents itself as an extremely interesting alternative to fight against fasciolosis. Thus, for many years new molecules of *F. hepatica*

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